CITY OF ATLANTA

HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

INVITATION TO BID

PROJECT NUMBER FC-8075

F3 A380 RECONFIGURATION

MIGUEL SOUTHWELL
AVIATION GENERAL MANAGER
DEPARTMENT OF AVIATION

ADAM L. SMITH, ESQ., CPPO, CPPB, CPPM, CPP
CHIEF PROCUREMENT OFFICER
DEPARTMENT OF PROCUREMENT

Kasim Reed
Mayor

CITY OF ATLANTA

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DEPARTMENT OF PROCUREMENT
Adam L. Smith, Esq., CPPO, CPPB, CPPM, CPP
Chief Procurement Officer
asmith@atlantaga.gov

April 20, 2015

ATTENTION INTERESTED BIDDER:

Your firm is hereby invited to submit to the City of Atlanta (the "**City**"), Department of Procurement (the "**DOP**"), a Bid for **Project Number: FC-8075, F3 A380 Reconfiguration**. This project will allow for an A380 aircraft to be accommodated on the new Concourse F and to provide airside improvements to Gate F3 at Hartsfield-Jackson Atlanta International Airport.

A **Pre-Bid Conference** will be held on **Tuesday, May 5, 2015, at 2:00 P.M, at the Hartsfield-Jackson Technical Support Campus, 1255 South Loop Road, College Park, Georgia 30337.** The purpose of the Pre-Bid Conference is to provide Bidders with detailed information regarding the Procurement process and to address questions and concerns. There will be representatives from the Department of Aviation, Risk Management and the Office of Contract Compliance available at the conference to discuss this project and to answer any questions. Attendance to the Pre-Bid Conference is strongly encouraged. An optional site tour will immediately follow the conference.

The last date to submit questions will be **Friday, May 8, 2015, no later than 5:00 P.M.** Questions may be sent to **Kiondria Walker, Contracting Officer,** via email at kmwalker@atlantaga.gov, or facsimile at 404-658-7705. Questions will be responded to in the form of an addendum.

Your response to this Invitation to Bid **("Bid")** must be received by designated staff of the Department of Procurement at 55 Trinity Avenue, S.W., City Hall, Suite 1900, Atlanta, GA 30303, **no later than 2:00 P.M., on Wednesday, June 3, 2015.** Any Bid received after this time will not be considered and will be rejected and returned.

All Bids will be publicly opened and read at 2:00 P.M. on the respective due date in Suite 1900, 1st Floor, 55 Trinity Avenue, S.W., City Hall, Atlanta, GA 30303.

If you have any questions regarding this project, please contact **Kiondria Walker, Contracting Officer,** at 404-330-6654, or by email at kmwalker@atlantaga.gov. Any questions regarding the procedures for purchasing a copy of the document or obtaining a copy of the plan holder's list should be directed to Jessica Boston, Administrative Assistant Senior, at 404-330-6903, or by e-mail at jaboston@atlantaga.gov.

The City reserves the right to cancel any and all solicitations and to accept or reject, in whole or in part, any and all Bids when it is for good cause and in the best interest of the City.

Thank you for your interest in doing business with the City.

Sincerely,

Adam L. Smith

ALS:kaw

Directions to Technical Support Campus

1255 South Loop Road, College Park, Georgia 30337
404-530-5500 (main)

From Downtown Atlanta:

- Take I-75/I-85 South
- Continue on I-75 at the I-75/I-85 Split
- Exit 238B – I-285 West
- Stay in right lane and follow signs for Loop Road
- Bypassing exit for I-285 West, continue on Loop Road through traffic light
- The Tech Campus is the second building on the left (grey stone w/ blue awning)

From East Atlanta:

- Take I-285 South
- Get off I-285 at the I-75 exit.
- Follow signs to I-285 West/Clark Howell Hwy/ Loop Rd.
- Exit at Loop Rd.
- The Tech Campus is the second building on the left (grey stone w/ blue awning)

From South of Atlanta: (I-75)

- Take I-75 North
- Exit 238B - I-285 West
- Keep to the right and exit at Clark Howell Hwy / Loop Rd
- Follow signs for Loop Road, go through traffic light
- The Tech Campus is the second building on the left (grey stone w/ blue awning)

From Southwest of Atlanta: (I-85)

- I-85 North
- Exit 68 - I-285 Bypass, follow to I-285 East
- Exit 59 – Loop Road / Clark Howell Hwy /Airport Cargo
- Follow signs for Loop Road
- Bypass exit for I-285 West, staying in two right lanes to Loop Road
- Continue through traffic light
- The Tech Campus is the second building on the left (grey stone w/ blue awning)

From West of Atlanta:

- From I-20, take I-285 South
- Exit 59 – Loop Road / Clark Howell Hwy /Airport Cargo
- Follow signs for Loop Road
- Bypass exit for I-285 West, staying in two right lanes to Loop Road
- Continue through traffic light
- The Tech Campus is the second building on the left (grey stone w/ blue awning)

From the Airport:

- Take Airport Blvd toward I-85 North, stay in the right lane
- Exit Right onto North Inner Loop Rd.
- Continue on N Inner Loop Rd, crossing over Aviation Blvd, and road then becomes South Inner Loop Road.
- Stay on S Inner Loop Rd until you see the “Road Closed” signs.
- The Tech Campus is the second building on the left (grey stone w/ blue awning)

CITY OF ATLANTA
DEPARTMENT OF AVIATION
HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

INVITATION TO BID
PROJECT NUMBER FC-8075
F3 A380 RECONFIGURATION

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PART I

INFORMATION AND INSTRUCTION TO BIDDERS

Part 1; Information and Instructions to Bidders

1. **Services Being Procured:** This Invitation to Bid ("**ITB**") from qualified bidders ("**Bidder" or "Bidders**") by the City of Atlanta ("**City**"), on behalf of its Department of Aviation ("**DOA**"), seeks to procure the following services ("**Services**"): **F3 A380 Reconfiguration** ("**Project**"). A more detailed Scope of Services sought in this procurement is set forth in Exhibit E, Scope of Work and Technical Specifications, attached to the Services Agreement ("**Services Agreement**"); **Contract No. FC-8075; F3 A380 Reconfiguration**, included at Part 2 of this ITB. [1] Work areas will be within the Airport Operations Area (AOA). Work schedule will primarily be between the hours of 11:00 p.m. to 6:00 a.m. each day, unless otherwise directed by the DOA.

2. **Method of Source Selection:** This procurement is being conducted in accordance with all applicable provisions of the City of Atlanta's Code of Ordinances, including its Procurement and Real Estate Code, and the particular method of source selection for the Services sought in this ITB is Code Section 2-1188; Competitive sealed bidding. By submitting a Bid concerning this procurement, a Bidder acknowledges that it is familiar with all laws applicable to this procurement, including, but not limited to, City's Code of Ordinances and Charter, which laws are incorporated into this ITB by reference.

3. **Minimum Qualifications:**

3.1. Each Bidder participating in this procurement must have a valid Georgia Contractor's License.

3.2. Each Bidder participating in this procurement must have a valid Georgia Utility License or a Bidder may utilize a Subcontractor to fulfill this requirement. If the Bidder is utilizing a Subcontractor to fulfill this requirement, that Subcontractor will be identified in the Contract in SC-09 as well as Form "B" as an Essential Subcontractor. **A copy of the license must be submitted with the bid.**

3.3. Each Bidder participating in this procurement must have a valid Georgia Electrical Contractor's License or a Bidder may utilize a Georgia Electrical Subcontractor to fulfill this requirement. If the Bidder is utilizing a Georgia Electrical Subcontractor to fulfill this requirement, that Subcontractor will be identified in the Contract in SC-09 as well as Form "B" as an Essential Subcontractor. **A copy of the license must be submitted with the bid**.

3.4. Each Bidder participating in this procurement must have a valid Georgia Mechanical Contractor's License or a Bidder may utilize a Georgia Mechanical Subcontractor to fulfill this requirement. If the Bidder is utilizing a Georgia Mechanical Subcontractor to

1 All capitalized terms contained in the Services Agreement are incorporated into this ITB.

fulfill this requirement, that Subcontractor will be identified in the Contract in SC-09 as well as Form "B" as an Essential Subcontractor. **A copy of the license must be submitted with the bid**.

3.5. **A Joint Venture is required**.

3.6. Each Bidder must have and document lead experience using Form "I", Experience Statement to document work, for at least three (3) projects of similar scope of work to this project that occurred within the last ten (10) calendar years. This experience must have been achieved on active airfields or apron/gate operations at a major airport hub similar to Hartsfield-Jackson Atlanta International Airport (H-JAIA). Experience must include tunneling and underpinning.

3.7. Each Bidder must have and document experience using Form "I", Experience Statement to document work, for at least one (1) project within the last five (5) years working in Federal Inspection Services (FIS) area similar to H-JAIA.

3.8. All Sub-Contractor work experience is to be documented using Form "B", Essential Subcontractor Qualification Statement. The essential activities/trades for this project are identified in Special Condition (SC)-09 and are comprised of the following:

- Electrical
- Mechanical
- Metals / Structural Steel
- Site Work
- Concrete Paving
- Foundations
- Passenger Boarding Bridges

As identified in SC-09, Form "B", "Essential Subcontractors", shall be completed to include all essential subcontractors and submitted with bid.

4. **No Offer by City; Firm Offer by Bidder:** This procurement does not constitute an offer by City to enter into a Services Agreement and cannot be accepted by any Bidder to form a Services Agreement. This procurement is only an invitation for offers from interested Bidders and no offer shall bind City. A Bidder's offer is a firm offer and may not be withdrawn except under the rules specified in City's Code of Ordinances and other applicable law.

5. **Bid Deadline:** To be considered Responsive and Responsible, a Bidder must complete and submit all required Bid submittals in accordance with the instructions contained in this ITB or on the individual form. Accordingly, responses to this ITB must be received by City's Department of Procurement, 55 Trinity Avenue, S.W., City Hall South, Suite 1900, Atlanta, Georgia 30303-0307, on **Wednesday, June 3, 2015**, no later than **2:00 p.m.** EST (as verified

by the Bureau of National Standards) each Bidder must submit **one (1) Original**, marked "Original", and **five (5)** copies of its bid in **three-ring binders**. The following submittals are required to be included in each bid:

5.1. The following forms from Part 1:

5.1.1. **Form 1: Illegal Immigration Reform and Enforcement Act**: This ITB is subject to the Illegal Immigration Reform and Enforcement Act ("**Act**"). Pursuant to Act, the Bidder must provide with its bid proof of its registration with and continuing and future participation in the E-Verify Program established by the United States Department of Homeland Security. A completed Affidavit, set forth in **Part 1; Form 1**; **Illegal Immigration Reform and Enforcement Act Forms**, must be submitted at the time of submission. Under state law, the City cannot consider any bid which does not include completed forms. It is not the intent of this notice to provide detailed information or legal advice concerning the Act. All Bidders intending to do business with the City are responsible for independently apprising themselves of and complying with the requirements of the Act and assessing its effect on City procurements and their participation in those procurements. For additional information on the E-Verify program or to enroll in the program, go to: https://e-verify.uscis.gov/enroll.

5.1.2. **Form 2: Contractor Disclosure Form**;

5.1.3. **Form 3: Bid Bond**;

5.1.4. **Form 4: Respondent Financial Disclosure Form (N/A FOR THIS ITB);**

5.1.5. **Form 5: Acknowledgement of Insurance and Bonding Requirements**;

5.1.6. **Form 6.1: Certification of Insurance Ability**;

5.1.7. **Form 6.2: Certification of Bonding Ability**;

5.1.8. **Form 7: Acknowledgement of Addenda**;

5.1.9. **Form 8: Bidder Contact Directory**;

5.1.10. **Form 9: Georgia Contractor Utility License**;

5.1.11. **Georgia Contractor's License;**

5.1.12. **Georgia Electrical Contractor's License**; and

5.1.13. **Georgia Mechanical Contractor's License**

5.2. The following forms from Exhibit "C", Quantities, Pricing and Data:

5.2.1. **Form A. Schedule of Quantities and Prices**;

5.2.2. **Form A-1. Schedule of Unit and Lump Sum Prices**;

5.2.3. **Form B. Essential Subcontractor Qualification Statement**;

5.2.4. **Form C. Preliminary Contract Schedule**;

5.2.5. **From D. Project Organization and Work Plan**;

5.2.6. **Form E. Safety Program**;

5.2.7. **Form F. Resumes of Key Personnel**;

5.2.8. **Form G. Summary of QC Program**;

5.2.9. **Form H. Work in Progress**;

5.2.10. **Form I. Experience Statement**.

5.3. The following forms Part 2 of this ITB:

5.3.1. **Exhibit "D"; OCIP Program Insurance Information Form (Pages 1 and 2)**; and

5.3.2. **Appendix A; EBO Forms 1 through 5 (attached to Services Agreement; Part 2 of ITB)**.

6. **Pre-Bid Conference:** It is strongly recommended that each Bidder attend the Pre- Bid Conference which is scheduled for **Tuesday, May 5, 2015** at **2:00 P.M.**, at the H-JDP Technical Support Campus, 1255 South Loop Road, College Park, Georgia. Each Bidder is responsible to be fully informed regarding all existing and expected conditions and matters which might affect the cost or the performance of the Services. Any failure to fully investigate the requirements of this ITB shall not relieve any Bidder from the responsibility for estimating properly the difficulty or cost of successfully performing the Services being sought under this ITB.

7. **Bid Guarantee:**

7.1. Each Bidder must furnish a Bid Guarantee in the amount of **five percent (5%)** of its Bid amount. At the option of the Bidder, the Bid Guaranty may also be a certified check payable to the City of Atlanta or a Bid Bond attached to this ITB as **Form 3**. A surety executing a Bid Bond must meet the requirements set forth in Exhibit D; Insurance and

Bonding Requirements and Exhibit A, General Conditions, GC-12 Performance and Payment Bonds attached to the Services Agreement included at Part 2 of this ITB.

7.2. Each Bidder agrees that, if it is awarded a Services Agreement (the form of which is attached to this ITB at Part 2 and must be fully executed and provided as a submittal in a Bidder's Bid), it will, in addition to the executed Services Agreement, be required to submit additional documentation (e.g. insurance/bonds, etc.) after such award pursuant to notice provided by City. If, within ten (10) days of receiving such notice, the successful Bidder fails to comply with that notice and submit additional requested documentation, City may retain the Bid Guarantee as liquidated damages and not as a penalty.

8. **Procurement Questions; Prohibited Contacts:** Any questions regarding this ITB should be submitted in writing to City's contact person, **Ms. Kiondria Walker**, Contracting Officer, Department of Procurement, 55 Trinity Avenue, SW, Suite 1900, Atlanta, Georgia 30303-0307, by fax (404) 658-7705 or e-mail **kmwalker@Atlantaga.gov** on or before **Friday, May 8, 2015.** Questions received after the designated period will not be considered. Any response made by City will be provided in writing to all Bidders by addendum. It is the responsibility of each Bidder to obtain a copy of any Addendum issued for this procurement by monitoring the City' website at www.atlantaga.gov and its Department of Procurement's Plan Room which is open during posted business hours, Suite 1900, 55 Trinity Avenue, S.W., City Hall South, Atlanta, Georgia 30303. No Bidder may rely on any verbal response to any question submitted concerning this ITB. All Bidders and representatives of any Bidder are strictly prohibited from contacting any other City employees or any third-party representatives of City on any matter having to do with this ITB. All communications by any Bidder concerning this ITB must be made to the City's contact person, or any other City representatives designated by the Chief Procurement Officer in writing.

9. **Ownership of Bids:** Each Bid submitted to City will become the property of City, without compensation to a Bidder, for City's use, in its discretion.

10. **Insurance and/or Bonding Requirements:** The Insurance and/or bonding requirements for any Services Agreement that may be awarded pursuant to this ITB are set forth in **Exhibit "D"; Insurance and Bonding Requirements** and **Exhibit A, General Conditions, GC-12 Performance and Payment Bonds** attached to the Services Agreement included at Part 2 of this ITB.

11. **Applicable City OCC Programs:** City's OCC Programs applicable to this procurement are set forth in **Appendix "A"; Office of Contract Compliance** Submittals, attached to the Services Agreement included at Part 2 of this ITB.

12. **Evaluation of Financial Information:** This ITB requires the provision of a Payment Bond and/or Performance Bond if a Services Agreement is awarded, attached as **Form 10 Performance Bond** and **Form 11 Payment Bond**. In connection with that requirement, City

will review the information included in Form **6.1** & **6.2**; **Certification of Insurance and/or Certification of Bonding Ability**. A Bidder must include with that form (a) notarized letter(s) from its proposed insurer(s) and surety(ies) indicating that the financial capacity of the Bidder is such that the insurer(s)/surety(ies) is/are willing to issue insurance and Payment and Performance Bonds for the Bidder if a Services Agreement is awarded to it.

13. **Rules Applicable to Evaluation of Bids:**

13.1. All extensions of the unit prices shown and the subsequent addition of extended amounts included in a Bid may be verified by City. In the event of a discrepancy between the unit price bid and the extension, the unit price will be deemed intended by the Bidder and the extension shall be adjusted. In the event of a discrepancy between the sum of the extended amounts and the Bid total, the sum of the extended amounts shall govern.

13.2. City reserves the right to reject any Bid in which the pricing, upon comparison with City's cost estimate(s), appears to be irregular. Where only a single responsible and responsive Bid is received, City may, in its sole discretion, elect to conduct a price or cost analysis of the Bid. Such Bidder shall cooperate with City and provide any supplemental information that may be required. The determination whether to enter into a Services Agreement with such sole Bidder is entirely within City's discretion.

13.3. Each Bidder's Bid must affirmatively state within it that the prices contained in it, as well as its total Bid amount(s), are valid for a period of ninety (90) days from the date of the Bid deadline.

14. **Examination of Bid Documents:**

14.1. Each Bidder is responsible for examining with appropriate care this ITB and associated Bid Documents and all Addenda, and for informing itself with respect to all conditions which might in any way affect the cost or the performance of any Services. Failure to do so will be at the sole risk of the Bidder, who is deemed to have included all costs for performance of the Services in its Bid.

14.2. Each Bidder shall promptly notify City in writing should it find discrepancies, errors, ambiguities or omissions in the ITB and associated Bid Documents, or should their intent or meaning appear unclear or ambiguous, or should any other question arise relative to the ITB and associated Bid Documents.

14.3. City may, by addendum, modify any provision or part of this ITB or associated Bid Documents at any time prior to the Bid due date and time. The Bidder may not rely on oral clarifications/representations/instructions to the ITB or associated Bid Documents unless they are confirmed in writing by City in an issued addendum.

14.4. Each Bidder must confirm addenda have been received and acknowledge receipt by executing **Form 7; Acknowledgment of Addenda** attached to this ITB.

15. **Cancellation of Solicitation:** This solicitation may be cancelled in accordance to the City of Atlanta Code of Ordinances.

16. **Escrow Bid Documents:**

16.1. Within ten (10) calendar days after the CITY issues its Notice of Intent to Award a Contract, the winning Bidder shall submit one true copy of all documents used in preparation of its Bid (including subcontractors' documents, if applicable) to the CITY to be held in the CITY's secured vault located within the Department of Procurement ("escrow") for the duration of the Contract. This collection of documents shall be referred to as the "Escrow Bid Documents."

16.2. If a Bid is based on subcontracting any part of the Work, the winning Bidder shall also submit Escrow Bid Documents for each subcontractor whose total subcontract price exceeds five percent (5%) or Five Hundred Thousand ($500,000) Dollars, whichever is less, of the total Contract price proposed by the winning Bidder. Such documents must be filed in the same manner and at the same time as the winning Bidder's Escrow Bid Documents.

16.3. The winning Bidder may submit Escrow Bid Documents in its usual cost-estimating format. The requirement to submit Escrow Bid Documents is not intended to cause the Bidder extra work during the preparation of its Bid. The Escrow Bid Documents shall be in English.

16.4. An Escrow Bid Documents Certificate ("Certificate") must accompany the Escrow Bid Documents at the time they are placed in escrow. The Certificate must be signed by an individual authorized by the Bidder to execute the bid proposal who must represent and warrant (1) that the material in the Escrow Bid Documents constitutes all the documents used in preparation of the Bid, (2) that he or she has personally examined the contents of the Escrow Bid Documents container, (3) that the documents in the container are accurate and complete, and (4) that no other Bid preparation information shall be considered in resolving disputes.

16.5. The CITY acknowledges that the Escrow Bid Documents may contain information that the winning Bidder, or its subcontractor(s), considers "trade secret," as that term is defined in O.C.G.A. § 10-1-761. Information provided to the City is subject to disclosure under the Georgia Open Records Act. Pursuant to O.C.G.A. § 50-18-72(a)(34), "[a]n entity submitting records containing trade secrets that wishes to keep such records confidential under this paragraph shall submit and attach to the records an affidavit affirmatively declaring that specific information in the records

constitute trade secrets pursuant to Article 27 of Chapter 1 of Title 10 [O.C.G.A. § 10-1-760 et seq.]."

16.6. Additional information regarding the Escrow Bid Documents (e.g. use, examination, ownership) may be found in the General Conditions attached to and incorporated into the form of Construction Contract included herewith.

17. **Submission of Bids:**

17.1. Bids must be submitted according to the requirements of this ITB. All blank spaces must be typed or hand written in black ink. All dollar amounts must be BOTH in writing and figures. Written prices prevail over typed prices in the event of a discrepancy. All corrections to any entry must be lined out and initialed by the Bidder. Do not use correction tapes or fluids.

17.2. Bids shall be signed by hand by a principal of the Bidder with the authority to enter into a Contract with the City. Joint Ventures or partnerships must designate one joint venture/partner to represent the joint venture/partnership in submitting and executing a Bid. Each Bidder is responsible for the preparation of its Bid and for the costs of preparing and submitting them.

17.3. Bids will be opened on **Wednesday, June 3, 2015** at **2:00 P.M.** in the Department of Procurement's Bid Conference Room, Suite 1900, 55 Trinity Avenue, S. W., City Hall South, Atlanta, Georgia.

17.4. Bids must be <u>sealed</u> and clearly marked identifying the following information on the front of the package:

17.4.1. Bidder's Name/Company Name and Address.

17.4.2. Bidder's Georgia Contractor's License Number

17.4.3. Bidder's Federal Work Authorization User Identification Number

17.4.4. Addressed to:

Adam L. Smith, Esq., CPPO, CPPB, CPPM, CPP
Chief Procurement Officer
Department of Procurement
City of Atlanta
55 Trinity Avenue, Suite 1900
City Hall South
Atlanta, Georgia 30303
RE: **PROJECT NUMBER FC-8075**

17.5.The following submittals must be completed and submitted on **Wednesday, June 3, 2015**:[2]

Item #	Required Bid Submittal Check Sheet	Check (√)
1.	Form 1; Illegal Immigration Reform and Enforcement Act Affidavit	
2.	Form 2; Contractor Disclosure Form	
3.	Form 3; Bid Bond Form	
4.	Form 4; Respondent Financial Disclosure Form (N/A for this ITB)	
5.	Form 5; Acknowledgement of Insurance & Bonding Requirements	
6.	Form 6.1; Certification of Insurance Ability	
7.	Form 6.2: Certification of Bonding Ability	
8.	Form 7; Acknowledgement of Addenda	
9.	Form 8; Bidder Contact Directory	
10.	Form 9; Georgia Utility Contractor's License	
11.	Georgia Contractor's License	
12.	Georgia Electrical Contractor's License	
13.	Georgia Mechanical Contractor's License	
14.	Exhibit "C", Form A: Schedule of Quantities and Prices	
15.	Exhibit "C", Form A-1: Schedule of Unit and Lump Sum Prices	
16.	Exhibit "C", Form B: Essential Subcontractor Qualification Statement	
17.	Exhibit "C", Form C: Preliminary Contract Schedule	
18.	Exhibit "C", Form D: Project Organization and Work Plan	
19.	Exhibit "C", Form E: Safety Program	
20.	Exhibit "C", Form F: Resumes of Key Personnel	
21.	Exhibit "C", Form G: Summary of QC Program	
22.	Exhibit "C", Form H: Work in Progress	
23.	Exhibit "C", Form I: Experience Statement	
24.	Exhibit "D", OCIP Program Insurance Information Forms (Page 1 and 2)	
25.	Appendix "A": EBO Forms 1 through 5	

2 This table is included for Bidder's convenience and may be used to track the preparation and submittal of certain required information with its Bid.

FORM 1; ILLEGAL IMMIGRATION REFORM AND ENFORCEMENT AFFIDAVIT

FORM 1

Illegal Immigration Reform and Enforcement Act Forms

INSTRUCTIONS TO RESPONDENTS

All Respondents must comply with the Illegal Immigration Reform and Enforcement Act of 2011, O.G.G.A § 13-10-90, et seq. ("**IIREA**"). Respondents must familiarize themselves with IIREA and are solely responsible for ensuring their compliance therewith. Respondents may not rely on these instructions for that purpose. These instructions are offered only as a convenience to assist Respondents in complying with the requirements of the City's procurement process and the terms of this solicitation document.

1. The attached Contractor Affidavit must be filled out COMPLETELY and submitted with the respondent's submission prior to the due date.

2. The Contractor Affidavit must contain an active Federal Work Authorization Program ("**E-Verify"**) User ID Number and Date of Registration.

3. Where the business structure of a Respondent is such that Respondent is required to obtain an Employer Identification Number ("**EIN"**) from the Internal Revenue Service, Respondent must complete the Contractor Affidavit on behalf of, and provide a Federal Work Authorization User ID Number issued to, the Respondent itself (see Example 1 below). Where the business structure of a Respondent does not require it to obtain an EIN, each entity comprising Respondent must submit a separate Contractor Affidavit (see Example 2 below).

Example 1, ABC, Inc. and XYZ, Inc. form and submit a response as Happy Day, LLC. Happy Day, LLC must enroll in the E-verify program and submit a single Contractor Affidavit in the name of Happy Day, LLC which includes the Federal Work Authorization User ID Number issued to Happy Day, LLC.

Example 2, ABC, Inc. and XYZ, Inc. execute a joint venture agreement and submit a response under the name Happy Day, JV. If based on the nature of the JV agreement, Happy Day, JV is not required to obtain an EIN from the IRS, then the response submitted by Happy Day, JV must include both a Contractor Affidavit for ABC, Inc. and a Contractor Affidavit for XYZ, Inc.

4. All Contractor Affidavits must be executed by an authorized representative of the entity named in the Affidavit.

5. All Contractor Affidavits must be notarized.

6. All Contractor Affidavits must be submitted with the Respondent's response to the solicitation document.

7. Subcontractor and sub-subcontractor affidavits are not required at the time of response submission, but will be required at contract execution or in accordance with the timelines set forth in IIREA.

FORM 1
Contractor Affidavit under O.C.G.A. § 13-10-91(b)(1)

By executing this Contractor Affidavit, the undersigned contractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services on behalf of the City of Atlanta has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned contractor will continue to use the federal work authorization program throughout the contract period and the undersigned contractor will contract for physical performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the contractor with the information required by O.C.G.A. § 13-10-91(b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____ _____
Federal Work Authorization User Identification Number Date of Authorization

Name of Contractor: _____

Name of Project: _____

Name of Public Employer: City of Atlanta

I hereby declare under penalty of perjury that the forgoing is true and correct.

Executed on _____, ____, 20__ in _____ (city), _____ (state)

_____
Signature of Authorized Officer or Agent

_____
Printed name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE
ME ON THIS THE ___, DAY OF _____, 201_____

_____
NOTARY PUBLIC
My Commission Expires: _____

FORM 1
Subcontractor Affidavit under O.C.G.A. § 13-10-91(b)(3)

By executing this Subcontractor Affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services under a contract with _____ (name of contractor) on behalf of the City of Atlanta has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the subcontractor with the information required by O.C.G.A. § 13-10-91(b). Additionally, the undersigned subcontractor will forward notice of the receipt of an affidavit from a sub-subcontractor to the contractor within five business days of receipt. If the undersigned subcontractor receives notice of receipt of an affidavit from any sub-subcontractor that has contracted with a sub-subcontractor to forward, within five business days of receipt, a copy of such notice to the contractor. Subcontractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____ _____

Federal Work Authorization User Identification Number Date of Authorization

Name of Subcontractor: _____

Name of Project: _____

Name of Public Employer: City of Atlanta

I hereby declare under penalty of perjury that the forgoing is true and correct.

Executed on _____, ____, 20__ in _____ (city), _____ (state)

_____

Signature of Authorized Officer or Agent

_____

Printed name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE
ME ON THIS THE ___, DAY OF _____, 201_____

_____

NOTARY PUBLIC

My Commission Expires: _____

FORM 1

Sub-subcontractor Affidavit under O.C.G.A. § 13-10-91(b)(4)

By executing this affidavit, the undersigned sub-subcontractor verifies its compliance with O.C.G.A. §13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services under a contract for _____ (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract) and _____ (name of contractor) on behalf of the City of Atlanta has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned sub-subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned sub-subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the sub-subcontractor with the information required by O.C.G.A. § 13-10-91(b). The undersigned sub-subcontractor shall submit, at the time of such contract, this affidavit to _____ (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Additionally, the undersigned sub-subcontractor will forward notice of the receipt of any affidavit from a sub-subcontractor to _____ (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Sub-subcontractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____ _____

Federal Work Authorization User Identification Number Date of Authorization

Name of Sub-Subcontractor: _____

Name of Project: _____

Name of Public Employer: City of Atlanta

I hereby declare under penalty of perjury that the forgoing is true and correct.

Executed on _____, ____, 20__ in _____ (city), _____ (state)

_____

Signature of Authorized Officer or Agent

_____

Printed name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE
ME ON THIS THE ___, DAY OF _____, 201_____

_____

NOTARY PUBLIC
My Commission Expires: _____

FORM 2; CONTRACTOR DISCLOSURE FORM

FORM 2
Contractor Disclosure Form

DEFINITIONS FOR THE PURPOSES OF THIS DISCLOSURE

"Affiliate"	Any legal entity that, directly or indirectly through one of more intermediate legal entities, controls, is controlled by or is under common control with the Respondent or a member of Respondent.
"Contractor"	Any person or entity having a contract with the city.
"Control"	The controlling entity: (i) possesses, directly or indirectly, the power to direct or cause the direction of the management and policies of the controlled entity, whether through the ownership of voting securities or by contract or otherwise; or (ii) has direct or indirect ownership in the aggregate of fifty one (51%) or more of any class of voting or equity interests in the controlled entity.
"Respondent"	Any individual or entity that submits a response to a solicitation. If the Respondent is an individual, then that individual must complete and sign this Contractor Disclosure Form where indicated. If the Respondent is an entity, then an authorized representative of that entity must complete and sign this Contractor Disclosure where indicated. **If the Respondent is a newly formed entity (formed within the last three years), then an authorized representative of that entity must complete and sign this Contractor Disclosure Form where indicated, and each of the members or owners of the entity must also complete and sign separate Contractor Disclosure Form where indicated.**

Instructions: Provide the following information for the entity or individual completing this Statement (the "Individual/Entity").

A. Basic Information:
1. Name of Respondent: _____
2. Name of the authorized representative for the Respondent: _____

B. Individual/Entity Information:
Principal Office Address: _____
Telephone and Facsimile Numbers: _____
E-Mail Address: _____
Name and title of Contact Person for the Individual/Entity: _____

Is the individual/Entity authorized to transact business in the state of Georgia?

☐ Yes **(Attach Certificate of Authority to transact business in Georgia from Georgia Secretary of State.)**
☐ No

C. Questionnaire

If you answer "YES" to any of the questions below, please indicate the name(s) of the person(s), the nature, and the status and/or outcome of the information, indictment, conviction, termination, claim or litigation, the name of the court and the file or reference number of the case, as applicable. Any such information should be provided on a separate page, attached to this form and submitted with your Proposal.

1. Please describe the general development of the Respondent's business during the past ten (10) years, or such shorter period of time that the Respondent has been in business.

_____
_____
_____
_____

	YES	NO
2. Are there any lawsuits, administrative actions or litigation to which Respondent is currently a party or has been a party (either as a plaintiff or defendant) during the past ten (10) years based upon fraud, theft, breach of contract, misrepresentation, safety, wrongful death or other similar conduct?	☐	☐
3. If "yes" to question number 2, were any of the parties to the suit a bonding company, insurance company, an owner, or otherwise? If so, attach a sheet listing all parties and indicate the type of company involved.	☐	☐
4. Has the Respondent been charged with a criminal offense within the last ten (10) years?	☐	☐
5. Has the Respondent received any citations or notices of violation from any government agency in connection with any of Respondent's work during the past ten (10) years (including OSHA violations)? Describe any citation or notices of violation which Respondent received.	☐	☐

6. Please state whether any of the following events have occurred in the last ten (10) years with respect to the Respondent. If any answer is yes, explain fully the circumstances surrounding the subject matter of the affirmative answer:

	YES	NO
(a) Whether Respondent, or Affiliate currently or previously associated with Respondent, has ever filed a petition in bankruptcy, taken any actions with respect to insolvency, reorganization, receivership, moratorium or assignment for the benefit of creditors, or otherwise sought relief from creditors?	☐	☐

		YES	NO
(b)	Whether Respondent was subject of any order, judgment or decree not subsequently reversed, suspended or vacated by any court permanently enjoining Respondent from engaging in any type of business practice?	☐	☐
(c)	Whether Respondent was the subject of any civil or criminal proceeding in which there was a final adjudication adverse to Respondent which directly arose from activities conducted by Respondent.	☐	☐

7. Has any employee, agent or representative of Respondent who is or will be directly involved in the project, in the last ten (10) years:

	YES	NO
(a) directly or indirectly, had a business relationship with the City?	☐	☐
(b) directly or indirectly, received revenues from the City?	☐	☐
(c) directly or indirectly, received revenues from conducting business on City property or pursuant to any contract with the City?	☐	☐

	YES	NO
8. Whether any employee, agent, or representative of Respondent who is or will be directly involved in the project has or had within the last ten (10) years a direct or indirect business relationship with any elected or appointed City official or with any City employee?	☐	☐
9. Whether Respondent has provided employment or compensation to any third party intermediary, agent, or lobbyist to directly or indirectly communicate with any City official or employee, or municipal official or employee in connection with any transaction or investment involving your firm and the City?	☐	☐
10. Whether Respondent, or any agent, officer, director, or employee of your organization has solicited or made a contribution to any City official or member, or to the political party or political action committee within the previous five (5) years?	☐	☐
11. Has the Respondent or any agent, officer, director, or employee been terminated, suspended, or debarred (for cause or otherwise) from any work being performed for the City or any other Federal, State or Local Government?	☐	☐
12. Has the Respondent, member of Respondent's team or officer of any of them (with respect to any matter involving the business practice or activities of his or her employer been notified within the five (5) years preceding the date of this offer that any of them are the target of a criminal investigation, grand jury investigation, or civil enforcement proceeding?	☐	☐

13. Please identify any Personal or Financial Relationships that may give rise to a conflict of interest as defined below *[Please be advised that you may be ineligible for*

award of contract if you have a personal or financial relationship that constitutes a conflict of interest that cannot be avoided]:

(a) Personal relationships: executives, board members and partners in firms submitting offers must disclose familial relationships with employees, officers and elected officials of the City of Atlanta. Familial relationships shall include spouse, domestic partner registered under section 94-133, mother, father, sister, brother, and natural or adopted children of an official or employee. **YES** ☐ **NO** ☐

(b) Financial relationships: Respondent must disclose any interest held with a City employee or official or family members of a City employee or official, which may yield, directly or indirectly, a monetary or other material benefit to the Respondent or the Respondent's family members. Please describe: **YES** ☐ **NO** ☐

_____
_____
_____

D. REPRESENTATIONS

Anti-Lobbying Provision. All respondents, including agents, employees, representatives, lobbyists, attorneys and proposed partner(s), subcontractor(s) or joint venturer(s), will refrain, under penalty of the respondent's disqualification, from direct or indirect contact for the purpose of influencing the selection or creating bias in the selection process with any person who may play a part in the selection process.

Certification of Independent Price Determination/Non-Collusion. Collusion and other anticompetitive practices among offerors are prohibited by city, state and federal laws. All Respondents shall identify a person having authority to sign for the Respondent who shall certify, in writing, as follows:

> "I certify that this bid proposal is made without prior understanding, agreement, or connection with any corporation, firm, or person submitting a bid or offer for the same supplies, labor, services, construction, materials or equipment to be furnished or professional or consultant services, and is in all respects fair and without collusion or fraud. I understand collusive bidding is a violation of city, state and federal law and can result in fines, prison sentences, and civil damages awards. By signing this document, I agree to abide by all conditions of this solicitation and offer and certify that I am authorized to sign for this Respondent/Offeror."

Certify Satisfaction of all Underlying Obligations. (If Applicable) If a Contract is awarded through this solicitation, then such Contractor should know that before final payment is made to a Contractor by the City, the Contractor shall certify to the City in writing, in a form satisfactory to the City, that all subcontractors, materialmen suppliers and similar firms or persons involved in the City contract have been paid in full at the time of final payment to the Contractor by the City or will be paid in full utilizing the monies constituting final payment to the Contractor.

Confidentiality. Details of the proposals will not be discussed with other respondents during the selection process. Respondent should be aware, however, that all proposals and information submitted therein may become subject to public inspection following award of the contract. Each respondent should consider this possibility and, where trade secrets or other proprietary information may be involved, may choose to provide in lieu of such proprietary information, an explanation as to why such

information is not provided in its proposal. However, the respondent may be required to submit such required information before further consideration.

Equal Employment Opportunity (EEO) Provision. All bidders or offerors will be required to comply with sections 2-1200 and 2-1414 of the City of Atlanta Code of Ordinances, as follows: During the performance of the agreement, the Contractor agrees as follows:

a. The Contractor shall not discriminate against any employee, or applicant for employment, because of race, color, creed, religion, sex, domestic relationship status, parental status, familial status, sexual orientation, national origin, gender identity, age, disability, or political affiliation. As used here, the words "shall not discriminate" shall mean and include without limitation the following:

   Recruited, whether by advertising or other means; compensated, whether in the form of rates of pay, or other forms of compensation; selected for training, including apprenticeship; promoted; upgraded; demoted; downgraded; transferred; laid off; and terminated.

   The Contractor agrees to and shall post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officers setting forth the provisions of the EEO clause.

b. The Contractor shall, in all solicitations or advertisements for employees, placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, creed, religion, sex, domestic relationship status, parental status, familial status, sexual orientation, national origin, gender identity, age, disability, or political affiliation.

c. The Contractor shall send to each labor union or representative of workers with which the Contractor may have a collective bargaining agreement or other contract or understanding a notice advising the labor union or workers' representative of the Contractor's commitments under the equal employment opportunity program of the City of Atlanta and under the Code of Ordinances and shall post copies of the notice in conspicuous places available to employees and applicants for employment. The Contractor shall register all workers in the skilled trades who are below the journeyman level with the U.S. Bureau of Apprenticeship and Training.

d. The Contractor shall furnish all information and reports required by the contract compliance officer pursuant to the Code of Ordinances, and shall permit access to the books, records, and accounts of the Contractor during normal business hours by the contract compliance officer for the purpose of investigation so as to ascertain compliance with the program.

e. The Contractor shall take such action with respect to any subcontractor as the city may direct as a means of enforcing the provisions of paragraphs (a) through (h) herein, including penalties and sanctions for noncompliance; provided, however, that in the event the Contractor becomes involved in or is threatened with litigation as a result of such direction by the city, the city will enter into such litigation as is necessary to protect the interest of the city and to effectuate the equal employment opportunity program of the city; and, in the case of contracts receiving federal assistance, the Contractor or the city may request the United States to enter into such litigation to protect the interests of the United States.

f. The Contractor and its subcontractors, if any, shall file compliance reports at reasonable times and intervals with the city in the form and to the extent prescribed by the contract compliance officer. Compliance reports filed at such times directed shall contain information as to employment practices, policies, programs and statistics of the Contractor and its subcontractors.

g. The Contractor shall include the provisions of paragraphs (a) through (h) of this equal employment opportunity clause in every subcontract or purchase order so that such provisions will be binding upon each subcontractor or vendor.

h. A finding, as hereinafter provided, that a refusal by the Contractor or subcontractor to comply with any portion of this program, as herein provided and described, may subject the offending party to any or all of the following penalties:

(1) Withholding from the Contractor in violation all future payments under the involved contract until it is determined that the Contractor or subcontractor is in compliance with the provisions of the contract;

(2) Refusal of all future bids for any contract with the City of Atlanta or any of its departments or divisions until such time as the Contractor or subcontractor demonstrates that there has been established and there shall be carried out all of the provisions of the program as provided in the Code of Ordinances;

(3) Cancellation of the public contract;

(4) In a case in which there is substantial or material violation of the compliance procedure herein set forth or as may be provided for by the contract, appropriate proceedings may be brought to enforce those provisions, including the enjoining, within applicable law, of Contractors, subcontractors or other organizations,

individuals or groups who prevent or seek to prevent directly or indirectly compliance with the policy as herein provided.

Prohibition on Kickbacks or Gratuities/Non-Gratuity. The undersigned acknowledges the following prohibitions on kickbacks and gratuities:

a. It is unethical for any person to offer, give or agree to give any employee or former employee a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, preparation or any part of a program requirement or a purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing or in any other advisory capacity in any proceeding or application, request for ruling, determination, claim or controversy or other particular matter pertaining to any program requirement or a contract or subcontract or to any solicitation or proposal therefor.

b. It is unethical for any employee or former employee to solicit, demand, accept or agree to accept from another person a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, preparation or any part of a program requirement or a purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing or in any other advisory capacity in any proceeding or application, request for ruling, determination, claim or controversy or other particular matter pertaining to any program requirement or a contract or subcontract or to any solicitation or proposal therefor.

c. It is also unethical for any payment, gratuity or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime Contractor or higher tier subcontractor or any person associated therewith as an inducement for the award of a subcontract or order.

Declaration

Under penalty of perjury, I declare that I have examined this Contractor Disclosure Form and all attachments to it, if applicable, and, to the best of my knowledge and belief all statements contained herein and in any attachments, if applicable, are true, correct and complete.

I certify that this offer is made without prior understanding, agreement, or connection with any corporation, firm, or person submitting an offer for the same supplies, services, construction, or professional or consultant services, and is in all respects fair and without collusion or fraud. I understand collusive bidding is a violation of city, state and federal law and can result in fines, prison sentences, and civil damages awards. I agree to abide by all conditions of this solicitation and offer and certify that I am authorized to sign for this Respondent.

For entities that are newly formed (formed within the last three years):

☐ I certify that the Respondent is newly formed and does not have sufficient information to respond to Part C of this Form.

Sign here if you are an individual:
Printed Name: _____
Signature: _____
Date: _____
Subscribed and sworn to or affirmed by _____ (name) this ___ day of _____, 20__.

_____
Notary Public of _____(state)
My commission expires: _____

Sign here if you are an authorized representative of a responding entity or partnership:
Printed Name of Entity or Partnership: _____
Signature of authorized representative: _____
Title: _____
Date: _____, 20___

Subscribed and sworn to or affirmed by _____ (name), as the _____ (title) of _____ (entity or partnership name) this _____ day of _____, 20___.

_____
Notary Public of _____(state)
My commission expires: _____

FORM 3; BID BOND

FORM 3

Bid Bond

KNOW ALL MEN BY THESE PRESENTS, THAT WE_____

_____

hereinafter called the PRINCIPAL, and _____

_____

hereinafter called the SURETY, a corporation chartered and existing under the laws of the State of _____, and duly authorized to transact Surety business in the State of Georgia, are held and firmly bound unto the City of Atlanta, Georgia, in the penal sum of either: [i] _____ Dollars and Cents ($_____); or [ii] 5% of PRINCIPAL'S Bid amount for **PROJECT NUMBER FC-8075; F3 A380 RECONFIGURATION**, good and lawful money of the United States of America, to be paid upon demand of the City of Atlanta, Georgia, to which payment well and truly to be made we bind ourselves, our heirs, executors, administrators and assigns, jointly and severally and firmly by these presents.

WHEREAS the PRINCIPAL has submitted to the City of Atlanta, Georgia, for **PROJECT NUMBER FC-8075; F3 A380 RECONFIGURATION,** a Bid;

WHEREAS the PRINCIPAL desires to file this Bond in accordance with law, in lieu of a certified Bidder's check otherwise required to accompany this bid;

NOW THEREFORE: The conditions of this obligation are such that if the Bid be accepted, the PRINCIPAL shall within ten (10) calendar days after receipt of written notification from the CITY of the award of the Contract execute a Contract in accordance with the Bid and upon the terms, conditions and prices set forth therein, in the form and manner required by the City of Atlanta, Georgia, and execute sufficient and satisfactory Performance and Payment Bonds payable to the City of Atlanta, Georgia, each in the amount of one hundred percent (100%) of the total Contract price in form and with security satisfactory to said City of Atlanta, Georgia, then this obligation to be void; otherwise, to be and remain in full force and virtue in law; and the SURETY shall upon failure of the PRINCIPAL to comply with any or all of the foregoing requirements within the time specified above immediately pay to the City of Atlanta, Georgia, upon demand the amount hereof in good and lawful money of the United States of America, not as a penalty but as liquidated damages.

In the event suit is brought upon this Bond by the CITY and judgment is recovered, the SURETY shall pay all costs incurred by the CITY in such suit, including attorney's fees to be fixed by the Court.

Enclosed is a Bid Bond in the approved form, in the amount of either:

[i] _____ Dollars and Cents ($_____), being in the amount of 5% of the CONTRACT Sum; or [ii] 5% of PRINCIPAL'S Bid amount for **PROJECT NUMBER FC-8075; F3 A380 RECONFIGURATION**. The money payable on this bond shall be paid to the City of Atlanta, Georgia, for the failure of the Bidder to execute a CONTRACT within ten (10) days after receipt of the Contract form and at the same time furnish a Payment Bond and Performance Bond.

IN TESTIMONY THEREOF, the PRINCIPAL and SURETY have caused these presents to be duly signed and sealed this _____ day of 201__.

Corporate Bidder:
[Insert Corporate Name]

_____
By:_____
Name:_____
Title:_____

_____
Corporate Secretary/Assistant Secretary (Seal)

Non-Corporate Bidder:
[Insert Bidder Name]

_____
By:_____
Name:_____
Title:_____

_____
Notary Public (Seal)

My Commission Expires:_____

Surety:
Name:_____
By:_____
Name:_____
Title:_____

FORM 4-[*N/A FOR THIS ITB]*

FORM 4

Non-Applicable for this ITB

FORM 5; ACKNOWLEDGEMENT OF INSURANCE & BONDING REQUIREMENTS

FORM 5

Acknowledgement of Insurance and Bonding Requirements

I, _____, on behalf of _____, Proponent, acknowledge that if selected as the successful Proponent for **FC-8075: F3 A380 Reconfiguration** at H-JAIA. Proponent shall comply completely and promptly with all insurance requirements contained in the Agreement attached to this Solicitation and appendices thereto, pertaining to insurance.

Proponent understands that it is expected to share these requirements with potential sureties and insurance brokers, agents, underwriters, etc. prior to any award of an Agreement and to take all necessary steps to ensure compliance with the applicable requirements without delay. Proponent understands, acknowledges and agrees that any failure to fully comply with these requirements within ten (10) days of the date Proponent receives a final Agreement document from the City may result in the forfeiture of the Proposal guarantee submitted with this Proposal and/or the disqualification of Proponent from further consideration for the Agreement.

By executing this Acknowledgement of Insurance Requirements, I represent that the Proponent understands and agrees to comply unconditionally with all requirements related to insurance contained in the Agreement attached to this Solicitation. Further, by signing below, I represent that I am authorized to make the representations contained herein on behalf of Proponent.

Dated this _____ day of _____, 201_.

Corporate Proponent: [Insert Corporate Name]	Non-Corporate Proponent: [Insert Proponent Name]
_____	_____
By:_____	By:_____
Print Name:_____	Print Name:_____
Title:_____	Title:_____
_____ Corporate Secretary/Assistant Secretary (Seal)	_____ Notary Public (Seal) My Commission Expires:_____

FORM 6.1; CERTIFICATION OF INSURANCE ABILITY

FORM 6.1

Certification of Insurance

Instructions: Offerors must submit a completed copy of this form executed by their insurance company. Failure to submit a completed form will result in the Offeror being deemed non-responsive.

I, _____ [*insert an individual's name*], on behalf of _____ [*insert insurance company name*], a _____ [*insert type of entity LLC, LLP, corporation, etc.*]("**Insurer**"), hereby represent and certify each of the following to the City of Atlanta, a municipal corporation of the State of Georgia ("**City**") on this _____ day of _____, 20____ [*insert date*]:

(a) Insurer is licensed by the Insurance and Safety Fire Commissioner of the State of Georgia to transact insurance business in the State of Georgia;

(b) Insurer has reviewed the Agreement attached to the solicitation for Project Number **FC-8075, F3 A380 RECONFIGURATION** ("**Project**") and its **Exhibit D**; and

(c) Insurer certifies that if, as of the date written above, _____ ("**Offeror**") was selected as the successful Offeror for the Project, Insurer would provide insurance to Offeror for this Project in accordance with the terms set forth in **Exhibit D** attached to the Service Agreement.

PLEASE NOTE: If this form is executed by an Attorney-in-Fact, then Insurer must attach a copy of a duly executed Power-of-Attorney evidencing such authority in addition to correctly completing this form. If Offeror is unable to provide City with insurance that comply with the terms of Exhibit D attached to the Service Agreement within ten (10) days of receiving notice of intent to award the Project from the City, the City may, in its sole discretion, retain Offeror's security submitted with its offer and/or disqualify Offeror from further consideration for the award of the Agreement.

By executing this certification, Insurer represents that all of the information provided by Insurer herein is true and correct as of the date set forth above.

Insurer: [*insert company name on line provided below*]

_____

By:_____

Print Name:_____

Title:_____

_____
Corporate Secretary/Assistant Secretary
(Seal)

FORM 6.2; CERTIFICATION OF BONDING ABILITY

FORM 6.2

Certification of Bonding Ability

Instructions: Offeror must submit a completed copy of this form executed by their surety. Failure to submit a completed form will result in the Offeror being deemed non-responsive.

I, _____ [*insert an individual's name*], on behalf of _____ [*insert surety full company name*], a _____ [*insert type of entity LLC, LLP, corporation, etc.*] ("**Surety**"), hereby represent and certify each of the following to the City of Atlanta, a municipal corporation of the State of Georgia ("**City**") on this _____ day of _____, 20____ [*insert date*]:

(a) Surety is licensed by the Insurance and Safety Fire Commissioner of the State of Georgia to transact surety business in the State of Georgia;

(b) Surety has reviewed the Agreement attached to the solicitation for Project Number **FC-8075, F3 A380 RECONFIGURATION** ("**Project**") and its **Exhibit D**;

(c) Surety certifies that if, as of the date written above, _____ ("**Offeror**") was selected as the successful Offeror for the Project, Surety would provide bonding to Offeror for this Project in accordance with the terms set forth in **Exhibit D** attached to the Service Agreement; and

(d) The Surety states that Offeror's uncommitted bonding capacity (not taking into account this Project) is approximately $ _____ (U.S.). Surety's statement set forth in this Section does not represent a limitation of the bonding capacity of Offeror or that Offeror will have the bonding capacity noted above at the time of contract execution for this Project.

PLEASE NOTE: If this form is executed by an Attorney-in-Fact, then Surety must attach a copy of a duly executed Power-of-Attorney evidencing such authority in addition to correctly completing this form. If Offeror is unable to provide City with bonds that comply with the terms of Exhibit D attached to the Service Agreement within ten (10) days of receiving notice of intent to award the Project from the City, the City may, in its sole discretion, retain Offeror's security submitted with its offer and/or disqualify Offeror from further consideration for the award of the Agreement.

By executing this certification, Surety represents that all of the information provided by Surety herein is true and correct as of the date set forth above.

Surety: [*insert company name on line provided below*]

_____

By:_____

Print Name:_____

Title:_____

_____
Corporate Secretary/Assistant Secretary
(Seal)

FORM 7; ACKNOWLEDGEMENT OF ADDENDA

FORM 7

Acknowledgment of Addenda

Each Respondent must complete and submit and acknowledgement with its solicitation that it has received all Addenda issued for this solicitation. This form has been included and may be used to satisfy this requirement.

This is to acknowledge receipt of the following **Addenda** for **FC-8075, F3 A380 RECONFIGURATION:**

☐ None (Check if None)

1. _____;
2. _____;
3. _____; and
4. _____.

Dated the _____ day of _____, 20___.

Corporate Proponent:
[Insert Corporate Name]

_____

By:_____

Name:_____

Title:_____

_____
Corporate Secretary/Assistant Secretary (Seal)

Non-Corporate Proponent:
[Insert Proponent Name]

_____

By:_____

Name:_____

Title:_____

_____
Notary Public (Seal)
My Commission Expires:

FORM 8; BIDDER CONTACT DIRECTORY

FORM 8

BIDDER CONTACT DIRECTORY

This Respondent Contact Directory should include the names, positions/titles, firms, mailing addresses, phone and fax numbers and e-mail addresses for each of the following as it pertains to each of the firms in a Respondent's team:

1. At least two individuals authorized to represent the firm for purposes of this Solicitation; and
2. All of Respondent's subcontractors (if any).

NAME	POSITION/TITLE	MAILING ADDRESS	PHONE NUMBER	FAX NUMBER	EMAIL ADDRESS

FORM 9; CONTRACTOR'S GEORGIA UTILITY LICENSE CERTIFICATION

FORM 9

CONTRACTOR'S GEORGIA UTILITY
LICENSE CERTIFICATION

PROJECT NUMBER FC-8075
F3 A380 RECONFIGURATION

NOTE: The Utility Contractor's License Number is also required on the Bid Envelope.

Contractor's Name: _____

Bidder's Georgia Utility Contractor's License Number: _____

Expiration Date of License: _____

I certify that the above information is true and correct and that the classification noted is applicable to the Bid for this Project.

Signed: _____

Printed: _____

Date: _____

FORM 10; PERFORMANCE BOND

FORM 10
Performance Bond

KNOW ALL MEN BY THESE PRESENTS:

That _____ as principal ("Principal),
(Legal Name and Address)

and _____ as surety ("Surety"), are held and firmly bound unto the
(Legal Title and Address of Surety)

CITY OF ATLANTA as Obligee ("Owner"), in the amount of _____DOLLARS

($_____), to which payment Principal and Surety bind themselves, their heirs, executors,

administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into an Agreement with the Owner bearing date of _____ and in the

same monetary amount of this bond for:

FC-8075; F3 A380 RECONFIGURATION accordance with drawings and specifications prepared by:

_____which said
(Full Name and Title)

Contract and Task Order are incorporated herein by reference and made a part hereof, and is hereinafter referred

to as the Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Principal shall promptly and faithfully perform and comply with the terms and conditions of said contract; and shall indemnify and save harmless the Owner against and from all cost, expenses, damages, injury or loss to which said Owner may be subjected by reason of any negligent act or omission, including patent infringement, misconduct, want of care or skill, default or failure of performance on the part of said Principal, his agents, subcontractors, materialmen or employees, in the execution or performance of said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

(1) The said Surety to this bond, for value received, hereby stipulates and agrees that no change or changes, extension of time or extensions of time, alteration or alterations or addition or additions to the terms of the Contract or to the work to be performed thereunder, or the specifications or drawings accompanying same, or the exercise of the Owner's right to do work, shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change or changes, extension of time or extensions of time, alteration or alterations or addition or additions to the terms of the Contract or to the Work or to the specifications or drawings. In addition the Surety to this bond, for value received, hereby agrees to the provisions of the Agreement for increases in the penal amount of this bond and waives notice from the Owner of any such changes, as set forth in the Contract Documents.

(2) If pursuant to the Contract Documents the Principal shall be declared in default by the Owner under the aforesaid Contract, the Surety shall promptly perform this bond agreement in accordance with its terms and conditions. It shall be the duty of the Surety to give an unequivocal notice in writing to the Owner, within twenty-five (25) days after receipt of a declaration of default, of the Surety's election to either remedy the default or defaults promptly or to perform the Contract promptly, time being of the essence. In said notice of election, the Surety shall indicate the date on which the remedy or performance will commence, and it shall then be the duty of the Surety to give prompt notice in writing to the Owner immediately upon completion of (a) the remedy and/or correction of each default, (b) the remedy and/or correction or each item of defective work, (c) the furnishing of each omitted item of work, and (d) the performance of the Contract. The Surety shall not assert its Principal as justification for its failure to give notice of election or for its failure to promptly remedy the default or defaults or perform the Contract.

(3) It is expressly agreed by the Principal and the Surety that the Owner, if he desires to do so, is at liberty to make inquiries at any time of subcontractors, laborers, materialmen, or other parties concerning the status of payments for labor, materials, or services furnished in the prosecution of the work.

(4) No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the legal successors of the Owner.

(5) For the purposes of this bond, the name and address of the Authorized Agent of the Owner to whom correspondence and telecommunications may be addressed and/or with whom business concerning this bond may be conducted will be as follows:

Mr. James Drinkard
1255 South Loop Road
College Park, GA 30337

(6) Further, this bond shall be the Performance Bond furnished under O.C.G.A. §§ 36-91-70, et seq. and shall be subject to increase

Approved as to form: _____ **Senior Assistant City Attorney**	**Contractor**
Corporate Surety: _____ **Surety Name (Type)** **By:**_____ **Attorney-In-Fact (Sign)** **Name:**_____ **Attorney-In-Fact (Type)** **(Seal)**	**Signature:**_____ **Name:**_____ **Title:**_____ **ATTEST:** _____ **SECRETARY/ASST. SECRETARY** **[Affix Corporate Seal]**

FORM 11; PAYMENT BOND

FORM 11
Payment Bond

KNOW ALL MEN BY THESE PRESENTS:

That_____as Principal ("Principal) and
(Legal Title and Address)

_____as Surety ("Surety") are held and firmly bound unto the
(Legal Name and Address of the Surety)

CITY OF ATLANTA as Obligee ("Owner") in the amount of: _____DOLLARS
(Insert Contract Price)

($_____), to which payment Principal and Surety bind themselves, their heirs, executors,

administrators, successors and assigns jointly and severally, firmly by these presents. WHEREAS, the Principal has entered

into an Agreement with the Owner bearing date of _____ and in the same

monetary amount of this bond for **FC-8075; F3 A380 RECONFIGURATION** in accordance with the drawings and specifications prepared by:

_____ which said Contract and Task
(Here insert Full Name and Title)

Order *are* incorporated herein by reference and made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and materials supplied in the prosecution of the work provided for in said Contract, then this obligation shall be void, otherwise it shall remain in full force and effect subject, however, to the following conditions:

(1) The said Surety to this bond, for value received, hereby stipulates and agrees that no change or changes, extension of time or extensions of time, alteration or alterations or addition or additions to the terms of the contract or to the work to be performed thereunder, or the specifications or drawings accompanying same, or the exercise of the Owner's right to do work, shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change or changes, extension of time or extensions of time, alteration or alterations or addition or additions to the terms of the contract or to the Work or to the specifications or drawings. In addition the Surety to this bond, for value received, hereby agrees to the provisions of the Contract for increases in the penal amount of this bond and waives notice from the Owner of any such changes.

(2) A claimant is defined as any subcontractor and any person supplying labor, materials, machinery or equipment in the prosecution of the work provided for in said Contract and as provided in O.C.G.A §§ 36-91-90, et seq.

(3) Every person entitled to the protection hereunder and who has not been paid in full for labor or materials furnished in the prosecution of the work referred to in said bond shall have the rights and obligations set forth in O.C.G.A §§ 36-91-90, et seq.

(4) No action can be instituted on this bond after one year from the completion of the Contract and acceptance of the Project by the proper public authorities.

(5) Further, this bond shall be the Payment Bond furnished in compliance with O.C.G.A. §§ 36-91-90, et seq. and shall be subject to increase in the penal amount of the bond pursuant to such statutes of the Agreement.

Approved as to form: _____ **Senior Assistant City Attorney**	**Contractor**
Corporate Surety: _____ **Surety Name (Type)** **By:**_____ **Attorney-In-Fact (Sign)** **Name:**_____ **Attorney-In-Fact (Type)** **(Seal)**	**Signature:**_____ **Name:**_____ **Title:**_____ **ATTEST:** _____ **SECRETARY/ASST. SECRETARY** **[Affix Corporate Seal]**

PART II

AGREEMENT

CITY OF ATLANTA
HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

PROJECT NUMBER FC-8075

F3 A380 RECONFIGURATION

AGREEMENT

Contractor:_____ Contract No._____

Address:_____Telephone:_____

Contact:_____Facsimile: _____

This Contract is effective as of the _____ day of_____, 2015, between CITY and the above named CONTRACTOR who hereby agree that all Work specified below shall be performed by the CONTRACTOR in accordance with all the provisions of this Contract, consisting of the following Contract Documents:

Exhibit "A" General Conditions
Exhibit "B" Special Conditions
Exhibit "C" Quantities, Pricing and Data Forms
Exhibit "D" Insurance & Bonding/Construction Safety and Health Plan
Exhibit "E" Scope of Work and Technical Specifications
Exhibit "F" Index of Drawings
Exhibit "G" Airport Security Program
Exhibit "H" Schedule Requirements
Exhibit "I" Quality Control Program
Appendix A; Office of Contract Compliance

1. WORK TO BE PERFORMED: Except as specified elsewhere in the Contract, CONTRACTOR shall furnish all plant; labor; materials; tools; supplies; equipment; transportation; supervision; technical, professional and other services; and shall perform all operations necessary and required to satisfactorily:

GENERAL SCOPE:

This project will allow for an A380 Aircraft (Group 6) to be accommodated on the new Concourse F. Currently no gate on Concourse F can accommodate the A380 and it is the desire of the Department of Aviation (DOA) to have the ability to have a Group 6 aircraft gated on Concourse F. Gate F3 was chosen as the best location; however both the terminal and airside areas will require improvements. The airside improvements to Gate F3 include an addition of a second loading bridge, and relocation of the aircraft lead-in line. Concourse improvements include a new vertical transportation core and tie-in to the CBP sterile

corridor, additional millwork for the new bridge, and extension of the concourse level sterile corridor to tie-in to the new vertical transportation core. The new vertical transportation core will include a stair, elevator and an escalator.

2. SCHEDULE: The Work shall be performed in accordance with the dates set forth in the Exhibit "B" Special Conditions, SC-2 clause titled “COMMENCEMENT, PROGRESS AND COMPLETION OF THE WORK."

3. COMPENSATION: As full consideration for the satisfactory performance by CONTRACTOR of this Contract, CITY shall pay to CONTRACTOR compensation in the amount of $_____, in accordance with the prices set forth in Exhibit "C" and the payment provisions of this Contract.

4. LEGISLATIVE RESOLUTION: This Contract is authorized by resolution attached, adopted by the Council of the City of Atlanta on _____, 2015 and approved by the Mayor of the CITY on _____, 2015.

This Contract embodies the entire agreement between CITY and CONTRACTOR and supersedes all other writings. The parties shall not be bound by or be liable for any statement, representation, promise, inducement or understanding not set forth herein.

OWNER:

CITY OF ATLANTA

_____
MAYOR

ATTEST:

_____
MUNICIPAL CLERK

APPROVED:

_____
AVIATION GENERAL MANAGER

_____
ASSISTANT AVIATION GENERAL MANAGER

_____
CHIEF PROCUREMENT OFFICER
DEPARTMENT OF PROCUREMENT

APPROVED AS TO FORM:

_____
CITY ATTORNEY

CONTRACTOR NAME:

_____

SIGNATURE:_____

PRINT:_____

TITLE:_____

ATTEST:

_____
SECRETARY/ASST. SECRETARY

[Affix Corporate Seal]

EXHIBIT A; CONSTRUCTION GENERAL CONDITIONS

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GC-01 DEFINITIONS

Airport means Hartsfield-Jackson Atlanta International Airport.

Award means when legislation authorizing the award of the contract has been adopted by the council and approved by the mayor, provided, however, that the contract will not become binding upon the city and the city will incur no liability under it until it has been duly executed by the contractor, returned to the city with all required submittals, including insurance and bonding, if applicable, executed by the mayor, attested to by the municipal clerk, approved by the city attorney as to form and delivered to the contractor.

Beneficial Occupancy means the stage of construction before Substantial Completion or Final Acceptance, at which the CITY does occupy the building, structure or facility, or a portion thereof, for the purpose it was constructed.

Bid Guaranty means the security furnished with a Bid to guarantee that the Bidder will enter into a contract if his/her bid is accepted by the CITY.

Bidder means any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a Bid for the work contemplated.

Bi-Lateral Change Order means a written alteration in specification, delivery point, time and rate of delivery, period of performance, price, quantity or other provisions of the Contract accomplished by mutual action of the parties to the Contract and executed by both the CITY and CONTRACTOR."

Calendar Day means every day shown on the calendar.

Change Order (*unilateral*) means a written order signed and unilaterally issued by the chief procurement officer or other authorized individual, directing the contractor to make changes that the Changes Clause of the contract authorizes without the consent of the contractor.

CITY/OWNER/SPONSOR means the CITY of Atlanta and its designated representatives, employees and successors in interest.

Construction Manager (CM) means the team retained by the CITY to assist in the management of construction projects. The CM will represent the ENGINEER.

Contract Documents means the Form of Contact, Exhibits A through I and all Attachments, Appendices and other documents referenced therein is signed by both CITY and Contractor.

CONTRACTOR means any person having a contract with the city.

Contractor's Representative means the Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the ENGINEER, and who shall supervise and direct the construction.

DOA means the CITY of Atlanta's Department of Aviation.

ENGINEER means the Aviation Assistant General Manager – Planning and Development, an employee of the CITY of Atlanta Department of Aviation, and any of his designated representatives acting in their professional capacity.
Equipment means all machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

FAA means Federal Aviation Administration of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator of his/her duly authorized representative.

Federal Specifications means Federal Specifications and Standards, and supplements, amendments and indices thereto which are prepared and issued by the General Services Administration of the Federal Government.

Final Acceptance means the CONTRACTOR has completed all Work included in the contract and a Final Acceptance letter has been issued by the ENGINEER indicating all requirements on the Final Acceptance Checklist are satisfied and all punchlist items are complete.

Firm means any individual, partnership, corporation, association, joint venture or other legal entity permitted by law to practice or offer professional or consultant services.

FIS means Federal Inspection Services.

H-JAIA means Hartsfield-Jackson Atlanta International Airport.

Inspector means an authorized representative of the ENGINEER assigned to make all necessary inspections and/or tests of the work performed or being performed, or of the materials furnished or being furnished by the CONTRACTOR.

Installer means the CONTRACTOR or another entity engaged by the CONTRACTOR, either as an employee, subcontractor or specialty contractor, to perform a particular construction activity, including installation, erection, application and similar operations. Installers are required to be experienced in the construction operations they are engaged to perform.

Invitation for Bids means all documents, whether attached or incorporated by reference, utilized for soliciting sealed Bids. <u>No confidential or proprietary data shall be solicited in any invitation for Bids.</u>

ISO means International Standards Organization.

Jobsite means the Hartsfield-Jackson Atlanta International Airport, Clayton County, Georgia, at which location construction activity shall be performed under this Contract.

Laboratory means official testing laboratories of the Owner or such other laboratories as may be designated by the ENGINEER.

Lump Sum Price means the full payment for performance of the work and covers all costs of whatever nature incurred by CONTRACTOR in accomplishing the Work in accordance with the provisions of the Contract.

Materials means any substance specified for use in the construction of the Contract work.

Notice to Proceed means a written notice from the CITY to the CONTRACTOR to begin the actual contract work.

OSHA means Occupational Safety and Health Administration. OSHA's mission is to prevent work-related injuries, illnesses, and deaths.

Payment Bond means a bond with good and sufficient surety or sureties payable to the governmental entity for which the work is to be done and intended for the use and protection of all Subcontractors and all persons supplying labor, materials, machinery, and equipment in the prosecution of the Work provided for in the Public Works Construction Contract.

Performance Bond means a bond with good and sufficient surety or sureties for the faithful performance of the Contract and to indemnify the governmental entity for any damages occasioned by a failure to perform the same within the prescribed time. Such bond shall be payable to, in favor of, and for the protection of the governmental entity for which the Work is to be done.

Plans means the official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the Work to be done and which are to be considered as a part of the contract, supplementary to the specifications.

Project Manager (PM) means the designated representative in charge to coordinate, schedule, and monitor the progress of construction activities.

Project means the Hartsfield-Jackson Atlanta International Airport Project located at the jobsite for which the Work under this Contract is being performed.

Service means the furnishing of labor, time, or effort by a contractor, not involving the delivery of a specific end product other than reports which are merely incidental to the required performance.

Specifications mean a part of the Contract containing the written directions and requirements for completing the Contract Work. Standards for specifying materials or testing which are cited in the Contract specifications by reference shall have the same force and effect as if incorporated into the Contract.

Substantial Completion means the Project, or a specified portion thereof, shall be deemed Substantially Completed or having achieved Substantial Completion when (a) the Work is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Project, or a specified portion thereof, for its intended use, and (b) the Contractor has obtained on behalf of the Owner for the Project or specified portion thereof, all necessary permits and regulatory approvals necessary for the Owner to occupy and begin use or operation and (c) the Owner accepts the Project, or specified portion thereof, as being at Substantial Completion and issues a Notice of Substantial Completion.

Total Contract Price means the Contract value which is the sum of the product of all Contract Line Items extended as shown in Exhibit "C" titled "QUANTITIES, PRICING, AND DATA."

Utility System means any system at least five (5) feet underground, when installed or accessed by trenching, open cut, cut and cover, or other similar construction methods which install or access the system from the ground surface, including, but not limited to, gas distribution systems, electrical distribution systems, communication systems, water supply systems, sanitary sewerage and drainage systems, reservoirs and filtration plants, water and waste-water treatment plants, and pump stations, when the system distributes or collects a service, product, or commodity for which a fee or price is paid for said service, product, or commodity.

Work means the furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the CONTRACTOR's performance of all duties and obligations imposed by the contract, plans, and specifications.

GC-02 CONTRACTORS' OBLIGATIONS

CONTRACTOR represents that it is fully experienced, properly qualified, registered, licensed, equipped, organized, and financed to perform the Work under this Contract.

2.1 Subject to the provisions of this Agreement, CONTRACTOR hereby undertakes to cause and obtain the:

2.1.1 Permitting, construction, and commissioning of the Work in accordance with the Construction Documents,

2.1.2 To cause Substantial Completion of the same to occur on or before the Scheduled Completion Date, as the same may be extended pursuant to the provisions of this Contract, and

2.1.3 To equip the Project in accordance with the Contract Documents. Provided that CITY shall be in compliance with its payment obligations hereunder, all costs, expenses and expenditures in connection with the permitting, construction, and commissioning of the Work, including, without limitation, the amounts owing to the, Subcontractors and Suppliers for supervision, transportation, labor, materials or Permits or other matters in connection with the Work, shall be paid by CONTRACTOR.

2.2 CONTRACTOR shall manage, direct and cause the permitting, construction, commissioning and equipping of the Work, and shall coordinate the activities of all Subcontractors and Suppliers involved therein. CONTRACTOR shall meet with Persons providing construction Work on a regular and frequent basis and as specifically provided herein in order to assure the performance of the Work in accordance with the terms of this Agreement. To the extent CONTRACTOR has, obtains, or retains rights under any Subcontract pertaining to the Work, CONTRACTOR will exercise such rights in accordance with all approval and consent provisions provided to CITY in this Contract. CONTRACTOR shall ensure that all warranties provided by the Subcontractors are consistent with the terms of this Contract.

2.3 CONTRACTOR shall provide all labor, materials, equipment and all services required to implement the scope defined by the Contract Documents, as approved by CITY.

2.4 CONTRACTOR shall be responsible for the professional quality, technical accuracy, and other non-construction services furnished by the CONTRACTOR under this Contract. The CONTRACTOR shall, without additional compensation, correct or revise any errors in construction and other non-construction services and perform any necessary rework or modifications including any damage to real personal property for Work performed by the CONTRACTOR, its Subcontractors and its Suppliers, under this Contract.

2.5 Independent CONTRACTOR. CONTRACTOR shall act as an independent CONTRACTOR and not as the agent of CITY in performing this Contract, maintaining complete control over its employees and all of its Subcontractors. Nothing contained in this Contract or any Subcontract awarded by CONTRACTOR shall create any contractual relationship between any Subcontractor and CITY. CONTRACTOR shall perform the Work hereunder in accordance with its own methods subject to compliance with this Contract.

GC-03 DESIGNATED REPRESENTATIVES

3.1 Designation of ENGINEER. CITY hereby designates the Assistant Aviation General Manager, Planning and Development, a full-time employee of the Department of Aviation, as ENGINEER for this Contract. The ENGINEER shall carry out the CITY's duties specified in this Contract, or necessarily to be implied from this Contract.

3.2 ENGINEER's Representative. ENGINEER may appoint a representative who shall carry out such duties and exercise such authority as may be delegated to him. Any communication given by ENGINEER's representative shall have the same effect as though it had been given by CITY; provided that any failure of ENGINEER to disapprove or reject any work shall not prejudice the authority of ENGINEER to disapprove such work or to give instructions for the recertification of defects.

3.3 ENGINEER's Discretion. Whenever, under this Contract, ENGINEER is required to exercise his discretion by giving a decision, opinion, or consent; by expressing his satisfaction or approval; or by determining values, he shall exercise such discretion reasonably, fairly, and impartially within the terms of this Contract.

3.4 CONTRACTOR's representative. Before starting work, CONTRACTOR shall designate, in writing, an authorized representative acceptable to ENGINEER to represent and act for CONTRACTOR and shall specify any and all limitations of such representative's authority. Such representative shall be present or be represented at the Jobsite at all times when Work is in progress; shall, together with other appropriate CONTRACTOR personnel, be available for meetings as required by ENGINEER; shall be empowered to receive communications in accordance with this Contract on behalf of CONTRACTOR. During periods when the Work is suspended, arrangements shall be made for an authorized representative acceptable to ENGINEER to be available for any emergency work that may be required. All communications given to the authorized representative by ENGINEER or by a designated representative, in accordance with this Contract shall be binding upon CONTRACTOR.

3.5 Notification of Changes in Representatives. Notification of changes of authorized representatives for either CITY or CONTRACTOR shall be provided in advance, in writing, to the other party.

GC-04 NOTICES

4.1 Delivery. All notices, demands, consents, approvals and requests given by either party to the other under this Contract shall be in writing and may be delivered by (i) regular mail, postage prepaid; (ii) certified or registered mail; (iii) facsimile; or (iv) hand-delivery, to the parties at the addresses and facsimile numbers set forth in the Clause titled "ADDRESSES."

4.2 Receipt. Notices sent by mail shall be deemed to be received upon deposit in the mail, properly addressed. Notices sent by certified or registered mail shall be deemed to be received upon acknowledgement. Notices sent by facsimile shall be deemed to be received upon successful transmission to the proper facsimile number. Notices delivered by hand-delivery shall be deemed to be received upon acceptance by the respective party or its agent.

4.3 Change of Address or Facsimile Number. Either party may, at any time, change its respective address or facsimile number by sending written notice to the other party of the change by registered or certified mail, postage prepaid, to the respective addresses set forth in this clause.

GC-05 CONTRACT INTERPRETATION

All questions concerning interpretation or clarification of this Contract or applicable standards and codes, including the discovery of conflicts, discrepancies, errors or omissions, or the acceptable performance thereof by CONTRACTOR, shall be immediately submitted in writing to ENGINEER for resolution. Subject to the provisions of the Clause titled "CHANGE DOCUMENTS", all determinations, instructions, and clarifications of ENGINEER shall be final and conclusive unless determined to have been fraudulent or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence. At all times CONTRACTOR shall proceed with the Work in accordance with the determinations, instructions, and clarifications of ENGINEER. CONTRACTOR shall be solely responsible for requesting instructions or interpretations and shall be solely liable for any costs and expenses arising from its failure to do so.

GC-06 ORDER OF PRECEDENCE

6.1 Precedence of Contract Documents. All Contract Documents, and subsequently formally executed Addendums, Amendments or Modifications to the Contract Documents, are essential parts of this Contract and a requirement or provision contained in one is binding as though contained in all. In resolving conflicts, discrepancies, errors or omissions, including, but not limited to, interpretations pursuant to the Clause titled "CONTRACT INTERPRETATION", the following order of precedence will be used:

6.1.1 Change Order(s);

6.1.2 Legislation;

6.1.3 Agreement;

6.1.4 Exhibit A, Construction Contract General Conditions;

6.1.5 Exhibit B, Construction Contract Special Conditions;

6.1.6 Exhibit D, Insurance and Bonding/Construction Safety and Health Plan;

6.1.7 Exhibit G, Airport Security Program;

6.1.8 Exhibit H, Schedule Requirements;

6.1.9 Exhibit I, Quality Control Program;

6.1.10 Exhibit E, Technical Specifications;

6.1.11 Exhibit F, Contract Drawings;

6.1.12 CONTRACTOR Submittals.

6.2 Interpretation Not Affected. The organization of this Contract into articles, sections, paragraphs, and subparagraphs, the Table of Contents and the insertion of headings and subheadings are for convenience and reference only and shall not modify or affect the meaning, interpretation, construction, or effect of this Contract nor the rights, obligations, and liabilities of the parties.

GC-07 STANDARDS AND CODES

Wherever references are made in this Contract to standards or codes in accordance with which the Work under this Contract is to be performed, the edition or revision of the standards or codes current on the effective date of this Contract shall apply unless otherwise expressly stated. In case of conflict between any referenced standards and codes and any Contract Documents, the law and the code shall prevail over Contract Documents.

GC-08 LAWS AND REGULATIONS

8.1 Compliance with Applicable Law. CONTRACTOR must comply with all applicable federal, state, or local statues, laws, ordinances, codes, rules, regulations, standards, executive orders, consent orders, orders and guidance from regulatory agencies, judicial decrees, permits, licenses or other governmental requirements of any kind, then in effect or which come into effect during the Work being performed, and any present or future amendments to those Governmental Requirements, which specifically relate to (i) the business of the CITY; (ii) the business of the CONTRACTOR or the CONTRACTOR's Subcontractors; (iii) the Contract and the Contract Documents; (iv) the performance of the Work under this Contract by the CONTRACTOR and its Subcontractors; (v) the Airport; (vi) the Transportation Security Administration (TSA) and Federal Aviation administration (FAA) security requirements; or (vii) any other matters relating to this Contract.

8.2 Applicable Law. This Contract shall be governed by and interpreted under the laws of the State of Georgia. The parties fix venue and jurisdiction for any actions brought in connection with this Contract in Fulton County, Georgia.

8.3 Jurisdiction and Venue. The parties submit and consent to the exclusive jurisdiction of the state courts of Fulton County, Georgia or the United States District Court for the Northern District of Georgia and irrevocably agree that all actions or proceedings relating to this Agreement will be litigated in such courts and each of the Parties waives any objection which it may have based on improper venue or forum non conveniens to the conduct of any such action or proceeding in such courts.

8.4 Equitable Remedies. The Parties agree that, notwithstanding the provisions of "Dispute Resolution", due to the unique nature of either Party's Confidential Information, there may not be an adequate remedy at law for a breach of the Section titled "Confidential Information", which breach may result in irreparable harm to the non-disclosing Party. Accordingly, in such instance, the non-breaching Party will be entitled to appropriate equitable relief in addition to whatever remedies it might have at law.

8.5 Notice of Inconsistencies. If CONTRACTOR discovers any discrepancy or inconsistency between this Contract and any law, ordinance, statute, rule, regulation, order or decree, CONTRACTOR shall report the same immediately, in writing, to ENGINEER.

8.6 Utility Contractor Licensing Requirements. CONTRACTOR shall comply with the requirements of O.C.G.A. § 43-14-8.2 (b) which states:

8.7 Sec.2-1295 – Copyrights and Rights in Data. Under this article, if a contract is being funded by the city, the contract shall include a provision giving the CONTRACTOR notice that the city shall have the right to any plans, drawings, specifications, computer programs, technical reports, operating manuals and similar work products developed and paid for under the contract.

8.8 Confidential Information.

8.8.1 General. Each Party agrees to preserve as strictly confidential all Confidential Information of the other Party for two (2) years following the expiration or termination of this Agreement; provided, however, that each Party's obligations for the other Party's Confidential Information that constitutes trade secrets pursuant to Applicable Law will continue for so long as such Confidential Information continues to constitute a trade secret under Applicable Law. Any Confidential Information that may be deemed Sensitive Security Information by the Department of Homeland Security or any other similar Confidential Information related to security will be considered trade secrets. Upon request by City, CONTRACTOR will return any trade secrets to City. Each Party agrees to hold the Confidential Information of the other in trust and confidence and will not disclose it to any Person, or use it (directly or indirectly) for its own benefit or the benefit of any other Person other than in the performance of its obligations under this Agreement.

8.8.2 Disclosure of Confidential Information or Information Other Party Deems to be Confidential Information. Each Party will be entitled to disclose any Confidential Information if compelled to do so pursuant to: (i) a subpoena; (ii) judicial or administrative order; or (iii) any other requirement imposed upon it by Applicable Law. Prior to making such a disclosure, to the extent allowed pursuant to Applicable Law, each Party must provide the other with thirty six (36) hours prior notice by facsimile of its intent to disclose, describing the content of the

information to be disclosed and providing a copy of the pleading, instrument, document, communication or other written item compelling disclosure or, if not in writing, a detailed description of the nature of the communication compelling disclosure with the name, address, phone number and facsimile number of the Person requesting disclosure. Should the non-disclosing Party contest the disclosure, it must: a) seek a protective order preventing such disclosure; or b) intervene in such action compelling disclosure, as appropriate. This Section will be applicable to information that one Party deems to be Confidential Information but the other Party does not.

8.9 Work Product.

8.9.1 Except as otherwise expressly provided in this Agreement, all reports, information, data, specifications, computer programs, technical reports, operating manuals and similar Work or other documents, all deliverables and other Work Product prepared or authored by CONTRACTOR or any of its Subcontractors exclusively for City under this Contract and all intellectual property rights associated with the foregoing items (collectively, the "Work Product") will be and remain the sole and exclusive property of City. Any of CONTRACTOR's or its Subcontractors' works of authorship comprised within the Work Product (whether created alone or in concert with City or Third Party) will be deemed to be "works made for hire" and made in the course of Work rendered and, whether pursuant to the provisions of Section 101 of the U.S. Copyright Act or other Applicable Law, such Work Product will belong exclusively to City. CONTRACTOR and its Subcontractors grant City a non-exclusive, perpetual, worldwide, fully paid up, royalty free license to all Work Product not exclusively developed for City under this Agreement.

8.9.2 If any of the Work Product is determined not to be a work made for hire, CONTRACTOR assigns to City, worldwide and in perpetuity, all rights, including proprietary rights, copyrights and related rights and all extensions and renewals of those rights, in the Work Product. If CONTRACTOR has any rights to the Work Product that cannot be assigned to City, CONTRACTOR unconditionally and irrevocably waives the enforcement of such rights and irrevocably grants to City during the term of such rights an exclusive, irrevocable, perpetual, transferable, worldwide, fully paid and royalty-free license, with rights to sublicense through multiple levels of sublicensees, to reproduce, make, have made, create derivate works of, distribute, publicly perform and publicly display by all means, now known or later developed, such rights.

8.9.3 City will have the sole and exclusive right to apply for, obtain, register, hold and renew, in its own name or for its own benefit, all patents, copyrights, applications and registrations, renewals and continuations and all other appropriate protection.

8.9.4 To the extent exclusive title or complete and exclusive ownership rights in any Work Product created by CONTRACTOR or its Subcontractor(s) may not originally vest in City by operation of Applicable Law, CONTRACTOR and its Subcontractors must, immediately upon request, unconditionally and irrevocably assign, transfer and convey to City all rights, title and interest in the Work Product.

8.9.5 Without any additional cost to City, CONTRACTOR and its Subcontractors must promptly give City all reasonable assistance and execute all documents City may reasonably request to enable City to perfect, preserve, enforce, register and record its rights in all Work

Product. CONTRACTOR and its Subcontractors irrevocably designate City as agent and attorney-in-fact to execute, deliver and file, if necessary, any documents necessary to give effect to the provisions of this Section and to take all actions necessary, in CONTRACTOR's or its Subcontractor's name, with the same force and effect as if performed by CONTRACTOR or its Subcontractor.

8.10 Sec.2-1213. Prohibition against contracting with predatory or high cost lenders.

8.10.1 The CITY, and those authorized to act on its behalf, shall not enter into any contract with any person or business entity that is a predatory or a high cost lender, or an affiliate thereof, as defined in Code Section 58-102.

8.10.2 Every CITY contract and purchase order shall contain a provision requiring that the person or business entity with which the CITY is contracting certify, under penalty of perjury, that neither the person, or business entity, nor any of its affiliates is a high cost lender or a predatory lender, as provided by Code Section 58-102. All contractors shall identify a person having authority to sign for the CONTRACTOR who shall certify, in writing, as follows:

> I certify, under penalty of perjury, that this offer is made by a person or business entity that is neither a high cost lender nor a predatory lender, nor is the CONTRACTOR an affiliate of a high cost lender or a predatory lender, as defined by City of Atlanta Code Section 58-102. I further certify that I am an agent duly authorized to sign this certification on behalf of the contracting party.

8.10.3 Any person or business entity that provides a false affidavit shall be subject to any or all of the following penalties:

8.10.3.1 Withholding of ten percent (10%) of all future payments under the involved contract until it is determined that the person, or business entity, is in compliance with this section.

8.10.3.2 Withholding of all future payments under the involved contract until it is determined that the person, or business entity, is in compliance with this section.

8.10.3.3 Cancellation of the involved contract.

8.10.4 Nothing in this section shall affect the validity of any contract entered into in connection with any debt obligations issued by or on behalf of the CITY, regardless of whether the contract was awarded in compliance with this Clause.

8.11 Sec.2-1200. Equal employment opportunity Clause

8.11.1 During the performance of this agreement, said CONTRACTOR agrees as follows:
8.11.1.1 The CONTRACTOR shall not discriminate against any employee, or applicant for employment, because of race, color, creed, religion, sex, domestic relationship status, parental status, familial status, sexual orientation, national origin, gender identity, age, disability, or political affiliation. As used here, the

words "shall not discriminate" shall mean and include without limitation the following:

8.11.1.1.1 Recruited, whether by advertising or other means; compensated, whether in the form of rates of pay, or other forms of compensation; selected for training, including apprenticeship; promoted; upgraded; demoted; downgraded; transferred; laid off; and terminated.

8.11.1.1.2 The CONTRACTOR agrees to and shall post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officers setting forth the provisions of the EEO clause.

8.11.2 The CONTRACTOR shall, in all solicitations or advertisements for employees, placed by or on behalf of the CONTRACTOR, state that all qualified applicants will receive consideration for employment without regard to race, color, creed, religion, sex, domestic relationship status, parental status, familial status, sexual orientation, national origin, gender identity, age, disability, or political affiliation.

8.11.3 The CONTRACTOR shall send to each labor union or representative of workers with which the CONTRACTOR may have a collective bargaining agreement or other contract or understanding a notice advising the labor union or workers' representative of the CONTRACTOR's commitments under the equal employment opportunity program of the City of Atlanta and under the Code of Ordinances and shall post copies of the notice in conspicuous places available to employees and applicants for employment. The CONTRACTOR shall register all workers in the skilled trades who are below the journeyman level with the U.S. Bureau of Apprenticeship and Training.

8.11.4 The CONTRACTOR shall furnish all information and reports required by the contract compliance officer pursuant to the Code of Ordinances, and shall permit access to the books, records, and accounts of the CONTRACTOR during normal business hours by the contract compliance officer for the purpose of investigation so as to ascertain compliance with the program.

8.11.5 The CONTRACTOR shall take such action with respect to any Subcontractor as the city may direct as a means of enforcing the provisions of paragraphs (a) through (h) herein, including penalties and sanctions for noncompliance; provided, however, that in the event the CONTRACTOR becomes involved in or is threatened with litigation as a result of such direction by the city, the city will enter into such litigation as is necessary to protect the interest of the city and to effectuate the equal employment opportunity program of the city; and, in the case of contracts receiving federal assistance, the CONTRACTOR or the city may request the United States to enter into such litigation to protect the interests of the United States.

8.11.6 The CONTRACTOR and its Subcontractors, if any, shall file compliance reports at reasonable times and intervals with the city in the form and to the extent prescribed by the contract compliance officer. Compliance reports filed at such times directed shall

contain information as to employment practices, policies, programs and statistics of the CONTRACTOR and its Subcontractors.

8.11.7 The CONTRACTOR shall include the provisions of paragraphs (a) through (h) of this equal employment opportunity clause in every subcontract or purchase order so that such provisions will be binding upon each Subcontractor or vendor.

8.11.8 A finding, as hereinafter provided, that a refusal by the CONTRACTOR or Subcontractor to comply with any portion of this program, as herein provided and described, may subject the offending party to any or all of the following penalties:

8.11.8.1 Withholding from the CONTRACTOR in violation all future payments under the involved contract until it is determined that the CONTRACTOR or Subcontractor is in compliance with the provisions of the contract;

8.11.8.2 Refusal of all future bids for any contract with the City of Atlanta or any of its departments or divisions until such time as the CONTRACTOR or Subcontractor demonstrates that there has been established and there shall be carried out all of the provisions of the program as provided in the Code of Ordinances;

8.11.8.3 Cancellation of the public contract;

8.11.8.4 In a case in which there is substantial or material violation of the compliance procedure herein set forth or as may be provided for by the contract, appropriate proceedings may be brought to enforce those provisions, including the enjoining, within applicable law, of CONTRACTORs, Subcontractors or other organizations, individuals or groups who prevent or seek to prevent directly or indirectly compliance with the policy as herein provided.

8.12 Ethics: Gratuities and Kickbacks.

8.12.1 Gratuities and Kickbacks. In accordance with the City of Atlanta's Code of Ordinances, Section 2-1484, as may be amended, it shall be unethical for any person to offer, give or agree to give any employee or former employee or for any employee or former employee to solicit, demand, accept or agree to accept from another person a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, preparation or any part of a program requirement or a purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing or in any other advisory capacity in any proceeding or application, request for ruling, determination, claim or controversy or other particular matter pertaining to any program requirement or a contract or subcontract or to any solicitation or proposal therefore. Additionally, it shall be unethical for any payment, gratuity or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor or any person associated therewith as an inducement for the award of a subcontract or order.

8.12.2 Rights and Remedies. The rights and remedies of CITY provided in this Clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this Contract.

8.12.3 Contingent Fees. The CONTRACTOR warrants that it has not employed nor retained any company or person, other than a bona fide employee working for the vendor or CONTRACTOR or firm, to solicit or secure the Contract; and that the vendor or CONTRACTOR or firm has not paid or agreed to pay any person, company, association, corporation, individual, or firm, other than a bona fide employee working for the vendor or CONTRACTOR or firms, any fee, commission, percentage, gift or any other consideration contingent upon or resulting from the award or making of the Contract. For the breach or violation of the above warranty, and upon a finding after notice and hearing, CITY shall have the right to terminate the Contract, and, at its discretion, to deduct from the Contract price, or otherwise recover the full amount of such fee, commission, percentage, gift or consideration.

8.12.4 Fraud and misrepresentation. Any written or oral information provided by [insert as appropriate "Contractor" or Service Provider"], directly or indirectly related to the performance of the services required by this Agreement, constitutes material representations upon which the City relies for the requirements of the Agreement and compliance with local, state and federal laws, rules and regulations. [Contractor] agrees to notify the City immediately of any information provided to the City that it knows and/or believes to be false and/or erroneous and immediately provide correct information to the City and take corrective action. [Contractor] further agrees to notify the City immediately of any actions or information that it believes would constitute fraud or misrepresentation to the City in performance of this Agreement, whether or not such information actually constitutes fraud and/or misrepresentations, by contacting the Integrity Line 1-800-884-0911. [Contractor] agrees to place signage provided by the City regarding the Integrity Line at the location to which [Contractor's] employees report to perform the services required by this Agreement. [Contractor] acknowledges and agrees that a finding of fraud or other impropriety on the part of the [Contractor] or any of its [subcontractors] may result in suspension or debarment of the [Contractor]; and the City may pursue any other actions or remedies that the City may deem appropriate. [Contractor] agrees to include this clause in its [subcontracts] and take appropriate measures to ensure compliance with this provision.

8.13 Sec. 2-1109 Compliance with Federal Requirements. When the procurement or real estate transaction involves the expenditure of federal assistance or contract funds, the procurement or real estate transaction shall be conducted in accordance with any applicable mandatory federal law and authorized regulations which are not reflected in this article. Notwithstanding, where federal assistance or contract funds are used in a procurement or real estate transaction, requirements that are more restrictive than federal requirements shall be followed.

8.14 Sec. 2-1273 Wage Requirements for Construction Contracts. Unless otherwise required or if federally assisted, when a construction project exceeds the sum of $10,000.00, the prevailing wages paid shall correspond as nearly as practicable to the prevailing wages

required in the federal Davis Bacon Act. Such scale of wages to be paid shall be posted by the CONTRACTOR in a prominent and easily accessible place at the site of work.

8.15 Sec. 2-1291 Responsibilities and Rights of Parties to Contract. CONTRACTOR acknowledges that this contract and any changes to it by amendment, modification, change order or other similar document may have required or may require the legislative authorization of the City's Council and approval of the Mayor. Under Georgia law, CONTRACTOR is deemed to possess knowledge concerning the City's ability to assume contractual obligations and the consequences of CONTRACTOR's provision of goods or services to the City under an unauthorized contract, amendment, modification, change order or other similar document, including the possibility that the CONTRACTOR may be precluded from recovering payment for such unauthorized goods or services. Accordingly, CONTRACTOR agrees that if it provides goods or services to the City under a contract that has not received proper legislative authorization or if the CONTRACTOR provides goods or services to the City in excess of the any contractually authorized goods or services, as required by the City's Charter and Code, the City may withhold payment for any unauthorized goods or services provided by CONTRACTOR. CONTRACTOR assumes all risk of non-payment for the provision of any unauthorized goods or services to the City, and it waives all claims to payment or to other remedies for the provision of any unauthorized goods or services to the City, however characterized, including, without limitation, all remedies at law or equity.

GC-9 PERMITS

Responsibility of Permits. Except as otherwise specified, CONTRACTOR shall procure and pay for all permits, licenses, certifications, and other applicable governing authority requirements and inspections, other than inspections performed by the CITY, and shall furnish any documentations, bonds, security or deposits required to permit performance of the Work.

GC-10 TAXES

CONTRACTOR shall pay all taxes, levies, duties, and assessments of every nature due in connection with the Work under this Contract and shall make any and all payroll deductions and withholdings required by law, and hereby indemnifies and holds harmless the CITY, from any liability on account of any and all such taxes, levies, duties, assessments, and deductions.

GC-11 TITLE AND RISK OF LOSS

11.1 Title to Goods. Where Contractor fabricates or purchases equipment, materials or other tangible items (Goods) for incorporation into the Work or any of its separate parts, the title of such Goods shall be vested in CITY when the first of the following events occurs:

11.1.1 The Goods or part thereof is first identifiable as being appropriated to this Contract,

11.1.2 When CITY pays for the Goods or part thereof in accordance with this Contract, or

11.1.3 When the Goods or part thereof are dispatched to or from Contractor's fabrication yard or to the Jobsite.

11.2 CITY's Right to Reject Goods/Materials. However such transfer of title in the Goods will be without prejudice to CITY's right to reject the Goods/Materials in case of non-conformity with the requirements of this Contract. Irrespective of transfer of title in the Goods/Materials, CONTRACTOR shall remain responsible for risk of loss or damage to work in progress and all Goods until Final Acceptance. CONTRACTOR shall ensure that the above provisions are imposed upon its suppliers and Subcontractors and shall execute all documents and take all steps necessary to vest title in accordance with this Clause.

11.3 Title to Bulk Goods. Title to standard Goods of the type usually bought in bulk such as reinforcement bars, piping materials, non-tagged instruments and instrument installation material, cable and similar items which are not incorporated into the Work shall revert to CONTRACTOR upon agreement by the CITY that such Goods are not required for the Work.

GC-12 PERFORMANCE AND PAYMENT BONDS

12.1 Bonding Requirements. CONTRACTOR, at its sole expense, shall maintain in effect at all times during the performance of the Work Performance and Payment Bonds each in an amount with limits not less than those set forth in this article. All Bonds shall be issued in a form and by a Surety acceptable to the CITY and contain the Surety's waiver of notice of all contract changes, including, but not limited to, increase or decrease in scope, value, and schedule acceleration or deceleration. Upon satisfactory completion of all Contract obligations, CITY shall return such securities to Contractor.

12.1.1 CONTRACTOR shall, at the time of execution of this Contract, furnish CITY a Performance Bond and a Payment Bond for the Work under this Contract, each in an amount equal to one hundred percent (100%) of the Contract value. The person executing the Bonds on behalf of the Surety shall file with the Bonds a general power of attorney as to amount and type of the Bonds covered by such power of attorney, and certified by an official of said Surety.

12.2 Corporate Surety. Bonds shall be executed by a corporate Surety (insurance company), which is satisfactory to CITY and meets the following minimum financial security requirements:

12.2.1 Have a current Best's rating of not less than A-, and current, and;

12.2.2 Have a Best's financial size category of not less than Class IX, and;

12.2.3 Be authorized by the Georgia Insurance Commissioner pursuant to a valid and current Certificate of Authority to conduct and transact Surety business in the State of Georgia, and;

12.2.4 Be a U.S. Treasury Circular 570 listed company.

The Bonds shall be submitted and will be dated by the CITY upon execution of the Contract. The Surety shall appoint an agent for service in Atlanta, Georgia upon whom all notices shall be served. The person executing the Bonds on behalf of the Surety shall file with the Bonds a general power of attorney unlimited as to amount and type of Bonds covered by such power of attorney, and certified to by an official of said Surety. The Bonds shall be on forms provided by CITY, and subject to increase for any alterations, extension of the time allows for performance, extra or additional work and any other changes authorized under this Contract.

12.3 Amendment to Bonds. In the event the Contract Price is increased, CONTRACTOR shall deliver to CITY an amendment or Rider to the Payment and Performance Bonds increasing the final amounts of the Bonds to the new Contract Price, or new Bonds shall be furnished in the final amount of the new Contract Price. These Bonds shall remain in effect through the period of performance, including the period of warranty, and as required under Georgia law for Bonds on Public construction contracts.

12.4 Related Obligations.

12.4.1 No limitations. The requirements contained herein as to forms and limits, as well as CITY's approval of Bond coverage to be maintained by CONTRACTOR, are not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by CONTRACTOR under this Contract.

12.4.2 Use of Facilities. CONTRACTOR agrees that it will not use the facilities for any purpose which might void any Bond covering the Work or render any loss under any Bond uncollectible.

GC-13 LABOR, PERSONNEL, AND WORK RULES

13.1 Qualifications and Procedures. CONTRACTOR shall employ only competent and skilled personnel to perform the Work and shall remove from the Jobsite any CONTRACTOR personnel determined to be unfit or to be acting in violation of any provision of this Contract. CONTRACTOR is responsible for maintaining labor relations in such manner that there is harmony among workers and shall comply with and enforce Project and Jobsite procedures, regulations, work rules and work hours established by ENGINEER.

13.2 Professional Standards.
The Work will be performed in a professional and workmanlike manner in accordance with the standards imposed by Applicable Law and the practices and professional standards used in well managed operations performing work similar to the Work.

13.3 Discretion to Deny Access. ENGINEER may at his sole discretion deny access to the Jobsite to any individual by written notice to CONTRACTOR. In the event an employee is excluded from the Jobsite, CONTRACTOR shall promptly replace such individual with another who is fully competent and skilled to perform the Work.

13.4 Demands for Collective Bargaining. CONTRACTOR shall give ENGINEER prompt notice in writing of every demand for collective bargaining made upon CONTRACTOR or any of its

subcontractors by any labor organization and of any labor dispute, which may reasonably be expected to affect performance of the Work under this Contract.

13.5 Jurisdictional Disputes. Unless other methods are established by ENGINEER, the rules, regulations, and procedures of the Plan for Settlement of Jurisdictional Disputes in the Construction Industry, or any successor agreement thereto, shall be used to determine work assignments and to resolve jurisdictional disputes on work covered by this Contract.

13.6 Wage Requirements for Construction Contracts. Unless otherwise required or if federally assisted, when a construction project exceeds the sum of Ten Thousand Dollars ($10,000.00), the prevailing wages paid shall correspond as nearly as practicable to the prevailing wages required in the federal Davis Bacon Act. Such scale of wages to be paid shall be posted by the Contractor in a prominent and easily accessible place at the site of work.

GC-14 ASSIGNMENTS AND SUBCONTRACTS

14.1 Consent of CITY Required. Any assignment of this Contract or rights hereunder, in whole or part, without the prior written consent of CITY shall be void, except that upon ten (10) calendar days written notice to CITY. CONTRACTOR may assign monies due, or to become due, under this Contract. Any assignment of monies shall be subject to proper set-offs in favor of CITY and to any deductions provided for in this Contract.

14.2 Pass Down of Contract Requirements. Purchase orders and subcontractors must include provisions to secure all rights and remedies of CITY provided under this Contract, and must impose upon the Subcontractor all of the duties and obligations required to fulfill this Contract with respect to their activities.

14.3 Subcontractors. If Consultant subcontracts any of the Services, Consultant shall: (i) be responsible for the performance of Services by the Subcontractors; (ii) remain City's sole point of contact for the Services; and (iii) be responsible for the payment of any Subcontractors.

14.4 Required Provisions. Purchase orders and Subcontractors must include provisions to secure all rights and remedies of CITY provided under this Contract, and must impose upon the Subcontractor all of the duties and obligations required to fulfill this Contract with respect to their activities.

14.5 Copies of Purchase Orders and Subcontracts. Copies of all purchase orders and Subcontracts are to be provided to ENGINEER upon request.

14.6 No Relief of Responsibilities. No assignment or subcontract will be approved which would relieve CONTRACTOR or its sureties, if any, of their responsibilities under this Contract. CITY may require revised or modified bonds or insurance and the execution of assumption agreements as conditions for approval.

14.7 Further Acts. CITY and CONTRACTOR each agrees to perform any additional acts, execute, and deliver any additional documents as may reasonably be necessary in order to carry out the provisions and effectuate the intent of this Contract.

GC-15 COMMERCIAL ACTIVITIES

Neither CONTRACTOR nor its employees shall establish any commercial activity or issue concessions or permits of any kind to third parties for establishing commercial activities on the Jobsite or any other lands owned or controlled by CITY.

GC-16 PUBLICITY AND ADVERTISING

CONTRACTOR shall not make any announcement, release any photographs, or release any information concerning this Contract, or the Project, or any part thereof to any member of the public, press, business entity, or any official body unless prior written consent is obtained from ENGINEER. CONTRACTOR may not erect any signs without the written approval of the ENGINEER, other than those required by this Contract.

GC-17 ENVIRONMENTAL REQUIREMENTS

17.1 Environmental Plan and Controls. Throughout performance of the Work, CONTRACTOR shall conduct all operations in such a way as to minimize impact upon the natural environment and prevent any spread of contaminated or hazardous materials. CONTRACTOR shall:

17.1.1 Provide dust control of its operations within work and all other areas under its control and shall coordinate and cooperate with others for dust control in common areas;

17.1.2 Provide working machinery and equipment with efficient noise suppression devices and all other noise and vibration abatement measures necessary for the protection of workers and the public;

17.1.3 Provide suitable waste, sewage, sanitary, and garbage disposal methods and procedures approved by ENGINEER and consistent with State and Federal regulations.

17.1.4 Provide suitable equipment, facilities, and precautions to prevent the discharge of contaminants into the atmosphere, adjoining workspaces, any body of water, or land areas;

17.1.5 Provide all documentation required by all levels of governing authority or this Contract concerning environmental requirements; and

17.1.6 Be responsible for developing and maintaining a written Environmental Compliance Plan in accordance with CONTRACTOR's established practices, including, but not limited to, compliance with all applicable laws and all applicable requirements in the Project Environmental Control Plan. CONTRACTOR shall have sole responsibility for developing, implementing, and enforcing its Environmental Compliance Plan and CONTRACTOR's obligations under the Clause titled "INDEMNITY' apply to any liability arising in connection with or incidental to CONTRACTOR's performance or failure to perform as provided in this clause.

17.1.7 Submit NPDES Permit for staging / batch plant as required.

17.2 Storm Water Discharge. All discharged storm water, associated with construction activities, to the waters of the State of Georgia shall be in accordance with the limitations, monitoring requirements and other conditions set forth in the provisions of the Georgia Water Quality Control Act (Georgia Laws 1964, p. 416 as amended). The Federal Clean Water Act (33 U.S.C. 1251 et seq., as amended) and the Rules and Regulations promulgated to these acts.

17.3 Notice of Toxic/Hazardous Materials. In the event CONTRACTOR encounters on the Jobsite material reasonably believed to be toxic or hazardous material or waste, which has not been addressed in this Contract, CONTRACTOR shall immediately stop work in the affected area and notify the ENGINEER or its designated representative in writing of the condition. Pending receipt of written instructions from ENGINEER, CONTRACTOR shall not resume work in the affected area.

GC-18 HAZARDOUS SUBSTANCE AWARENESS

18.1 Hazardous Nature of the Work. The nature of the Work to be performed under this Contract may involve inherent risks. CONTRACTOR agrees that it will inform its officers, employees, agents, suppliers and Subcontractors, and any other parties which may come into contact with any hazardous substance as a result of CONTRACTOR's activities hereunder of the nature of such materials and any health or environmental risks associated with such materials.

18.2 Training Prior to Assignment. CONTRACTOR warrants that CONTRACTOR's personnel and personnel of its suppliers and Subcontractors, assigned to or regularly entering the Jobsite, have or will receive training as specified in OSHA 29 CFR 1910.120(e) in relation to this Contract prior to their assignment to field duty. Supervisory personnel will also receive, as a minimum, eight (8) hours additional specialized training in the management of hazardous waste operations. Such training shall be at CONTRACTOR's expense. CONTRACTOR personnel assigned to the Jobsite may also be required to attend specialized training classes specific to the Jobsite as presented by CITY or its designated representatives.

GC-19 HAZARDOUS SUBSTANCE REGULATIONS

CONTRACTOR shall ensure that all hazardous substances with which it deals receive safe and proper handling. CONTRACTOR confirms that it is aware of and will comply with the requirements of the All Environmental Regulations, including but limited to, Comprehensive Environmental Response, Compensation, Liability Act, 42 U.S.C. 9601-9675 (CERCLA) as amended; the Resource Conservation and Recovery Act, 42 U.S.C. 6901-6992- (RCRA) as amended; the Toxic Substances Control Act (TSCA), 15 U.S.C. 2601-2671; the Clean Water Act (CWA), 33 U.S. C. 1251-1387; Title 40 of the Code of Federal Regulations; the Department of Transportation (DOT) regulations applicable to hazardous substances, and any other federal, state, and local laws applicable to work with or near hazardous substances.

GC-20 DECONTAMINATION OF EQUIPMENT AND MATERIALS

All CONTRACTOR equipment, debris and used or surplus materials must be fully decontaminated prior to removal from designated work areas. CONTRACTOR shall submit decontamination and

contaminated material control procedures for ENGINEER review and acceptance. CONTRACTOR shall obtain ENGINEER's authorization to remove any such equipment, debris or surplus materials from the Jobsite.

GC-21 ON-SITE HANDLING AND DISPOSAL OF HAZARDOUS MATERIAL

If the Work under this Contract includes any intrusive site or structural drilling, boring, coring, or sampling, debris may be produced as a result of these efforts. This debris could include solids or liquids drawn from site wells for sampling purposes. All such debris shall be treated by the CONTRACTOR as if it were hazardous waste regulated under the Federal Resource and Conservation Recovery Act of 1976, 42 U.S.C. 6901-6992 (RCRA) as amended, or any more stringent applicable regulations, unless and until the CONTRACTOR has been able to confirm, to the satisfaction of ENGINEER and/or the appropriate regulatory agencies that the wastes are not regulated as hazardous.

GC-22 OFF-SITE TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIAL

CONTRACTOR shall have no authority or responsibility for the off-site transportation, storage, treatment or disposal of contaminated or potentially waste materials of any kinds, which are directly or indirectly generated at the Jobsite. Such removal shall be made by the CITY. However, CONTRACTOR shall handle all materials at the Jobsite with due care, in accordance with work or Jobsite plans and the requirements of this Contract.

GC-23 SITE CONDITIONS AND NATURAL RESOURCES

23.1 Nature and Location of Work. CONTRACTOR shall have the sole responsibility for satisfying itself concerning the nature and location of the Work and the general and local conditions, including but not limited to the following:

23.1.1 Transportation, access, disposal, handling and storage of materials;

23.1.2 Availability and quality of labor, water, electric power, and road conditions;

23.1.3 Climatic conditions, tides, and seasons;

23.1.4 Physical conditions at the Jobsite and the project area as a whole;

23.1.5 Topography and ground surface conditions; and

23.1.6 Equipment and facilities needed preliminary to and during the performance of the Work.

23.2 Failure to Assess Conditions. The failure of CONTRACTOR to acquaint itself with any applicable conditions will not relieve CONTRACTOR of the responsibility for properly estimating either the difficulties, time, or cost of successfully performing CONTRACTOR's obligations under this Contract.

GC-24 DIFFERING SITE CONDITIONS

24.1 Information on Subsurface Conditions. Where CITY has made investigations of subsurface conditions in areas where work is to be performed under this Contract, such investigations are made by CITY for the purpose of study and design. If the records of such investigation are included in the Contract Documents, the interpretation of such records shall be the sole responsibility of CONTRACTOR. Neither CITY nor its agents, representatives and consultants assume any responsibility whatsoever in respect to the sufficiency or accuracy of such investigations, the records thereof, or of the interpretations set forth and there is no warranty or guarantee, either express or implied, that the conditions indicated by such investigations or records thereof are representative of those existing throughout such areas, or any part thereof, or that unforeseen developments may not occur, or that materials other than or in proportions different from those indicated may not be encountered.

24.2 Notice for Differing Site Conditions. CONTRACTOR shall immediately notify ENGINEER in writing before proceeding with any work which CONTRACTOR believes constitutes a differing site condition with respect to:

24.2.1 Subsurface or latent physical conditions at the Jobsite differing materially from those indicated in this Contract; or

24.2.2 Previously unknown physical conditions at the Jobsite, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract.

24.3 Determination by ENGINEER. ENGINEER shall investigate such condition and make a written determination. If ENGINEER determines that such condition does constitute a differing site condition, CONTRACTOR may then, pursuant to the Clause titled "CHANGE DOCUMENTS", submit a written Change Notice Request setting forth the impact of such differing site condition and describing any additional or modified work resulting therefrom. Failure of CONTRACTOR to give the required notice shall be grounds for rejection of the claim to the extent CITY is prejudiced by such delay.

GC-25 TITLE TO MATERIALS FOUND

The title to water, soil, rock, gravel, sand, minerals, timber, and any other materials developed or obtained in the excavation or other operations of CONTRACTOR or any of its Subcontractors, and the right to use said materials, or dispose of same, is hereby expressly reserved by CITY. CONTRACTOR may, at the sole discretion of CITY, be permitted, without charge, to use in the Work any such materials, which meet the requirements of this Contract.

GC-26 SURVEY CONTROL POINTS AND LAYOUTS

26.1 Survey Control Points. Survey control points as shown on the drawings will be established by CITY. If CONTRACTOR or any of its Subcontractors or any of their representatives or employees move or destroy or render inaccurate any survey control point, such control point shall be replaced by ENGINEER at CONTRACTOR's expense.

26.2 Work to Confirm. CONTRACTOR shall complete the layout of all work and shall be responsible for execution of the Work in accordance with the locations, lines, and grades specified or shown on the drawings, subject to such modifications as ENGINEER may require as work progresses. Cross Sections, when required to establish quantities, shall be taken at a maximum of fifty (50) foot intervals.

26.3 Replacement Survey Control Points. If CONTRACTOR, or any of its Subcontractors or any of their representatives or employees, move or destroy or render inaccurate any survey control point, such control point shall be replaced by ENGINEER at CONTRACTOR's expense.

26.4 Certification of Survey Work. No separate payment will be made for survey work performed by CONTRACTOR, but all survey work shall be under the direction of registered Land Surveyor, licensed in Georgia, who shall certify all survey results.

GC-27 COOPERATION WITH OTHERS

27.1 Cooperation between CONTRACTORS. The CITY reserves the right to Contract for and perform other, or additional, work on or near the Work covered by this Contract. When separate contracts are let within the limits of any one project, each CONTRACTOR shall conduct its work so as not to interfere with, or hinder the progress of, completion of the Work being performed by other contactors. Contractors working on the same project shall cooperate with each other as directed.

Each contractor involved shall assume all liability, financial or otherwise, in connection with its Contract and shall protect and same harmless the CITY from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced by CONTRACTOR because of the presence and operations of other contractors working within the limits of the same project.

The CONTRACTOR shall arrange its work and shall place and dispose of the materials being used so as not to interfere with the operations of the other CONTRACTORS within the limits of the same project. It shall join its work with that of the others in an acceptable manner and shall perform Work in proper sequence to that of the others.

GC-28 ILLUMINATION

When any work is performed at night, or where daylight is obscured, CONTRACTOR shall, at its expense, provide artificial light sufficient to permit work to be carried on efficiently, satisfactorily and safely, and to permit thorough inspection. During such time periods, the access to the place of work shall also be clearly illuminated. All wiring for electric light and power shall be installed and maintained in a safe manner and meet all applicable codes and standards.

GC-29 USE OF COMPLETED PORTIONS OF WORK

29.1 Beneficial Occupancy. Whenever, as determined by Engineer, any portion of the Work performed by CONTRACTOR is suitable for use, CITY may, upon written notice, occupy and use such portion. Use shall not constitute acceptance, relieve CONTRACTOR of its responsibilities, or act as a waiver by the CITY of any terms of this Contract (see "WARRANTY").

29.2 Liability for Damage. CONTRACTOR shall not be liable for normal wear and tear or for repair of damage caused by any misuse during such occupancy or use by CITY. If such use increases the cost or time of performance of remaining portions of the Work, CONTRACTOR shall, pursuant to the Clause titled, "CHANGE DOCUMENTS", be entitled to an equitable adjustment in its compensation or schedule. Damage caused by CONTRACTOR's acts or omissions during such use shall be remedied at CONTRACTOR's expense.

29.3 Use of Unsatisfactory Work. If, as a result of CONTRACTOR's failure to comply with the provisions of this Contract, such use of completed portions of the Work proves to be unsatisfactory to CITY, the CITY shall have the right to continue such use until such portion of the Work can be taken out of service at the CITY's discretion for correction of defects, errors, omissions, or replacement; provided that the period of operations or use pending remedial action shall not exceed twelve (12) months.

29.4 Use of Permanently Installed Equipment. CONTRACTOR shall not use any permanently installed equipment unless such use is approved in writing by ENGINEER. When such use is approved, CONTRACTOR shall at its own expense properly use and maintain and, upon completion of such use, recondition such equipment as required, normal wear and tear as expected.

GC-30 USE OF CITY OR ITS DESIGNATED REPRESENTATIVES CONSTRUCTION EQUIPMENT OR FACILITIES

30.1 Owner Furnished Materials. None

30.2 When CONTRACTOR requests and ENGINEER agrees to make available for rent any equipment or facilities belonging to CITY for the performance of work, the following shall apply:

30.2.1 ENGINEER will furnish a copy of the equipment maintenance and inspection record, and these records shall be maintained by CONTRACTOR during the rental period;

30.2.2 CONTRACTOR shall assure itself of the condition of such equipment and/or materials and assume all risks and responsibilities during its use;

30.2.3 ENGINEER and CONTRACTOR shall jointly prepare an Inspection Report and inspect such equipment and/or materials before its use and upon its return, to document properly any damages as a result of CONTRACTOR's use. The cost of all necessary Improvements or replacement other than normal wear shall be at CONTRACTOR's expense; and

30.2.4 If such equipment and/or materials is furnished with an operator, the services of such operator will be performed under the complete direction and control of CONTRACTOR and such operator shall be considered CONTRACTOR's employee for all purposes other than the payment of wages, Workers' Compensation Insurance or other benefits.

30.2.5 Equipment rental rates shall be those shown in Exhibit "C" (Quantities, Pricing and Data) or, if none are shown, rates shall be negotiated based upon then current Data Quest Blue Book data."

GC-31 INSPECTION AND QUALITY ASSURANCE

31.1 Inspection and Audit. All material and equipment furnished and work performed shall be properly inspected by CONTRACTOR at its expense, and shall at all times be subject to quality surveillance and quality audit by the CITY who, upon reasonable notice, shall be afforded full and free access to the shops, factories, or other places of business of CONTRACTOR and its subcontractors for such quality surveillance or audit.

31.2 Authority and Access for Inspectors. Such quality auditors or inspectors are not authorized to change, revoke, or waive any provision of this Contract, not to issue instructions contrary to Contract requirements, nor to direct the efforts of any of CONTRACTOR's employees in any way. CONTRACTOR shall provide safe and adequate facilities, drawings, documents, and samples as requested, and shall provide assistance and cooperation including stoppage of work to perform such examination as may be necessary to determine compliance with the requirements of this Contract. Any work covered prior to any planned quality surveillance or test by the CITY shall be uncovered and replaced at the expense of CONTRACTOR if such covering interferes with or obstructs such inspection or test.

31.3 Uncovering of portions of the Work. At any time before Final Acceptance, ENGINEER may, for the purpose of inspection, direct CONTRACTOR to uncover portions of the Work which have been completed and covered up. If examination proves the completed work to be defective, corrections shall be made pursuant to the Clause titled "WARRANTY". If the Work is not defective, the impact of uncovering and restoration shall be treated as a change pursuant to the Clause titled "CHANGE DOCUMENTS".

31.4 Defective Work. If any work is determined by the CITY to be defective or not in conformance with this Contract, the provisions of the Clause titled "WARRANTY" shall apply.

31.5 Samples. CONTRACTOR shall furnish samples as requested and shall provide reasonable assistance and cooperation necessary to permit tests to be performed on materials or work in place including reasonable stoppage of work during testing. Any material or assembly that does not conform to the requirements of the Contract Documents shall be considered unacceptable and shall be rejected. The CONTRACTOR shall remove any rejected material or assembly from the site of the Work, unless otherwise instructed by the ENGINEER.

No rejected material or assembly, the defects of which have been corrected by the CONTRACTOR, shall be returned to the site of the Work until such time as the ENGINEER has approved its use in the Work.

31.6 Quality Assurance. The CONTRACTOR is advised that the cost of failing tests requiring additional tests to confirm compliance will be deducted from the monies due to CONTRACTOR through the Progress Payment Process.

GC-32 MONITORING

The equipment and materials furnished and work performed under this Contract shall be subject to monitoring by ENGINEER or his representatives who shall be afforded full and free access to the ships, factories, and other places of business of CONTRACTOR and its Subcontractors for monitoring purposes. As required by ENGINEER, CONTRACTOR shall provide detailed schedules and progress reports for use in monitoring and shall cooperate with ENGINEER in monitoring activities.

GC-33 BACKCHARGES

33.1 Corrective Actions by CITY or its Designated Representatives. If, under the provisions of this Contract, CONTRACTOR is notified by ENGINEER to correct defective or nonconforming work, and CONTRACTOR states, or by its actions indicates that it is unable or unwilling to proceed with corrective action in a reasonable time, ENGINEER may, upon written notice, proceed to accomplish the redesign, repair, rework or replacement of nonconforming work by the most expeditious means available and backcharge CONTRACTOR for the costs incurred. Furthermore, if ENGINEER agrees to or is required to perform work for CONTRACTOR, such as cleanup, off-loading or completion of incomplete work, ENGINEER may, upon written notice, perform such work by the most expeditious means available and backcharge CONTRACTOR for the costs incurred.

33.2 Backcharge Costs. The cost of backcharge work shall include:

33.2.1 Incurred labor costs including all payroll additives;

33.2.2 Incurred net delivered material costs;

33.2.3 Incurred Subcontractor costs directly related to performing the corrective action;

33.2.4 Equipment and tool rentals at prevailing rates in the Jobsite area; and

33.2.5 A factor of thirty-five percent (35%) applied to the total of Items 33.2.1 through 33.2.5 for overhead, supervision, and administrative costs.

33.3 CONTRACTOR's Concurrence. The backcharge notice will request CONTRACTOR's concurrence for ENGINEER to proceed with the required work. However, failure of CONTRACTOR to grant such concurrence shall not impair CITY's right to proceed with work under this or any other provision of this Contract.

33.4 Backcharge not a Release. ENGINEER shall separately invoice or deduct from payments otherwise due to CONTRACTOR the costs as provided herein. CITY's right to backcharge is in addition to any and all other rights and remedies provided in this Contract or by law. The performance of backcharge work by ENGINEER shall not relieve CONTRACTOR of any of its responsibilities under this Contract including, but not limited to, express or implied warranties, specified standards for quality, contractual liabilities and indemnifications, and meeting the

Contract Milestones of the Clause titled "COMMENCEMENT, PROGRESS, AND COMPLETION OF THE WORK".

GC-34 SUSPENSION

34.1 Suspension Notice. CITY may, by written notice to CONTRACTOR, suspend at any time the performance of all, or any portion of, work to be performed under this Contract. Upon receipt of such notice, CONTRACTOR shall, unless the notice requires otherwise;

34.1.1 Immediately discontinue work on the date and to the extent specified in the notice;

34.1.2 Place no further orders or subcontracts for material, services, or facilities with respect to suspended work other than to the extent required in the notice;

34.1.3 Promptly make every reasonable effort to obtain suspension upon terms satisfactory to CITY of all orders, subcontracts, and rental agreements to the extent they relate to performance of suspended work;

34.1.4 Continue to protect and maintain the Work including those portions on which work has been suspended; and

34.1.5 Take any other reasonable steps to minimize costs associated with such suspensions.

34.2 Notice to Resume. Upon receipt of notice to resume suspended work, CONTRACTOR shall immediately resume performance under this Contract to the extent required in the notice.

34.3 Equitable Adjustment. CONTRACTOR shall be entitled to an equitable adjustment for suspensions pursuant to the Clause titled "CHANGE DOCUMENTS", provided that within ten (10) days after receipt of notice to resume work, CONTRACTOR submits a Proposed Change Document, and provided that the suspension was not made necessary by the defective performance of work or any other Contract obligation of CONTRACTOR. No adjustment or relief of schedule milestones or completion dates shall be made for suspensions caused by CONTRACTOR.

GC-35 TERMINATION FOR DEFAULT

35.1 Reasons for Default. Notwithstanding any other provisions of this Contract, CONTRACTOR shall be considered in default of its contractual obligations under this Contract if it:

35.1.1 Performs work which fails to conform to the technical requirements of this Contract;

35.1.2 Fails to make progress so as to endanger performance of this Contract;

35.1.3 Abandons or refuses to proceed with any of the Work, including modifications directed pursuant to the Clause titled "CHANGE DOCUMENTS";

35.1.4 Fails to fulfill or comply with any of the terms of this Contract;

35.1.5 Engages in behavior that is dishonest, fraudulent or constitutes a conflict of interest with CONTRACTOR's obligations under this Contract; or,

35.1.6 Reasonable grounds for insecurity arise with respect to CONTRACTOR's performance.

35.2 Notice of Default. Upon the occurrence of any of the foregoing, ENGINEER shall notify CONTRACTOR in writing of the nature of the failure and of CITY's intention to terminate this Contract for default. If CONTRACTOR does not cure such failure within seven (7) calendar days from receipt of notification, or sooner, if safety to persons is involved, or fails to provide satisfactory evidence that such default will be corrected within a reasonable time, the CITY, by written notice to CONTRACTOR and without notice to CONTRACTOR's sureties, if any, shall terminate in whole or in part CONTRACTOR's right to proceed with the Work and CITY may prosecute the Work to completion in a timely manner by another contract or by any other reasonable method deemed expedient. CITY may take possession of and utilize any data, designs, licenses, equipment, materials, plant, tools, and property of any kind furnished by CONTRACTOR and necessary to complete the Work.

35.2A Immediate Termination. This Contract will immediately terminate, without the requirement of any action on CITY's part, and all termination for default remedies available and applicable termination actions required by CONTRACTOR when all work is terminated under this Contract shall apply, if CONTRACTOR:

35.2A.1 Voluntarily consents to an order for relief by filing a petition under the laws of the United States codified as Title 11 of the United States Code;

35.2A.2 Seeks consent to, or does not, contest the appointment of a receiver, custodian, or trustee for itself or for all or any part of its property;

35.2A.3 Files a petition seeking relief under the bankruptcy, arrangement, reorganization, or other debtor relief laws of any state or other competent jurisdiction;

35.2A.4 Admits in writing that it is generally not paying its debts as those debts become due;

35.2A.5 Gives notice to any governmental body of insolvency or pending insolvency or suspends operations;

35.2A.6 Becomes insolvent as that term is defined under applicable fraudulent transfer or conveyance laws; or

35.2A.7 Makes an assignment for the benefit of creditors or takes any other similar action for the protection or benefit of creditors.

35.3 Excess Reprocurement Costs. CONTRACTOR and its sureties, if any, shall be liable for all costs in excess of this Contract price for such terminated work reasonably and necessarily incurred in the completion of the Work, including cost of administration of any Contract awarded to others for completion.

35.4 Termination Actions. Upon termination for default, CONTRACTOR shall:

35.4.1 Immediately discontinue work on the date and to the extent specified in the notice and place no further purchase orders or subcontracts to the extent that they relate to the performance of the terminated work;

35.4.2 Inventory, maintain and turn over to CITY all data, designs, licenses, equipment, materials, plant, tools, and property furnished by CONTRACTOR, or provided by CITY for performance of the terminated work;

35.4.3 Promptly obtain cancellation upon terms satisfactory to CITY of all purchase orders, subcontracts, rentals, or any other agreements existing for performance of the terminated work or assign those agreements as directed by CITY;

35.4.4 Cooperate with the CITY in the transfer of data, designs, licenses and information and disposition of work in progress so as to mitigate damages;

35.4.5 Comply with other reasonable requests from CITY regarding the terminated work and;

35.4.6 Continue to perform in accordance with all of the terms and conditions of this Contract such portion of the Work that is not terminated.

35.5 CONTRACTOR not in Default. If, after termination pursuant to this Clause, it is determined for any reason that CONTRACTOR was not in default, the rights and obligations of the parties shall be the same as if the Notice of Termination had been issued pursuant to the Clause titled "TERMINATION FOR CONVENIENCE."

GC-36 TERMINATION FOR CONVENIENCE

36.1 Termination Actions. CITY may terminate for convenience any of the Work under this Contract in whole or, from time to time, at any time by written notice to CONTRACTOR. Such notice shall specify the extent to which the performance of the Work is terminated and the effective date of such termination. Upon receipt of such notice, CONTRACTOR shall:

36.1.1 Immediately discontinue the Work on the date and to the extent specified in the notice and place no further purchase orders or subcontracts for materials, services, or facilities, other than as may be required for completion of such portion of the Work that is not terminated.

36.1.2 Promptly obtain assignment or cancellation upon terms satisfactory to CITY of all purchase orders, subcontracts, rentals, or any other agreements existing for the performance of the terminated work or assign those agreements as directed by CITY;

36.1.3 Assist ENGINEER in the maintenance, protection, and disposition of work in progress, plant, tools, equipment, property, and materials acquired by CONTRACTOR or furnished by CITY under this Contract and;

36.1.4 Complete performance of such portion of the Work which is not terminated in accordance with the scheduled milestones and Contract completion dates.

36.2 Waiver and Compensation. In the event of termination, CONTRACTOR waives any claims for damages including loss of anticipated profits. As CONTRACTOR's sole right and remedy, CITY shall pay in accordance with the following:

36.2.1 The Contract price corresponding to the Work performed in accordance with this Contract prior to such notice of termination;

36.2.2 All reasonable costs for work thereafter performed as specified in such notice;

36.2.3 Reasonable administrative costs of settling and paying claims arising out of the termination of work under purchase orders or subcontracts;

36.2.4 Reasonable costs incurred in demobilization and the disposition of residual material, plant, and equipment and;

36.2.5 A reasonable overhead and profit on items 36.2.2 and 36.2.4 of this clause.

36.3 Proposal for Compensation. CONTRACTOR shall submit within thirty (30) calendar days after receipt of notice of termination, a written statement setting forth its proposal for an adjustment to the Contract price to include only the categories of incurred costs described in this clause. CITY shall review, analyze, and verify such proposal, negotiate an appropriate adjustment, and modify this Contract by Change Order accordingly.

GC-37 CHANGE DOCUMENTS

37.1 This section will govern changes to the Contract issued under the Contract, whether such changes involve an increase in the Total Contract Price or not. Changes in Contract or other aspects of this Contract shall be made by written document ("Change Document" or "Unilateral Change Document"). [1] All changes shall be implemented pursuant to this subsection and any Applicable Law.

37.2 Potential Change Documents that may be issued concerning this Contract include, but are not limited to:

[1] Change Documents may assume numerous multiple forms and titles depending on the nature of the change involved (e.g. Change Order, Unilateral Change Order, Amendment, Contract Modification, Renewal, etc.)

37.2.1 Change Documents to the Contract involving an increase to the Total Contract Price executed between CITY and CONTRACTOR which may, or may not, require legislative approval under Code Section 2-1292; and

37.2.2 Change Documents that do not involve an increase in the Total Contract Price will be executed pursuant to Code Section 2-1292(d) either bilaterally or unilaterally by the CITY; and

37.2.3 Unilateral Change Documents to the Contract issued by CITY pursuant to Code Section 2-1292(d) involving no increase to the Total Contract Price and changes in the value of the changes, or changes in the terms of amounts of compensation under the Total Contract Price; and

37.2.4 Change Documents to the Contract involving no increase to the Total Contract Price, changes in the value of the Charges or changes in the terms or amounts of compensation under the Total Contract Price executed between CITY and CONTRACTOR pursuant to Code Section 2-1292(d).

37.3 CITY may propose a change in the Contract or other aspects of this Contract by delivering written notice to CONTRACTOR describing the requested change ("Change Request"). Within ten (10) days of receipt of CITY's Change Request, CONTRACTOR shall evaluate it and submit a written response ("Proposed Change Document"). A Change Request which involves the reduction of Services shall be effective upon written notice to Contractor.

37.4 CONTRACTOR may, without receiving any Change Request, on its own submit a Proposed Change Document describing its own proposed requested change to the Contract.

37.5 Each Proposed Change Document shall include the applicable schedule for implementing the proposed change, any applicable changes to the Charges (either increased or decreased) and all other information applicable to the proposed change. Each Proposed Change Document shall constitute an offer by CONTRACTOR and shall be irrevocable for a period of sixty (60) days. CITY shall review and may provide CONTRACTOR with comments regarding a Proposed Change Document, and CONTRACTOR shall respond to such comments, if any. A Proposed Change Document from CONTRACTOR will become effective only when executed by an authorized representative of CITY.

37.6 CITY may propose any changes to the Contract, including, but not limited to, changes that it contends do not involve an increase to the Maximum Payment Amount, and CONTRACTOR shall, in good faith evaluate such proposed Change Request. If CITY and CONTRACTOR are able to reach agreement on such Change Request, each will execute a Change Document concerning such Change Request pursuant to Code Section 2-1292(d). Nothing in this Contract shall, in the event of disagreement between CITY and CNTRACTOR concerning a proposed Change Request, or otherwise, prohibit CITY from issuing a Unilateral Change Document to CONTRACTOR, pursuant to Code Section 2-1292(d), and CITY and CONTRACTOR agree to resolve their dispute pursuant to the Dispute Resolution Procedures set forth in the "DISPUTES" Clause. During the pendency of such Dispute, CONTRACTOR shall continue to perform the Services, as changed by such Unilateral Change Document.

37.7 Submittals Substantiating Adjustments.

37.7.1 CONTRACTOR shall supply certified pricing within thirty (30) days after providing written notice of intent to claim time or money. CONTRACTOR's pricing shall remain firm for a period of not less than sixty (60) days after delivery of the certified pricing. Any delay in the submission of all necessary supporting documentation or the determination of pricing will not justify or constitute a basis for an increase in the Total Contract Price, Purchase Order Amount, or Contract Completion.

37.7.2 CONTRACTOR shall certify in writing that the amounts included in the Proposed Change Document cover will direct, supplemental, indirect, consequential, serial, and cumulative costs and requested time extension, as applicable, and that those costs and the additional time would be or were necessarily incurred, despite the CONTRACTOR's reasonable and diligent efforts to mitigate them.

37.7.3 No submittal for an adjustment in the Total Contract Price, Purchase Order Amount, or Contract Completion shall be valid unless submitted in accordance with this Clause.

37.7.4 For each submittal, CONTRACTOR shall execute a certificate of current costs or pricing data. The certificate shall contain the wording in Clause:

37.7.4.1 This certificate shall be supplied at the time CONTRACTOR submits pricing information for any and all Proposed Change Documents.

37.7.4.2 The certificate of current costs or pricing data shall contain the following statement: "This is to certify that, to the best of my knowledge and belief, the costs or pricing data submitted, either actually or by specific identification in writing, to ENGINEER or any of his authorized representatives, in support of [identify the request for price adjustment, giving the appropriate reference any date] are accurate, complete and current as of [insert the day, month, and year when submittal was provided to ENGINEER].

CONTRACTOR: [type name]
By: [type name]
Title:
Date of Execution: [insert the day, month, and year of signing, which should be the same date as when the pricing information is submitted],

37.7.4.3 If any price, including profit or fee, negotiated under this Clause, or any cost reimbursement under this Contract was increased by any amount because CONTRACTOR furnished costs or pricing data that were not complete, accurate, and current as certified in its certificate of current costs or pricing data, the price or costs shall be reduced accordingly, and this Contract shall be

modified to reflect the deduction. CONTRACTOR is also placed on notice that, to the extent any submittal is determined to be a false claim based on any state or federal law, CONTRACTOR will be liable to the CITY for all remedies permitted by applicable statutes.

37.8 Failure to Agree. Failure by ENGINEER and CONTRACTOR to agree on any adjustment pursuant to this Clause shall be considered a Dispute, subject to the procession under the "DISPUTES" Clause of the Contract.

37.9 Emergency Cases. In addition to the CITY's ability to initiate changes through a Change Notice, in the event of an emergency that poses imminent threat to life or property, ENGINEER may use oral orders to CONTRACTOR for any work required by reason of such emergency. CONTRACTOR shall commence and complete such emergency work as directed by ENGINEER. Such orders will be confirmed by an appropriate Change Document. Any Change Document resulting from an emergency will be processed pursuant to this Clause.

37.10 Other Modifications. All other modifications to this Contract shall be by written amendment signed by both parties.

GC-38 PRICING OF ADJUSTMENTS

38.1 Pricing Methods. When costs are a factor in any determination of a Contract adjustment pursuant to the Clause titled "CHANGE DOCUMENTS", CONTRACTOR shall propose upward or downward price adjustments in one of the following methods as directed by ENGINEER:

38.1.1 Using Unit Prices from this Contract;

38.1.2 Estimating new Unit Prices where appropriate, subject to negotiation;

38.1.3 Estimating a lump sum price for the change, subject to negotiation; or

38.1.4 Establishing separate cost accounting records, subject to daily end-of-the-day written approval by ENGINEER of all allocable costs, on a Force Account basis. Reimbursement of reasonable and approved incurred costs, plus specified rates for overhead and profit, as defined below, shall be the basis for Force Account adjustment of the Contract price.

38.2 Cost Breakdown Information. When CONTRACTOR is directed to propose price adjustments pursuant to 38.1.2 or 38.1.3 above, it shall provide cost breakdown information for the purpose of, and in sufficient detail to permit, analysis and negotiation including but not limited to, labor categories, job hours and rates, equipment and material quantities, sources and calculations, overhead costs and allocations, profit computations Subcontractor quotes, and reference data upon which estimates are based.

38.3 Markup's.

38.3.1 If the pricing method is in accordance with 38.1.1 above, CONTRACTOR is not authorized any additional markup's as the Contract Unit Prices are considered fully burdened;

38.3.2 For work priced pursuant to 38.1.2 or 38.1.3 above, the additional markup shall be negotiated with the CONTRACTOR based on the complexity and type of work required; however, markup's on "Direct Labor" costs shall not exceed fifteen percent (15%) if the pricing adjustment is valued at less than Twenty Five Thousand ($25,000.00) Dollars; or will pay no more than Ten Percent (10%) markup on "Direct Labor" if the price adjustment is valued at greater than Twenty Five Thousand One ($25,001.00) Dollars.

38.3.3 If, for any reason, ENGINEER and CONTRACTOR are unable to agree upon a new unit rate or lump sum Contract price adjustment provisions 38.4 through 38.8 establish and define allowable costs and rates for Force account work pursuant to 38.1.4 above.

38.4 Direct Labor. Incurred direct labor wages for technical, craft, and manual labor for all classifications through lead ENGINEER, foreman or equivalent are allowable for the period of performance of the change. General supervision and management above lead ENGINEER, foreman or equivalent and indirect labor, e.g. surveyors, office personnel, timekeepers and maintenance personnel, are not allowable as direct costs but are recovered in the overhead and profit rates established by this Clause. Payroll additives are allowable and include taxes, insurance premiums, paid absences, and social and retirement benefits required by law, labor agreements, published company policies applying uniformly to CONTRACTOR's work force or which are normal and customary. CITY shall have access to CONTRACTOR's certified payroll records for verification of labor costs.

38.5 Equipment. Approved incurred construction equipment, facilities and vehicle net rental costs plus five percent (5%) for CONTRACTOR overhead and profit are allowable, except tools and equipment having original purchase prices of less than Five Hundred Dollars ($500.00) each, which are deemed to be covered in the overhead and profit rates established by this clause. If operating costs are not included in rental rates, they are also allowable.

38.5.1 Equipment Charges. Reasonable equipment charges for approved CONTRACTOR- owned construction equipment having original purchase prices of more than Five Hundred Dollars ($500.00) each shall also be allowed provided such charges are:

38.5.1.1 Agreed upon Contract unit rates; or

38.5.1.2 Based upon calculated values allocating ownership costs over the useful life of the equipment plus operating costs such as fuel, oil, lubricants, and maintenance, and a profit of ten percent (10%) on such costs; or

38.5.1.3 Not greater than seventy percent (70%) of Data Quest Blue Book daily rental rates applicable for the period of performance of the change; and

38.5.1.4 Appropriately discounted to stand-by rates for idle time reasonably required.

38.5.2 Limited Equipment Charges. When the operated use of equipment is infrequent and, as determined by ENGINEER, such equipment need not remain at the Work site continuously, charges shall be limited to actual hours of use. Equipment not operating but retained at the location of changes at ENGINEER's direction shall be charged at the standby rate.

38.5.3 Need for Equipment. For the cost of both rented and owned equipment to be allowable, ENGINEER must agree in writing, prior to their being used, that the individual pieces of equipment are needed, are appropriate for the Work, and that the mobilization and demobilization costs are allocable to the change and acceptable. This is in addition to the daily end-of-day approval of operating time for such equipment.

38.6 Materials. Approved incurred costs for material incorporated into the changed Work or required for temporary construction facilities made necessary by the change shall be allowable at net cost delivered to the Jobsite plus five percent (5%) overhead and profit for CONTRACTOR.

38.7 Subcontracts. Approved incurred costs for subcontracted tasks shall be allowable plus five percent (5%) overhead and profit for CONTRACTOR; provided that ENGINEER has approved the subcontract pursuant to the Clause on Titled "ASSIGNMENTS AND SUBCONTRACTS" before any work is performed.

38.8 Overhead, Project, and all other Costs. In addition to the overhead and profit provided in 38.4 through 38.7 above, CITY may also pay an additional markup on direct labor which will be deemed to be full consideration for all overhead, interest and profit, for all additional costs e.g. supervision and tools, and for all impacts of the change on all elements of the Work whether or not changed. The additional markup shall be equal to fifteen percent (15%) of total direct labor as described in 39.4 above for changes resulting in a Contract price adjustment, excluding this percentage markup, of less than Twenty Five Thousand ($25,000.00) Dollars; or will pay ten percent (10%) for changes resulting in adjustments of Twenty Five Thousand One ($25,001.00) Dollars or more.

GC-39 EXCUSABLE DELAYS

39.1 Force Majeure. Force Majeure shall mean:

39.1.1 Strikes, labor disputes, work stoppages, or picketing (legal or illegal);

39.1.2 Adverse weather conditions not reasonably foreseeable or unusually severe weather;

39.1.3 Acts of God, including, without limitation, floods, hurricanes, tornadoes, high winds, sinkholes, landslides, earthquakes, epidemics, quarantine and pestilence;

39.1.4 Fires or other casualties;

39.1.5 Freight embargoes;

39.1.6 Governmental actions, restrictions or moratoria;

39.1.7 Acts of a public enemy, civil commotion, riots, insurrections, acts of war, blockades, terrorism, effects of nuclear radiation or national or international calamities;

39.1.8 Sabotage or vandalism;

39.1.9 Condemnation or other exercise of the power of eminent domain

39.1.10 The passage or enactment of, or the interpretation of, any governmental requirement, and the orders of any governmental authority having jurisdiction over CONTRACTOR or the Work;

39.1.11 Delays in any approval process of any governmental authority to the extent such delays are not due to any fault, negligence, or lack of diligence of CONTRACTOR or its agents, employees, contractors, subcontractors, or consultants;

39.1.12 Actions of CITY (and its agents, employees or other representatives) not permitted by the Contract or by law;

39.1.13 Inconvenience, delays, inefficiencies or loss experienced by CONTRACTOR caused by the presence and operations of other CITY CONTRACTORS working within the limits of the Project; and

39.1.14 Restraint or other act by court or public authority to the extent such delays are not due to any fault, negligence, or lack of diligence of CONTRACTOR or its agents, employees, contractors, subcontractors, or consultants.

39.2 Force Majeure shall in any event exclude:

39.2.1 Lack of sufficient funds or any other financial difficulty of CONTRACTOR, and

39.2.2 Adverse weather

39.2.2.1 Occurring during non-work periods or on any day which is not a business day, unless CONTRACTOR can demonstrate that said weather impeded the Work the following day; or

39.2.2.2 Which shall not result in a direct and actual delay in CONTRACTOR's performance of Work at the time of such inclement weather.

39.3 Extensions for Force Majeure. If CONTRACTOR is delayed at any time in the commencement or progress of the Work by reason of Force Majeure or by other causes which CITY in its discretion may determine justifies an extension of the time for substantial completion or final completion, then the time for substantial completion or final completion shall be extended by Change Order for such reasonable time as CITY may determine that the Project's completion, or the achievement of any Contract milestones, is delayed by the Force Majeure, but only:

39.3.1 If and to the extent such event or circumstance is beyond the reasonable control of CONTRACTOR;

39.3.2 If and to the extent CONTRACTOR shall have taken all reasonable precautions to prevent delays by reason of such event or circumstance if such event or circumstance was actually shown in advance to CONTRACTOR,

39.3.3 If and to the extent such event or circumstance is not caused by CONTRACTOR's or CONTRACTOR's agents', materialmens', Subcontractor's, or employees' fault or negligence,

39.3.4 If and to the extent CONTRACTOR shall have taken all reasonable precautions to mitigate the delays owing to such event or circumstance,

39.3.5 If and to the extent that such event caused a delay to activities on the critical path of the Contract schedule, and

39.3.6 If CONTRACTOR strictly complied with the requirements of GC-39.3

39.4 Notice of Force Majeure. If CONTRACTOR is prevented or delayed by reason of Force Majeure, CONTRACTOR shall, within twenty-four (24) hours after the commencement of the Force Majeure, provide to ENGINEER written notice of the Force Majeure and shall, within seven (7) days after the Force Majeure event has ended, provide to ENGINEER a written description of the impact caused on the performance of the Work by the Force Majeure. The description of the impact for weather related Force Majeure events shall include U.S. Weather Bureau Climatological Reports for the months involved plus a report indicating the average precipitation, temperature, or other relevant impacting weather event for the past ten years from the nearest reporting station. The ten-year average will determine the number of adverse weather days that CONTRACTOR should normally expect to encounter.

39.5 Sole Remedy for Force Majeure. For delays in the construction of the Project caused by reason of Force Majeure, an extension in the time for Contract completion shall be CONTRACTOR's sole and exclusive remedy for any such delay. In no event shall CONTRACTOR be entitled to any increase in the Total Contract Price or any other additional compensation for costs resulting by reason of Force Majeure.

GC-40 COMPLETION AND ACCEPTANCE

40.1 Notice of Completion. When CONTRACTOR considers the Work or any independent portion of the Work under this Contract, to be complete and ready for acceptance, or when ENGINEER notifies CONTRACTOR in writing that some portion of the work is ready for Beneficial Occupancy, CONTRACTOR shall notify ENGINEER in writing that such Work is materially complete and ready for inspection. ENGINEER or his designated representatives, with CONTRACTOR's cooperation, will conduct such reviews, inspections and tests as may be reasonably required to satisfy ENGINEER that the Work, or identified portion of the Work, conforms to all requirements of this Contract. If all, or any part, of the Work covered by CONTRACTOR's notice does not confirm to Contract requirements, ENGINEER shall notify CONTRACTOR of such nonconformance and CONTRACTOR shall take corrective action in accordance with the Clause titled "WARRANTY" and shall have the nonconforming work re-inspected until all Contract requirements are satisfied."

40.2 Notice of Substantial Completion. The ENGINEER will issue a Certificate of Substantial Completion if the Work is deemed to be substantially complete. The CONTRACTOR will ascertain when the Work, or designated portions thereof, is ready for the ENGINEER's Substantial Completion inspection. CONTRACTOR will provide required regulatory or permit authority acceptance documentation for the ENGINEER's review at inspection.

40.3 Notice of Final Acceptance. ENGINEER shall issue a written Notice of Final Acceptance of the Work as a whole when satisfactorily inspected. ENGINEER's written Notice of Final Acceptance of the Work as a whole under this Contract shall be conclusive except with regard to latent defects, fraud, or such gross mistakes as amount to fraud, or with regard to CITY's rights under the Clause titled "WARRANTY".

GC-41 WARRANTY AND COMPONENT WARRANTIES

41.1 Warranty Standards. CONTRACTOR warrants to CITY that equipment and materials furnished under this Contract shall be new, or clear title and of the most suitable grade of their respective kinds for their intended uses, unless otherwise specified. All workmanship shall be first-class and performed in accordance with sound construction practices acceptable to ENGINEER. All equipment, materials, and workmanship shall conform to the requirements of the Contract documents.

41.2 Warranty Period. CONTRACTOR warrants all equipment and material it furnishes, and all work it performs against defects in CONTRACTOR's design/build, equipment, materials, or workmanship for a period from commencement of work to a date twenty-four (24) months after Beneficial Occupancy provided that all of requirements of this section have been met, unless more stringent requirements are otherwise specified elsewhere in the Contract documents. CONTRACTOR shall provide an additional thirty-six (36) month warranty on all chillers, pumps, starters, compressors, ventilation systems, fire detection systems, fire suppression equipment, emergency power, and communication equipment. A minimum of one (1) year labor warranty is required for all equipment/system replacement and repairs.

41.3 Warranty Guidelines.

41.3.1 Warranty should include manufacturers' and CONTRACTOR's name, telephone, contact, address, start, and end date of warranty.

41.3.2 All sections shall be tabbed and labeled.

41.3.3 A minimum of five (5) hard and two (2) electronic copies shall be furnished.

41.4 Discovery of Defects. If, at any time during the warranty period, the CITY or CONTRACTOR discovers any defect in the design/build, equipment, materials, or workmanship, immediate notice shall be given to the other parties. CONTRACTOR shall, within a reasonable time, propose corrective actions to cure such defects to meet the requirements of this Contract.

41.5 Remedies for Defects. ENGINEER, at his sole discretion, may direct CONTRACTOR in writing and CONTRACTOR agrees to:

41.5.1 Rework, repair or remove and replace defective equipment and materials or re-perform defective workmanship to acceptable quality at a time and in a manner acceptable to ENGINEER;

41.5.2 Cooperate with others assigned by ENGINEER to correct such defects and pay to ENGINEER al actual costs reasonably incurred by ENGINEER in performing or in having performed corrective actions; or

41.5.3 Propose and negotiate in good faith an equitable reduction in the Contract price in lieu of corrective action. This clause is applicable only for discovery of defects prior to the acceptance of the Project.

41.6 Incidental Cost. All costs incidental to corrective actions including demotion for access, removal, disassembly, transportation, reinstallation, reconstruction, retesting, and re-inspection as may be necessary to correct the defect and to demonstrate that the previously defective work conforms to the requirements of this Contract shall be borne by CONTRACTOR.

41.7 Extended Warranty. CONTRACTOR further warrants any and all corrective actions it performs against defects in design/build, equipment, materials, and workmanship for an additional warranty period of twelve (12) months as an extension to the original specified warranty period following acceptance by ENGINEER of the corrected work.

41.8 Operations and Maintenance (O&M) Data/Manuals. Prior to the commissioning of any equipment or section of the work, submit five (5) hard and two (2) electronic copies of operation and maintenance data/manuals that are specifically applicable to this Contract and a complete and concise description of the provided equipment or product. Data containing extraneous information to be sorted through to find applicable instructions will not be accepted. Present information in sufficient detail to clearly explain O & M requirements of the system, equipment, component, and subassembly level. Include an index preceding each submittal.

Information Required in O & M Data/Manuals, as applicable:

1) Environmental Conditions Operating Instructions
2) Safety Precautions
3) Operator Pre-start
4) Startup, Shutdown, and Post Shutdown Procedures
5) Normal Operations
6) Emergency Operations
7) Operator Service Requirements
8) Installation Details
9) Preventive Maintenance Instructions, Plans, and Schedule
10) Lubrication Data
11) Corrective Maintenance Instructions
12) Troubleshooting Guides and Diagnostic Techniques
13) Wiring Diagrams and Control Diagrams Including Sequence of Operations
14) Maintenance and Repair Procedures
15) Removal and Replacement Instructions
16) Spare Parts and Supply Lists Including Cost
17) Parts Identification
18) Personnel Training Requirements
19) Testing Equipment and Special Tool Information

41.9 Binding and Delivery. The manuals shall be bound or otherwise securely enclosed in oil and moisture resistant binders and sections shall be tabbed. Each binder cover shall indicate bold type, the manufacturer's name, Contract number, model number, and serial number of the unit or equipment. Five (5) hard and two (2) electronic copies of the manuals shall be delivered with the shop drawings and must be approved with the shop drawings. Also included, shall be CONTRACTOR's name, address, telephone number and contact.

41.9 Training. Include in the applicable specification sections the following requirements:

41.9.1 The CONTRACTOR shall include in the base Contract, all costs required to train the OWNER's operation and maintenance personnel in the use and maintenance of the specific systems.

41.9.2 Training sessions shall be conducted by instructors certified or approved in writing by the manufacturer of the specific system or equipment.

41.9.3 Sessions shall be conducted for not less than four-hour periods during normal working hours, i.e., Monday through Friday, 8:00 a.m. to 5:00 p.m. Training session schedules shall inform to the requirements of the OWNER; therefore, such schedules shall be submitted to the OWNER for approval not less than two weeks prior to the training session. Training sessions for different systems shall not be scheduled concurrently. All training sessions shall be digitally videotaped – two copies shall be delivered to the OWNER> At the OWNER's discretion, provisions shall be made to allow up to six (6) OWNER's personnel to participate in final system check of all systems.

41.9.4 All Operations and Maintenance Manuals shall be approved and issued prior to training.

41.9.5 All training shall be completed prior to final acceptance of equipment, systems, etc.

GC-42 DISPUTES

42.1 Claims, Counterclaims, Disputes:

42.1.1 All claims, counterclaims, disputes, and any other matters in question arising under, or relating to, the Contract Documents, or the breach thereof, shall be processed in accordance with the provisions of this Clause and are subject to audit by the CITY.

42.1.2 A "Claim" means a written demand or assertion by the CONTRACTOR seeking an adjustment in the Contract Price and payment of monies so due, an extension or shortening in Contract Completion, the adjustment or interpretation of Contract terms, or other relief arising under or relating to the Contract following denial of a submittal for Change Notice Request under "CHANGE DOCUMENTS". A written demand or assertion by the CONTRACTOR seeking the payment of money or an extension of time is not a Claim under this Clause until certified as required below. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a Claim under this Clause.

42.1.3 A Claim arising under the Contract, unlike a Claim relating to the Contract, is a Claim that can be resolved under a Contract provision that provides for, or excludes, the relief sought by the Claimant. A Claim arising under the Contract shall be resolved under the applicable provisions of the Contract. A Claim relating to the Contract must meet all requirements of this provision and any request for an increase in the Contract Price or an extension to the time for Contract Completion shall be calculated pursuant to and limited by the provisions of this Contract.

42.1.4 CONTRACTOR shall not be entitled to any damages or an adjustment in the Contract Price, and neither CITY nor its designated representatives shall be liable to CONTRACTOR or its Subcontractors in tort (including negligence) or Contract, except as specifically provided in this Contract.

42.2 When Notice and Claim Submittal Become Due:

42.2.1 For any Claim under this Clause to be valid, it shall be based upon written notice delivered by the CONTRACTOR to the ENGINEER promptly, but in no event later than seven (7) days, after the occurrence of the event giving rise to the Claim and stating the general nature of the Claim. The Claim submittal with all supporting cost data and CPM schedule analysis shall be delivered by the CONTRACTOR to the ENGINEER within sixty (60) days after that occurrence (unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the Claim). The responsibility to substantiate a Claim shall rest with the party making the Claim.

42.2.2 A Claim by the CONTRACTOR shall be made in writing and submitted to the ENGINEER within the timeframe required by GC 42.2.1 for a written decision.

42.3 Requirements for contractor Claims:

42.3.1 For all CONTRACTOR Claims seeking an increase in the Contract Price or time for Contract Completion, the CONTRACTOR shall submit with the Claim an affidavit certifying that:

42.3.1.1 The Claim is made in good faith, and the amount claimed accurately reflects the adjustments in the Contract Price or time for Contract Completion for which the CONTRACTOR can prove the CITY is liable, and covers all direct, supplemental, indirect, consequential, serial, and cumulative costs and delays to which the CONTRACTOR is entitled as a result of the occurrence of the claimed event;

42.3.1.2 Supporting cost and pricing data are current, accurate, complete, and represent the best of the CONTRACTOR's knowledge and belief; and

42.3.1.3 If the CONTRACTOR is an individual, the affidavit shall be executed by that individual; if the CONTRACTOR is not an individual, the affidavit shall be executed by a senior company official in charge at the CONTRACTOR's plant or location involved, or a responsible officer or general partner of the CONTRACTOR.

42.3.2 The attention of the CONTRACTOR is drawn to state and federal laws regarding penalties for false claims. The CITY will prosecute the CONTRACTOR to the fullest extent of the law for the submission of a false, fictitious, or unsubstantiated Claim.

42.3.3 A Claim for an adjustment of the time for Contract Completion shall be supported by an analysis of the Progress Schedule detailing the impact of the event giving rise to the Claim.

42.3.4 Any costs or expenses for consultants, experts, or legal representation that the CONTRACTOR elects to engage to investigate, prepare, and substantiate any claim related to any dispute shall be born solely by the CONTRACTOR.

42.4 Determination on a Claim. For CONTRACTOR-certified claims of $50,000.00 or less, the ENGINEER will, if requested in writing by the CONTRACTOR, render a determination within sixty (60) days of the request. For CONTRACTOR-certified claims over $50,000.00, the ENGINEER will, within sixty (60) days tender a determination of the Claim or notify the CONTRACTOR of the date by which the determination will be made. If CONTRACTOR and ENGINEER cannot resolve any claim or dispute, CONTRACTOR agrees to participate in good faith in non-binding Mediation if requested by the ENGINEER. The cost of Mediation will be split equally between CONTRACTOR and ENGINEER. If a resolution cannot be reached through mediation, the

CONTRACTOR's sole appeal of the ENGINEER's Final Determination is to institute legal action in Fulton Superior Court within sixty (60) days after Final Completion of the Work.

42.5 Dispute Defined.

42.5.1 Any Claim that is denied by the ENGINEER shall be considered a Dispute within the meaning of this Clause.

42.5.2 Pending final resolution of any Claim or Dispute, including litigation, the CONTRACTOR shall proceed diligently with performance of the Work, and comply with any decision of the CITY or the ENGINEER.

42.5.3 In the event the CITY is a prevailing party in any litigation brought under, or to enforce the provisions of this Contract, CONTRACTOR shall pay to CITY all its costs, expenses and fees associated with the litigation and the preparation thereof, including, but not limited to, reasonable attorneys' fees, expert witness fees, and all expenses incurred. CONTRACTOR shall pay CITY's reasonable attorneys' fees and other costs whether the services are performed by CITY's employees or independent counsel.

42.6 Failure to Provide Notice is a Waiver. The CITY must receive notice in strict compliance with the Contract of all Claims and Disputes in order to investigate such Claims and Disputes and to make decisions that will eliminate or minimize any additional costs or delays to the Work, the Project or to the CITY's overall expansion program. CONTRACTOR acknowledges that it has no right in law or equity to seek any increase to the Contract Price or an extension to the time for Contract Completion or any milestone(s), unless CONTRACTOR strictly complies with all requirements of this Clause. Failure by CONTRACTOR to meet all of the requirements of this Clause shall be deemed an intentional waiver by CONTRACTOR of any right to file a lawsuit seeking redress of any type. Compliance with all the requirements of this Clause is a strict condition precedent to CONTRACTOR having the right to file a lawsuit seeking redress of any type. The CITY is entitled to have any lawsuit dismissed with prejudice by showing that CONTRACTOR did not strictly comply with all of the requirements of this Clause.

42.7 Venue. CONTRACTOR acknowledges and agrees that the exclusive jurisdiction and venue for any legal action or proceeding, at law or in equity, arising out of or relating to this Contract shall be the Superior Court for Fulton County, Georgia. CONTRACTOR waives all objections it may have as to venue in the Fulton County Superior Court. CONTRACTOR also consents to the Fulton County Superior Court's jurisdiction for any such action or proceeding, regardless of CONTRACTOR's residence or domicile.

GC-43 MUTUAL WAIVER OF CONSEQUENTIAL DAMAGES

43.1 CONTRACTOR and OWNER expressly waive claims against each other for consequential damages arising out of, or relating to, this Contract. This mutual waiver includes:

43.1.1 Damages incurred by the OWNER for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity, or of the services of such persons; and

42.1.2 Damages incurred by the CONTRACTOR for principal office expenses including the compensation of the personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work. This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination. Provided, however, nothing in this Contract shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract documents.

GC-44 RECORDS AND AUDITS

CONTRACTOR shall maintain records and accounts in connection with the performance of this Contract that will accurately document incurred costs, both direct and indirect, including, but not limited to, labor hours and costs, equipment hours and costs, Subcontractor costs, material costs, and other costs of whatever nature, by cost code, including budgeted amounts, for a period of three (3) years from the expiration of CONTRACTOR's Contract unless otherwise specified by applicable law. As used in this agreement, "records" includes books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form.

CITY, or its designated representatives, shall have the right to examine and copy all such records, including weekly and monthly summary reports of the entire project, labor cost reports, and equipment cost reports, at all reasonable times, with advance notification. CONTRACTOR may also be required to provide an electronic "data dump" of each transaction posted to each cost code, labor hours and costs, and equipment hours and costs, and other transactions. Such data shall be in the format of an electronic spreadsheet or database, and not in "PDF" or other image formats.

44.1 City of Atlanta (COA) Audit. As used in this agreement, "records" includes book, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form.

44.2 Whenever the OWNER enters into any type of contractual arrangement including, but not limited to, lump sum contracts (i.e. fixed priced or stipulated sum contracts), unit price, cost plus or time and material contracts with or without a guaranteed maximum (or not-to-exceed amounts), CONTRACTOR's and Subcontractors' "records" shall, upon reasonable notice, be open to inspection and subject to audit and/or reproduction during normal business working hours. Such audits may be performed by an OWNER's representative or an outside representative engaged by OWNER. The OWNER, or its designee, may conduct such audits or inspections throughout the term of this contract and for a period of three years after final payment or longer if required by law. OWNER's representatives may (without limitation) conduct verifications such as counting employees at the Construction Site, witnessing the distribution of payroll, verifying information and amounts through interviews and written confirmations with CONTRACTOR employees, field and agency labor, Subcontractors, and vendors.

44.3 CONTRACTOR's "records", as referred to in this contract, shall include any and all information, materials, and data of every kind and character, including without limitation,

records, books, papers, documents, subscriptions, recordings, agreements, purchase orders, leases, contracts, commitments, arrangements, notes, daily diaries, superintendent reports, drawings receipts, vouchers and memoranda, and any and all other agreements, sources of information and matters that may in OWNER's judgment have any bearing on, or pertain to, any matters, rights, duties or obligations under or covered by any Contract Document. Such records shall include (hard copy, as well as computer readable data if it can be made available), written policies and procedures; time sheets; payroll registers; payroll records; cancelled payroll checks; subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, negotiation notes, etc.); original bid estimates; estimating work sheets; correspondence; change order files (including documentation covering negotiated settlements); backcharge logs and supporting documentation; invoices and related payments documentation; general ledger, information detailing cash and trade discounts earned, insurance rebates and dividends; and any other CONTRACTOR records which may have a bearing on matters of interest to the OWNER in conjunction with the CONTRACTOR's dealings with the OWNER (all foregoing hereinafter referred to as "records") to the extent necessary to adequately permit evaluation and verification of any or all of the following:

44.3.1 Compliance with contract requirements for deliverables

44.3.2 Compliance with approved plans and specifications

44.3.3 Compliance with OWNER's business ethics expectations

44.3.4 Compliance with Contract provisions regarding the pricing of change orders

44.3.5 Accuracy of CONTRACTOR representations regarding the pricing of invoices

44.3.6 Accuracy of CONTRACTOR representations related to claims submitted by the CONTRACTOR or any of his payees.

44.4 CONTRACTOR shall require all payees (examples of payees include Subcontractors, material suppliers, insurance carriers, etc.) to comply with the provisions of this article by including the requirements hereof in a written contract agreement between CONTRACTOR and payee. CONTRACTOR will ensure that all payees (including those entering into lump sum contracts) have the same right to audit provisions contained in this contract.

44.5 OWNER's authorized preventative or designee shall have reasonable access to the C ONTRACTOR's facilities, shall be allowed to interview all current or former employee's to discuss matters pertinent to the performance of this Contract and shall be provided adequate and appropriate work space in order to conduct audits in compliance with this article.

44.6 If an audit, inspection, or examination, in accordance with this article, discloses overpricing or overcharges, of any nature, by the CONTRACTOR to the OWNER in excess of one percent (1%) of the total Contract billed to date, in addition to making adjustments for the overcharges, all reasonable cost of the OWNER's audit shall be reimbursed to the OWNER by the CONTRACTOR. Any adjustments and/or payments, which must be made as a result of any such audit or inspection of the CONTRACTOR's invoices and/or records, shall be made within a

reasonable amount of time, not to exceed 90 days, from presentation of OWNER's findings to CONTRACTOR.

GC-45 INDEMNITY

45.1 Hold Harmless Agreement. In addition to its agreement to obtain and maintain the insurance as set forth herein, CONTRACTOR shall defend, indemnify and hold harmless the CITY, its officers, agents and employees, from and against any and all suits, actions, legal, or administrative proceedings, claims, damages, demands, liabilities, interest, attorney's fees, costs, and expenses of whatsoever kind or nature, including without limitation, those arising out of injury to, or death of, CONTRACTOR's employees, officers, agents or any subconsultant/Subcontractors' officers, agents or employees, whether arising before or after the completion of work, which allegedly arises out of any act or omission of the CONTRACTOR or any subconsultant/Subcontractor employed by the CONTRACTOR or any of the CONTRACTORS' and/or subconsultants'/Subcontractors' officers, agents or employees, whether active or passive. This defense, indemnification, and hold harmless agreement shall also apply to any and all claims which result from any condition created or maintained by the CONTRACTOR or any Subcontractor employed by CONTRACTOR, or any of the CONTRACTORS' and/or Subcontractors' officers, agents or employees, of which condition was not specified to be created or maintained by this Contract. The CONTRATOR further agrees that its agreement to defend, indemnify and hold harmless the CITY, its officers, agents and employees shall not be limited to the limits of the liability insurance under this Contract and the attached specifications. However, CONTRACTOR shall not be required to indemnify the CITY, its officers, agents, and employees for any claims resulting from the sole negligence or willful misconduct of the CITY, or any other party released, indemnified, or held harmless pursuant to this Contract. This paragraph shall survive any termination or expiration of this Contract.

45.2 Negligence and Waiver. CONTRACTOR's aforesaid release, indemnity and hold harmless obligations, or portions or applications thereof, shall apply even in the event of the fault or negligence, whether active or passive, or strict liability of the parties released, indemnified or held harmless to the fullest extent permitted by law, but in no event shall they apply to liability caused by the willful misconduct or sole negligence of the party released, indemnity by an industrial insurance or workers' compensation statute. CONTRACTOR further agrees that this Contract to indemnify and hold harmless the parties released shall not be limited to the limits or terms of the liability insurance, if any required under this Contract and/or otherwise maintained by the CONTRATOR. This indemnity provision shall survive any termination or expiration of this Contract.

GC-46 PATENT AND INTELLECTUAL PROPERTY INDEMNITY

46.1 Indemnification and Substitution. CONTRACTOR hereby indemnifies and shall defend and hold harmless CITY, and its officers, agents, employees and its authorized representatives from and against any and all claims, actions, losses, damages, and expenses, including attorneys' fees, arising from any claim, whether rightful or otherwise, that any concept, product, design, equipment, material, process, copyrighted material or confidential information, or any part thereof, furnished by CONTRACTOR under this Contract constitutes an infringement of any patent or copyrighted material or a theft of trade secrets. If use of any part of such conept, product, design, equipment, material, process, copyrighted material or confidential information

is limited or prohibited, CONTRACTOR shall, at its sole expense, procure the necessary licenses to use the infringing or a modified but non-infringing concept, product, design, equipment, material, process, copyrighted material or confidential information or, with CITY's prior written approval, replace it with substantially equal but non-infringing concepts, products, designs, equipment, materials, processes, copyrighted material or confidential information; provided however,

46.1.1 That any such substituted or modified concepts, products, designs, equipment, material, processes, copyrighted material or confidential information shall meet all the requirements and be subject to all the provisions of this Contract; and

46.1.2 That such replacement or modification shall not modify or relieve CONTRACTOR of its obligations under this Contract.

46.2 Exclusion if Furnished. The foregoing obligation shall not apply to any concept, product, design, equipment, material, process, copyrighted material or confidential information the detailed design of which (excluding rating and/or performance specifications) has been furnished in writing by the CITY to CONTRACTOR.

GC-47 NON-WAIVER

Failure by CITY or its designated representatives to insist upon strict performance of any terms or conditions of this Contract; failure to delay to exercise any rights or remedies provided herein or by law; failure to properly notify CONTRACTOR in the event of breach; the acceptance of, or payment for, any goods or services hereunder; the review or failure to review designs shall not release CONTRACTOR from any of the warranties or obligations of this Contract and shall not be deemed a waiver of any right of CITY to insist upon strict performance hereof.

GC-48 ARCHAEOLOGICAL AND HISTORICAL FINDINGS

48.1 No Known Significance. To the best of the knowledge of CITY, the Jobsite is not within any property, district, or site, and does not contain any building, structure or object listed in the current National Register of Historic Places published by the United States Department of Interior.

48.2 Stop Work. Should the CONTRACTOR encounter, during its operations, any building, part of a building, structure, or object, which is incongruous with its surroundings, which might be considered to be of archaeological or historical interest, CONTRACTOR shall immediately cease operations in that location and notify the ENGINEER in writing. The ENGINEER will investigate and will direct the CONTRACTOR either to resume its operations or to suspend operations in accordance with the Clause titled "SUSPENSION OF WORK".

GC-49 EXPLOSIVES

49.1 Transport of Explosives. Explosives shall be transported to the Jobsite only when required to perform the Work under this Contract and with prior notice to, and written approval of, CITY. CONTRACTOR shall be responsible for properly purchasing, transporting, storing, safeguarding, handling and using explosives required to perform the Work under this Contract.

CONTRACTOR shall employ competent and qualified personnel for the use of explosives and, notwithstanding any other provision in this Contract to the contrary, shall assume full responsibilities for the cost of any incidental or consequential damages caused by the improper use of explosives. Residual surplus explosives shall be promptly removed from the Jobsite and properly disposed of by CONTRACTOR.

49.2 Notice of Detonation. CONTRACTOR shall notify ENGINEER in writing no less than forty-eight (48) hours in advance of each intended detonation of explosives. CONTRACTOR shall submit a comprehensive blasting plan for each intended use of explosives to ENGINEER for approval. The plan shall describe drilling plans and patterns, types and amounts of explosives, and methods. Safety and storage considerations shall also be included.

GC-50 DRUGS, ALCOHOL, AND WEAPONS

50.1 Policy. CONTRACTOR's personnel shall not bring onto the Jobsite, or any other location where the provisions of this Contract apply:

50.1.1 Any firearm of whatsoever nature, knife with a blade exceeding four (4) inches (100 millimeters) in length or any other object which in the sole judgment of ENGINEER is determined to be a potential weapon.

50.1.2 Alcoholic beverages of any nature.

50.1.3 Illegal or CITY prohibited non-prescription drugs of any nature without exception.

50.2 Violations. CONTRACTOR shall abide by and enforce the requirements of this Clause to include the immediate removal from the Work under this Contract, of any employee who has violated the requirements of this Clause or who ENGINEER, in his sole judgment, determines has violated the requirements of this Clause.

GC-51 ESCROW DOCUMENTS

51.1 Generally. The Escrow Bid Documents constitute all documents generated by CONTRACTOR (or its subcontractors, if applicable) in preparation of its Bid for this project. CONTRACTOR was required to submit one complete set of its Escrow Bid Documents to the CITY to be held in the CITY's secured vault located within the Department of Procurement ("escrow"). Such Escrow Bid Documents shall remain in escrow for the duration of the Contract. Nothing in the Escrow Bid Documents shall change or modify the terms or conditions of the Contract Documents.

If the CONTRACTOR subcontracts any part of the Work, the Escrow Bid Documents must include the documents of each subcontractor whose total subcontract price exceeds five percent (5%) or Five Hundred Thousand ($500,000) Dollars, whichever is less, of the total Contract price. Such documents must be filed in the same manner and at the same time as the CONTRACTOR's Escrow Bid Documents and shall remain in escrow for the duration of the Contract. CITY retains the right to require the CONTRACTOR to submit Escrow Bid Documents from any other subcontractor.

An Escrow Bid Documents Certificate ("Certificate") must accompany the Escrow Bid Documents at the time they are placed in escrow. The Certificate must be signed by an individual authorized by the CONTRACTOR to execute the bid proposal who must represent and warrant (1) that the material in the Escrow Bid Documents constitutes all the documents used in preparation of the Bid, (2) that he or she has personally examined the contents of the Escrow Bid Documents container, (3) that the documents in the container are accurate and complete, and (4) that no other Bid preparation information shall be considered in resolving disputes.

51.2 Format and Contents. CONTRACTOR may submit Escrow Bid Documents in their usual cost-estimating format. The Escrow Bid Documents shall be in English.

The Escrow Bid Documents must clearly itemize the estimated costs of performing the Work of each Bid item contained in the Bid schedule. Bid items should be separated into sub-items as required to present a complete and detailed cost estimate and allow a detailed cost review. The Escrow Bid Documents shall include all quantity takeoffs, crew, equipment, calculations of rates of production and progress, copies of quotations from subcontractors and suppliers, and memoranda, narratives, consultant's reports, add/deduct sheets, and all other information used by the CONTRACTOR to arrive at the prices contained in its Bid. Estimated costs should be broken down into the CONTRACTOR's usual estimate categories such as direct labor, repair labor, equipment operation, equipment ownership, expendable materials, permanent materials, and subcontract cost as appropriate. Plant and equipment and indirect costs should be detailed in the CONTRACTOR's usual format. The CONTRACTOR's allocation of plant and equipment, indirect costs, contingencies, markup and other items to each Bid item shall be included.
All costs shall be identified. For Bid items amounting to less than Ten Thousand ($10,000) Dollars, estimated unit costs are acceptable without a detailed cost estimate, provided that labor, equipment, materials, and subcontracts, as applicable, are included and provided that indirect costs, contingencies, and markup, as applicable, are allocated.

Bid Documents provided by the CITY should not be included in the Escrow Bid Documents unless needed to comply with the requirements of this specification.

51.3 Purpose. Escrow Bid Documents will be used to assist in the negotiation of price adjustments, change orders, settlement of disputes, claims and litigation against the CITY related to the Contract. They will not be used for pre-award evaluation of the CONTRACTOR's anticipated methods of construction or to assess the CONTRACTOR's qualifications for performing the Work.

51.4 Examination. The Escrow Bid Documents shall be examined by the CITY and the CONTRACTOR (or designated representative) at any time deemed necessary by the CITY or the CONTRACTOR, to assist in the negotiation of price adjustments and change orders, or the settlement of disputes, claims and litigation related to this Contract.

Examination of the Escrow Bid Documents is subject to the following conditions:

51.4.1 The Escrow Bid Documents are proprietary and confidential regarding any "trade secrets." (See Confidentiality and Georgia Open Records Act section below.)

51.4.2 The CITY and CONTRACTOR may each designate one or more representatives in writing which shall be provided to the other party at least ten (10) days prior to any scheduled examination. Such representatives may be authorized to examine the Escrow Bid Documents on behalf of their respective principal. No other person shall have access to the Escrow Bid Documents.

51.5 Ownership. The Escrow Bid Documents are and shall remain the property of the CONTRACTOR, subject only to joint review by the CITY and the CONTRACTOR, as provided herein.

51.6 Confidentiality and Georgia Open Records Act. The CITY acknowledges that the Escrow Bid Documents may contain information that the CONTRACTOR, or its Subcontractor(s), considers "trade secret," as that term is defined in O.C.G.A. § 10-1-761. Information provided to the City is subject to disclosure under the Georgia Open Records Act. Pursuant to O.C.G.A. § 50-18-72(a)(34), "[a]n entity submitting records containing trade secrets that wishes to keep such records confidential under this paragraph shall submit and attach to the records an affidavit affirmatively declaring that specific information in the records constitute trade secrets pursuant to Article 27 of Chapter 1 of Title 10 [O.C.G.A. § 10-1-760 et seq.]."

51.7 Final Disposition. The Escrow Bid Documents will be returned to the CONTRACTOR at such time as the Contract has been completed and final settlement has been achieved.

GC-52 MISCELLANEOUS

52.1 Severability. In the event that any provision of this Agreement is declared invalid, unenforceable or unlawful, such provisions shall be deemed omitted and shall not affect the validity of other provisions of this Agreement.

52.2 Further Assurances. Each Party shall provide such further documents or instruments required by the other Party as may be reasonably necessary to give effect to this Agreement.

52.3 No Drafting Presumption. No resumption of any Applicable Law relating to the interpretation of contracts against the drafter shall apply to this Agreement.

52.4 Survival. Any provision of this Agreement which contemplates performance subsequent to any termination or expiration of this Agreement or which must survive in order to give effect to its meaning, shall survive the expiration or termination of this Agreement.

52.5 Third Party Beneficiaries. This Agreement is not intended, expressly, or implicitly, to confer on any other Person any rights, benefits, remedies, obligations or liabilities.

52.6 Cumulative Remedies. Except as otherwise provided herein, all rights and remedies under this Agreement are cumulative and are in addition to, and not in lieu of, any other remedies available under Applicable Law, in equity or otherwise.

52.7 Entire Agreement. The Contract Documents contain the entire Agreement of the Parties relating to their subject matter and supersede all previous communications, representations or agreements, oral or written, between the Parties with respect to such subject matter. This

Agreement may only be amended or modified by a writing executed by each Party's authorized representative and each such writing shall be deemed to incorporate the Contract Documents, except to the extent that CITY is authorized under Applicable Law to issue Unilateral Change Documents. SERVICE PROVIDER MAY NOT UNILATERALLY AMEND OR MODIFY THIS AGREEMENT BY INCLUDING PROVISIONS IN ITS INVOICES, OR OTHER BUSINESS FORMS, WHICH SHALL BE DEEMED OBJECTED TO BY CITY AND OF NO FORCE OR EFFECT.

52.8 Unauthorized Goods or Services. CONTRACTOR acknowledges that this Agreement and any changes to it by amendment, modification, change order, or other similar document may have required, or may require, the legislative authorization of the CITY's Council and approval of the Mayor. Under Georgia law, Service Provider is deemed to possess knowledge concerning the CITY's ability to assume contractual obligations and the consequences of Service Provider's provision of goods or services to the CITY under an unauthorized contract, amendment, modification, change order or other similar document, including the possibility that the Service Provider may be precluded from recovering payment for such unauthorized goods or services. Accordingly, Service Provider agrees that if it provides goods or services to the CITY under a contract that has not received proper legislative authorization, or if Service Provider provides goods or services to the CITY in excess of the any contractually authorized goods or services, as required by the CITY's Charter and Code, the CITY may withhold payment for any unauthorized goods or services provided by Service Provider. Service Provider assumes all risk of non-payment for the provision of any unauthorized goods or services to the CITY, and it waives all claims to payment or to other remedies for the provision of any unauthorized goods or services to the CITY, however characterized, including, without limitation, all remedies at law or equity.

EXHIBIT B; CONSTRUCTION SPECIAL CONDITIONS

HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT
EXHIBIT "B" CONSTRUCTION CONTRACT SPECIAL CONDITIONS
FC-8075, F3 A380 RECONFIGURATION

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SC-01 DEFINITIONS

AASHTO means The American Association of State Highway and Transportation Officials, the successor association to AASHO.

Access Road means the right-of-way; the roadway and all improvements constructed thereon connecting the airport to a public highway.

AIP means Airport Improvement Program, a grant-in-aid program, administered by the Federal Aviation Administration.

Air Operations Area (AOA) means for the purpose of these specifications, the term Air Operations Area shall mean an area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An Air Operation Area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.

Airside means the area of the Airport consisting of the airfield, aircraft parking ramps and other areas requiring a special Airport Security Identification badge to gain legal access. The general public does not have access to this area.

ASTM means The American Society for Testing and Materials.

Central Passenger Terminal Complex (CPTC) means the facilities at the Airport consisting of the North Terminal, South Terminal, Terminal Atrium, Concourses T, A, B, C, D, E, and F, and Airfield (active Runways and Taxiways).

Contract Line Item means a discretely priced portion of Work identified in the Exhibit titled "QUANTITIES, PRICING AND DATA FORMS."

Contract Schedule means the Work execution schedule developed and approved pursuant to the Exhibit titled "SCHEDULE REQUIREMENTS."

Drainage System means the system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted through the airport area.

H-JDP means Hartsfield-Jackson Development Program – H-JAIA development plan that includes major efficiencies/capacity projects associated with the Master Plan and replacement/upgrade/maintenance projects associated with the existing facility.

Landside means all areas outside the Airside, but still located on the Airport.

Large Hub Airport means an airport that enplanes more than one percent of the nation's passengers annually.

Lighting means a system of fixtures providing or controlling the light sources used on or near the Airport or within the Airport buildings. The field lighting includes all luminous signals, markers, floodlights, and

illuminating devices used on or near the Airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the Airport surface.

MARTA means Metropolitan Atlanta Rapid Transit Authority.

Pavement means the combined surface course, base course, and sub base course, if any, considered as a single unit.

PROPONENT means the legal entity proposing, its/their respective directors, officers, partners, joint venture, employees, agents, representatives, permitted assigns and successors, presented to the CITY for approval to perform specific work in accordance with the Scope of Work defined in this Request for Proposal.

Secured Area means the area located within the SIDA surrounding the terminal or concourses primarily used for parking / servicing aircraft.

SIDA means the Security Identification Display Area.

Sterile Area means the area located within the terminal and concourses that require passage through a TSA checkpoint to access.

Structures means Airport facilities such as bridges; culverts; catch basins; inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases, transformers, flexible and rigid pavements, navigational aids, buildings, vaults, and other manmade features of the Airport that may be encountered in the work and not otherwise classified herein.

Subgrade means the soil which forms the pavement foundation.

Taxiway means for the purpose of this document, the portion of the air operations area of an Airport that has been designated by Airport for movement of aircraft to and from the Airport's runways or aircraft parking areas.

TSA means the Transportation Security Administration.

Utility Contracting means undertaking to construct, erect, alter, or repair or have constructed, erected, altered, or repaired any utility system in which the cost of the utility system work exceeds one hundred thousand dollars ($100,000.00).

Utility Contractor means a sole proprietorship, partnership, or corporation, which is engaged in utility contracting under express or implied contract or which bids for, offers to perform, purport to have the capacity to perform or does perform utility contracting under express or implied contract.

Utility Foreman means any individual who is employed by a licensed CONTRACTOR to have oversight and charge of the construction, erection, alteration, or repair of utility systems.

Utility Manager means any individual who is employed by a utility CONTRACTOR to have oversight and charge of the construction, erection, alteration, or repair of utility systems.

SC-02 COMMENCEMENT, PROGRESS AND COMPLETION OF THE WORK

2.1 Commencement. CONTRACTOR shall commence Work according to the accepted schedule following written Notice to Proceed from CITY, but in no event later than ten (10) business days thereafter. To facilitate the start of construction as early as possible, CONTRACTOR is strongly encouraged to submit its Safety, Security, Environmental, Quality Control, Fire Prevention plans, and the FAA Safety Plan Compliance Document (SPCD) to the CITY for review and approval immediately after Award of the Contract by the Council of the City of Atlanta. CONTRACTOR acknowledges that construction cannot begin until the Safety, Security and Quality Control plans are approved and that the development and submittal of CONTRACTOR submittals prior to the Contract being fully executed and Notice to Proceed issued is at CONTRACTOR's risk. Prior to any actual construction being performed, there shall be a Pre-Construction Conference to discuss details of execution.

2.2 Intermediate Milestones. CONTRACTOR shall complete the following intermediate milestones under this Contract:

NO.	CONTRACT MILESTONES
1.	CONTRACTOR shall achieve Substantial Completion on or before **Three Hundred and Thirty Five (335) Calendar Days from Notice to Proceed**.
2.	CONTRACTOR shall achieve Final Completion for all work on or before **Three Hundred and Sixty Five (365) Calendar Days from Notice to Proceed.**
3.	CONTRACTOR shall provide O&M manuals, warranties and As-Builts within **Thirty (30) calendar days** from the date of substantial completion of the entire project.
4.	CONTRACTOR must turn over the Gate(s) every morning by **6:00 a.m.** as defined on the drawings.

2.3 Substantial Completion. CONTRACTOR shall achieve Substantial Completion as identified in this exhibit under section 2.2-Intermediate Milestones. This performance period is inclusive of the time required to gain approval for the Safety and Security plans which may require as many as 60 calendar days for review and approval. The SPCD must also be submitted and approved prior to commencement of work. CONTRACTOR acknowledges that CITY has purchased the entirety of the performance period. CONTRACTOR's schedule may indicate an earlier Substantial Completion date than required by CITY; however, CONTRACTOR is not entitled to any additional compensation should delays occur until the delays exceed the performance period indicated above.

2.4 Advance Information. CONTRACTOR shall give ENGINEER full information in advance in writing as to its plans for performing each part of the Work. If at any time, CONTRACTOR's actual progress is inadequate to meet the requirements of this Contract, ENGINEER may notify CONTRACTOR to take such steps as may be necessary to improve its progress. If, within a reasonable period as determined by ENGINEER, CONTRACTOR does not improve performance to meet the Contract Milestones set forth above, ENGINEER may require an increase in CONTRACTOR's labor force, the number of shifts, overtime operations, additional days of Work

construction plant and equipment, all without additional cost to CITY. Neither such notice, nor ENGINEER's failure to issue such notice, shall relieve CONTRACTOR of its obligation to achieve the quality of Work and rate of progress required by this Contract.

2.5 Noncompliance with ENGINEER's Instructions. Noncompliance with ENGINEER's instructions shall be grounds for ENGINEER's determination that CONTRACTOR is not prosecuting the Work with such diligence as will assure completion within the time specified. Upon such determination, CITY may terminate this Contract pursuant to the Clause titled "TERMINATION FOR DEFAULT."

SC-03 LIQUIDATED DAMAGES

3.1 Estimated Liquidated Damages. The parties hereby agree that the damages which CITY to determine with certainty and, therefore, have in good faith estimated as fair compensation, the Liquidated Damages as set forth below. If CONTRACTOR fails to deliver the equipment or materials or perform the services within the times specified in this Contract for the established Milestones & Substantial Completion, or any extensions granted in writing, the CONTRACTOR shall pay to CITY as fixed, agreed, and Liquidated Damages for each calendar day of delay the sum(s) specified below, which amounts shall be independently calculated as follows:

NO.	BASE BID CONTRACT MILESTONES	LIQUIDATED DAMAGES
1.	CONTRACTOR shall achieve Substantial Completion on or before **Three Hundred and Thirty Five (335) Calendar Days from Notice to Proceed**.	Two Thousand Dollars and Zero Cents ($2000.00) per calendar day.
2.	CONTRACTOR shall achieve Final Completion for all work on or before **Three Hundred and Sixty Five (365) Calendar Days from Notice to Proceed.**	Two Thousand Dollars and Zero Cents ($2000.00) per calendar day.
3.	CONTRACTOR shall provide O&M manuals, warranties and As-Builts within Thirty (30) calendar days from the date of substantial completion of the entire project.	Two Thousand Dollars and Zero Cents ($2000.00) per calendar day.
4.	CONTRACTOR must turn over the Gate(s) every morning by 6:00 a.m. as defined on the drawings. -	Five Thousand Dollars and zero cents ($5,000.00) per hour.

3.2 Application of Liquidated Damages not a Change. The application of Liquidated Damages shall not effect a change in the Contract milestone or relieve CONTRACTOR of its obligation to improve its progress, pursuant to the Clause titled "COMMENCEMENT, PROGRESS, AND COMPLETION OF THE WORK," to achieve, or to mitigate the failure to achieve, the Contract milestone date or stated area reopening.

3.3 Payment of Liquidated Damages. Payments of Liquidated Damages shall become due immediately upon failure to achieve Contract milestones. CITY shall be entitled to withhold from payments due, offset against other obligations, deduct from retainage, and draw down on

letter(s) of credit or performance securities any and all Liquidated Damages due from CONTRACTOR.

3.4 No Restriction of Rights and Remedies. Nothing in this Clause shall operate to restrict any other rights and remedies available to CITY at law or under this Contract.

SC-04 CONTRACT ADMINISTRATION

CONTRACTOR agrees to utilize forms, reports and formats for information furnished by the ENGINEER in conjunction with the execution of work under this Contract.

4.1 Preconstruction Conference. After the award of the Contract and prior to commencement of the Work, a preconstruction conference between the CITY and the CONTRACTOR will be held. The time and place of the meeting will be established by the CITY. All involved parties shall be prepared to discuss any issues or concerns with the execution of the Work.

4.2 Coordination and Progress Meetings. The CONTRACTOR and any requested subcontractors and suppliers shall participate in weekly meetings with the ENGINEER to review and status construction progress and discuss scheduling changes, as required. The time and place for the meetings will be established by the ENGINEER. From time to time, and at the discretion of the ENGINEER, the frequency of such meetings may be lessened or increased, based on the issues and progress at hand. Each Contractor involved shall assume all liability, financial or otherwise, in connection with its contract and shall protect and save harmless CITY from any and all damages that may arise because of inconvenience, delays, or loss experienced by it due to coordination of the Work on the Project and the CITY's other CONTRACTORS. CITY does not warrant or guarantee the coordination of the Work of the CITY's CONTRACTORS nor does the CITY warrant or guarantee the represented completion dates for any contract.

SC-05 CITY FURNISHED DRAWINGS AND SPECIFICATIONS

5.1 CITY will Furnish. CITY will furnish specifications and prints of engineering design drawings for each part of the Work under this Contract. Such drawings will give information required for the preparation of shop detail drawings by CONTRACTOR. CONTRACTOR shall, immediately upon receipt thereof, check all specifications and drawings furnished and shall promptly notify ENGINEER in writing of any omissions or discrepancies in such specifications or drawings.

5.1.1 Two (2) copies of all specifications, one (1) full size and two (2) half-size prints of drawings will be furnished to CONTRACTOR without charge. The CONTRACTOR shall also be provided, on compact disc, the drawings and specifications in electronic portable document format (PDF) for CONTRACTOR's use.

5.3 Drawings at the Jobsite. CONTRACTOR shall maintain one complete and current set of all Contract Documents available at the Jobsite at all times, including designer-reviewed CONTRACTOR drawings.

SC-06 CITY FURNISHED FACILITIES, MATERIALS

Facilities. The facility listed below will be furnished by CITY and shall be used by CONTRACTOR for this project only.

6.1 Use Charges. NONE

6.2 Temporary Facilities. Contractor shall be provided a temporary staging area as shown on the drawings. Contractor shall restore the area to its original condition or improved at the end of the project.

6.3 Use of Premises.

6.3.1 In general, the CONTRACTOR shall have limited use of the premises for construction operations as indicated on Contract Documents.

6.3.2 The CONTRACTOR shall limit use of premises to work areas indicated on Contract Documents. Do not disturb portions of the Project Site beyond areas in which work is indicated.

6.3.3 Any shutdown of Airport equipment or systems shall require a 7-day advance notice to the Airport.

6.3.4 For Electrical Work/Temporary Power, the CONTRACTOR shall coordinate temporary power needs by the CONTRACTOR, such as Electric Welding Machines, with the Airport representative in establishing power service point locations. The CONTRACTOR shall provide all equipment and installation to provide the temporary power needs.

6.3.5 CONTRACTOR shall manage premises to maintain a neat, orderly, and clean appearance. CONTRACTOR shall regularly mow along Airport roadways. CONTRACTOR shall comply with any directive of the ENGINEER to remedy conditions of unclean or disorderly appearance within the Work area.

6.4 Owner Furnished Materials. NONE

SC-07 CONTRACTOR FURNISHED DRAWING, DATA, AND SAMPLES

7.1 Drawings, Data, and Samples by CONTRACTOR. When drawings, samples, certificates and data are required by the Contract Documents or good engineering and construction practices, CONTRACTOR shall prepare and submit them to ENGINEER for DOA review. CONTRACTOR shall allow a minimum of twenty-one (21) calendar days for ENGINEER's review. CONTRACTOR shall prepare and submit to the ENGINEER a submittal schedule, at the same time the Contract Schedule is submitted. Such schedule shall incorporate all of the required and specified submittals, including, but not limited to, drawings, samples, and data. The submittal schedule shall identify each item together with dates for submission of each for review. The CONTRACTOR shall maintain consistency and logic between the submittal schedule and the Contract schedule.

7.2 ENGINEER Review. ENGINEER review and permission to proceed does not constitute acceptance or approval of submittal including, but not limited to, design details, calculations, analyses, test methods, construction methods, rigging plans, certificates or materials developed or selected by CONTRACTOR and does not relieve CONTRACTOR from full compliance with the Contract requirements.

7.3 Shop Drawings.

7.3.1 Description.

7.3.1.1 Original drawings, prepared by CONTRACTOR Subcontractors, suppliers or distributors, which illustrate the Work; showing fabrication, layout, setting or erection details.

7.3.1.2 Prepared by a qualified detailer.

7.3.1.3 Identify details by reference to sheet and detail numbers shown on contract drawings.

7.3.1.4 Maximum sheet sized: 24 inches x 36 inches

7.3.1.5 Reproductions for submittals: bond or black and white prints.

7.3.1.6 Shop drawings for structural details, false work and for temporary shoring shall be prepared by (or performed under the supervision of) a Georgia licensed P.E. (provided by CONTRACTOR) who shall sign and seal each shop drawing submitted.

7.4 Product Data.

7.4.1 Manufacturer's Standard Schematic Drawings.

7.4.1.1 Modify drawings to delete information that is not applicable to Project.

7.4.1.2 Supplement standard information to provide additional information applicable to Project.

7.4.1.3 Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.

7.4.1.3.1 Clearly, mark each copy to identify pertinent materials of products.

7.4.1.3.2 Show dimensions and clearances required.

7.4.1.3.3 Show performance characteristics and capacities.

7.5 Samples.

7.5.1 Physical examples. To illustrate materials, equipment, or workmanship, and to establish standards by which completed work is judged.

7.5.2 Office Samples. Of sufficient size and quantity to clearly illustrate specified requirements.

7.5.3 Functional Characteristics. Of product or material, with integrally related parts and attachment devices.

7.6 CONTRACTOR's Responsibilities.

7.6.1 Review and approve shop drawings, product data, and samples prior to submission. Shop drawings that have not been reviewed by CONTRACTOR will be automatically returned to CONTRACTOR.

7.6.2 Verify:

7.6.2.1 Field Measurement, Dimensions, and Existing Elevations

7.6.2.2 Field Construction Criteria

7.6.2.3 Catalog Numbers and Similar Data

7.6.3 Coordinate each submittal with requirements of Work and of Contract documents.

7.6.4 CONTRACTOR's responsibility for errors and omissions in submittals is not relieved by ENGINEER's review of submittals.

7.6.5 CONTRACTOR's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by ENGINEER's review of submittals, unless ENGINEER gives written acceptance of specific deviations.

7.6.6 Notify ENGINEER in writing at time of submission of deviations in submittals from requirements of Contract Documents.

7.6.7 Perform no work, which requires submittals until the return of submittals with ENGINEER's signature indicating a Code 1 or Code 2 review status (See "Code Notation")

7.6.8 After ENGINEER's review, distribute copies.

7.7 Submission Requirements.

7.7.1 The shop drawings shall be submitted in sufficient time to allow discussion and correction prior to beginning the Work. Work shall not be performed, nor materials ordered, prior to the review of the drawing except at CONTRACTOR's risk.

7.7.2 Submit one (1) electronic copy or six (6) hard copies of all product data and shop drawings excluding shop drawings that require the actual drawing be stamped. Submittals will be returned electronically, excluding shop drawings, that require the actual drawing be stamped.

7.7.3 Accompany submittals with transmittal letter, in duplicate containing:

7.7.3.1 Date;

7.7.3.2 Project title and number;

7.7.3.3 CONTRACTOR's name and address;

7.7.3.4 The number of each shop drawing product data and sample submitted;

7.7.3.5 Notification of deviations from contract documents; and

7.7.3.6 Other pertinent data.

7.7.4 Telephone communications or fax transmittals by CONTRACTOR requesting the review and/or approval of CONTRACTOR's submittal will not be accepted by ENGINEER.

7.7.5 Submittals shall include:

7.7.5.1 Data and revision dates;

7.7.5.2 Project title and number;

7.7.5.3 The name of:

8.7.5.3.1 The Engineer responsible for the submittal

7.7.5.3.2 CONTRACTOR;

7.7.5.3.3 Subcontractor;

7.7.5.3.4 Supplier;

7.7.5.3.5 Manufacturer; and

7.7.5.3.6 Separate detailer, when applicable.

7.7.6 Identification of product or material

7.7.7 Relation to adjacent structure or materials;

7.7.8 Field dimensions clearly identified as such;
7.7.9 Specification section number;

7.7.10 Applicable standards, such as ASTM number of Federal Specification;

7.7.11 A blank space, 5 inches x 5 inches for ENGINEER's stamp;

7.7.12 Identification of deviations from Contract documents; and

7.7.13 CONTRACTOR's stamp, initialed or signed, certifying to a review of the submittal, verification of field measurements and compliance with Contract documents.

7.8 Code Notation.

7.8.1 No exceptions taken (Code 1).

7.8.2 Make Corrections Noted. Work may proceed subject to incorporation of noted corrections (Code 2). Contractor must resolve the comments indicated and resubmit to obtain a Code 1 Notation prior to Completion of the affected work.

7.8.3 Amend and Resubmit. Work may not proceed; revise and re-submit (Code 3).

7.8.4 Rejected – See Remarks. Work is not acceptable; Work may not proceed (Code 4).

7.9 Resubmission Requirements of Shop Drawings.

7.9.1 Revise initial drawings as required and resubmit as specified for initial submittal.

7.9.2 Indicate on drawings any changes which have been made other than those requested by ENGINEER.

7.9.3 Product Data and Samples. Submit new data and samples in the same manner as required for initial submittals.

7.9.4 Labeling of Samples. Each sample shall bear a label showing CONTRACTOR's name, Project name, Contract number, name of the item, manufacturer's name, brand name, model number, supplier's name, and reference to the appropriate drawing number, technical specification section and paragraph number; all as applicable.

7.10 Distribution of Submittals After Review.

7.10.1 Distribute copies of shop drawings and product data which carry ENGINEER's stamp to:

ENGINEER – six (6) copies
Others as required

7.10.2 Distribute samples as directed.

7.10.3 Disposition of Samples. Samples which have been reviewed may, at ENGINEER's sole discretion, be returned to CONTRACTOR or retained.

7.11 Certificates and Data. Where certificates are required, four (4) copies of each certificate shall be submitted by, and at the expense, of CONTRACTOR. Submittal shall be made not less than fifteen (15) calendar days prior to the time that the materials represented by such certificates are needed for incorporation into the Work.

7.12 Certificates to Identify. Certificates shall clearly identify the material being certified and shall include but not be limited to, the following information: CONTRACTOR's name, Project name, contract number, name of the item, manufacturer's name, and reference to the appropriate drawing, technical specification section and paragraph number; all as applicable.

7.13 CITY's Rights in Data. CITY shall have an irrevocable unrestricted royalty-free license to use all reports, Information, data, plans, drawings, specifications, computer programs, technical reports, operating manuals or other similar work products developed by CONTRACTOR and paid for by CITY under this Contract, or any other documents procured by, given to, prepared by, or assembled by CONTRACTOR under this Contract.

SC-08 KEY PERSONNEL

8.1 CONTRACTOR shall not reassign, or remove, the key personnel listed below without the prior written authorization of CITY:

NAME	TITLE / POSITION
TBD	Project Manager
TBD	Safety Manager
TBD	Superintendent
TBD	Quality Control Manager

8.2 In addition to requirements elsewhere in the contract, Project Manager shall have the following experience and qualifications:

8.2.1 Contract administration and interpretation;
8.2.2 Writing ability and computer skills needed to prepare correspondence and documents related to assigned project;
8.2.3 Coordination of communications, approvals, notifications, and record keeping related to changes in the assigned work;
8.2.4 Ability to establish, interpret, and update schedules and records of all correspondence related to contract activity; and
8.2.5 Good understanding of diversity participation requirements.

Qualification skills may be supplemented by a Construction Administrator or Subconsultant as needed. Resume shall be required.

SC-09 ESSENTIAL SUBCONTRACTORS

9.1 The following designated Subcontractors, submitted during the bid process on "FORM B, Essential Subcontractor Qualification Statement" of the Exhibit titled "QUANTITIES, PRICING

AND DATA FORMS," are deemed to be essential by the CITY to the execution of this Contract. These Essential Subcontractors may not be removed or substituted by the CONTRACTOR without proper written notice with justification and approval by the CITY.

Company Names	**Scope of Subcontracted Services**
TBD	Electrical
TBD	Mechanical
TBD	Metals / Structural Steel
TBD	Site Work
TBD	Concrete Paving
TBD	Foundations
TBD	Passenger Boarding Bridges

9.2 Consent of CITY for Subcontracts. CONTRACTOR shall submit to the CITY a list of any third parties for the performance of all or any portion of the work within fifteen (15) calendar days from Notice to Proceed date for informational purposes. Those Subcontractors designated as essential in the Clause titled "ESSENTIAL SUBCONTRACTORS" need not be resubmitted.

SC-10 ADDRESSES

For all notices, demands, consents, approvals and requests to CITY, the address will be:

City of Atlanta Department of Aviation
1255 South Loop Road
Hartsfield-Jackson Atlanta International Airport
College Park, Georgia 30337

Facsimile (404) 209-1190
Attention: Aviation Assistant General Manager – Planning and Development

With a copy to:

City of Atlanta Department of Aviation
P.O. Box 20509
Hartsfield-Jackson Atlanta International Airport
Atlanta, Georgia 30320
Facsimile (404) 520-6803
Attention: Aviation General Manager

Department of Procurement
City of Atlanta
55 Trinity Avenue S.W.
City Hall South, Suite 1900
Atlanta, GA 30303-0307
Attention: Chief Procurement Officer

Hartsfield-Jackson Development Program
1255 South Loop Road
College Park, GA 30337
Facsimile (404) 684-8973
Attention: Resident Engineer

SC-11 MEASUREMENT FOR PAYMENT

11.1 Lump Sum Items. To establish a basis for payment against Lump Sum items set forth in the Exhibit titled QUANTITIES, PRICING AND DATA FORMS," CONTRACTOR shall, within ten (10) calendar days after Notice to Proceed, provide a Schedule of Values which proposes:

11.1.1 A reasonable number of measurable interim tasks required to accomplish each lump sum item; and

11.1.3 An allocation of the price to each task with reasonable relationship to the costs incurred in its accomplishment.

11.2 Schedule of Values. ENGINEER shall review CONTRACTOR's Schedule of Values, determine the appropriate tasks and values for progress payments and so advise CONTRACTOR in writing. The Schedule of Values shall be reconcilable to the Project Schedule.

11.3 Payment for Materials on Hand. Partial monthly estimates may include delivered cost of materials to be incorporated in the Work, provided that such materials meet the requirements of the Contract Documents, and are delivered to acceptable sites on the Airport property or at other sites in the vicinity that are acceptable to the CITY. Such delivered costs of stored or stockpiled materials may be included in the monthly estimates after the following conditions are met:

11.3.1 The material has been stored or stockpiled in a manner acceptable to the ENGINEER at, or on, an approved site. The CITY reserves the right to inspect.

11.3.2 The CONTRACTOR has furnished the ENGINEER with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

11.3.3 The CONTRACTOR has furnished the ENGINEER with satisfactory evidence that the material and transportation costs have been paid.

11.3.4 The CONTRACTOR has furnished the CITY legal title (free of liens or encumbrances of any kind) to the material stored or stockpiled.

11.3.5 The CONTRACTOR has furnished the CITY evidence that the material stored or stockpiled is insured against loss by damage or disappearance at any time prior to use in the Work.

It is understood and agreed that the transfer of title and the CITY's payment for such stored or stockpiled materials shall in no way relieve the CONTRACTOR of its

responsibilities for furnishing and placing such materials in accordance with the Contract Documents.

In no case will the amount of partial payments for materials on hand exceed the Contract Price for such materials or the Contract Price for the Contract item where such materials will be utilized.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

11.4 Surveys to Determine Quantities. CONTRACTOR shall make all surveys necessary for determining all quantities of work to be paid under this Contract. Copies of field notes, computations and other records made by CONTRACTOR for the purpose of determining quantities shall be furnished to ENGINEER upon request. CONTRACTOR shall notify ENGINEER in writing prior to the time such surveys are made. ENGINEER, at his sole discretion, may witness and verify such surveys. If ENGINEER performs surveys to verify CONTRACTOR surveys which are the basis of payment requests and CONTRACTOR's survey proves to be inaccurate, the cost of verification surveys shall be paid by CONTRACTOR. Measurements and computations shall be made by such methods as ENGINEER may consider appropriate for the class of work measured and the estimate of quantities of work completed shall be compatible with the reporting requirements of the Exhibit titled "SCHEDULE REQUIREMENTS." The dividing limits or lines, between adjacent items or classes of work where not definitely indicated on the drawings or in the specifications shall be as determined by ENGINEER.

SC-12 INVOICING AND PAYMENT

12.1 Submittal of Invoices. CONTRACTOR shall prepare the invoice from the 26th of the month to the 25th of the following month. The invoice must be submitted to the construction manager (CM) on the 5th day of the next month. CONTRACTOR shall meet with the CM, five (5) days prior to submission of the invoice request to verify the quantity of Work in place for progress payment. The CONTRACTOR shall provide the necessary schedule and cost reports for review and agreement of invoiced quantities. Invoices must be entered in the CITY's Online Invoicing System (OLIS).

12.2 Retainage. Within thirty (30) calendar days after receipt of a correct invoice, CITY will pay CONTRACTOR ninety percent (90%) of the approved invoice amount. When fifty (50%) percent of the Contract, including change orders and other additions the Contract value provided for by the Contract documents is due, and the manner of completion of the Contract work and its progress are reasonably satisfactory to the CITY, the CITY will not withhold any more retainage. At the discretion of the CITY and with the approval of the CONTRACTOR, the retainage of each Subcontractor may be released separately as the Subcontractor completes its Work. At the CITY's sole discretion and approval of the Surety, CITY may reduce previously retained amounts upon satisfactory completion of remaining Work. If, after discontinuing the retention, the CITY determines that the work is unsatisfactory or has fallen behind schedule, retention may be resumed at the previous level. If retention is resumed by the CITY, the CONTRACTOR and Subcontractors shall be entitled to resume withholding retainage accordingly. The retainage shall be shared by the CONTRACTOR and subcontractors as their interest may appear.

12.3 Releases of all Claims. CITY may, as a condition precedent to any payment, require CONTRACTOR to submit for itself, its Subcontractors, immediate and remote, and all material suppliers, vendors, laborers, and other parties acting through or under it, complete waivers and releases of all claims against CITY arising under or by virtue of this Contract. Upon request, CONTRACTOR shall, in addition, furnish acceptable evidence that all such claims have been satisfied.

12.4 Amounts Withheld. Any amounts otherwise payable under this Contract may be withheld, in whole or in part, if:

12.4.1 Any claims are filed against CONTRACTOR by CITY or third parties arising out of performance of this Contract;

12.4.2 CONTRACTOR is in material default of any Contract condition including, but not limited to, the schedule, quality assurance and health and safety requirements;

12.4.3 CONTRACTOR has not submitted:

12.4.3.1 Schedules as defined in the Exhibit titled "SCHEDULE REQUIREMENTS,"

12.4.3.2 Proper insurance certificates, or not provided proper coverage or proof thereof, and

12.4.3.3 Required Performance and Payment Bonds or CITY approved equivalent securities.

12.4.4 Adjustments are due from previous overpayment or audit result; or

12.4.5 Offsets in favor of CITY in other transactions are asserted.

12.5 Release of Withholdings. CITY will release and pay such withheld amounts if CONTRACTOR:

12.5.1 Has provided As-Built information approved by the ENGINEER.

12.5.2 Pays, satisfies, or discharges any claim of CITY, or third parties against CONTRACTOR; or

12.5.3 Cures all defaults in the performance of this Contract.

12.6 Claims Against CONTRACTOR. If claims filed against CONTRACTOR connected with performance under this Contract, for which CITY may be held liable if unpaid (e.g. unpaid withholding and back taxes), are not promptly removed by CONTRACTOR after receipt of written notice from CITY to do so, CITY may remove such claims and deduct all costs in connection with such removal form withheld payments or other monies due, or which may become due, to CONTRACTOR. If the amount of such withheld payment or other monies due CONTRACTOR under this Contract is insufficient to meet such costs, or if any claim against

CONTRACTOR is discharged by CITY after final payment is made, CONTRACTOR and its Surety or sureties, if any, shall promptly pay CITY all costs incurred thereby regardless of when such claim arose, or whether such claim imposed a lien upon the Project or the real property upon which the Project is situated.

12.7 Payment of Final Invoice. CITY shall, within thirty (30) calendar days following Final Acceptance of the Work as a whole and after submittal of a final invoice, pay to CONTRACTOR the amount then remaining due, provided that, CONTRACTOR shall have furnished CITY for itself, its Subcontractors, immediate and remote, and all material suppliers, vendors, laborers, and other parties acting through or under it, waivers and releases of all claims against CITY arising under or by virtue of this Contract, except such claims, if any, as may with the consent of CITY, be specifically excepted by CONTRACTOR from the operation of the release in stated amounts to be set forth therein.

12.8 Final Release of Retainage. Prior to the Final release of Retainage, the CONTRACTOR shall certify to the CITY, in writing, in a form satisfactory to the CITY, that all Subcontractors, materialmen, suppliers, and similar firms or persons involved in the CITY Contract, have been paid in full at the time of Final payment to the CONTRACTOR by the CITY, or will be paid in full utilizing the monies constituting Final payment to CONTRACTOR.

12.9 Payment Does Not Constitute Acceptance. No payments of invoices, or portions thereof, shall at any time constitute approval or acceptance of any Work under this Contract, nor be considered a waiver by CITY of any of the terms of this Contract; however, title to all equipment and materials which has vested in CITY pursuant to the Clause titled 'TITLE AND RISK OF LOSS" shall not be part of CONTRACTOR's property or estate, unless otherwise specified by applicable law, in the event CONTRACTOR is adjudged bankrupt or makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of CONTRACTOR's insolvency, or if all or any portion of this Contract is terminated.

12.10 Submittal of Invoices. CONTRACTOR shall submit an original and one (1) copy to:

Hartsfield-Jackson Development Program
Construction Management
Attn: Assigned Resident Engineer (TBD)
1255 South Loop Road
College Park, GA 30337

Reference: PROJECT NUMBER FC-8075 – F3 A380 RECONFIGURATION

12.11 Waiver of Applicability of Prompt Pay Act. CONTRACTOR specifically waives the application to this Contract of Georgia Code Annotated §§ 13-11-1, 13-11-4, 13-11-7, and 13-11-8.

SC-13 WAGE REQUIREMENTS

CONTRACTOR shall pay the prevailing wages as stipulated by the wage scale(s), which is incorporated in the Contract Documents (Section titled "WAGE AND BENEFITS RATES"). Such

scale of wages to be paid shall be posted by the CONTRACTOR in a prominent and easily accessible place at the site of the work.

SC-14 PROJECT CONTINGENCY AND ALLOWANCES

The "Project Contingency" allowance is that sum of money set aside and under the control of the ENGINEER, or his designee, as part of the Project budget which has been designated to pay for scope modifications, unforeseen events, Work items consistent and related to the Contract but not shown on the drawings and/or specifications but necessary for the successful completion of the Work, or emergences during the course of the Project not otherwise contemplated in the Contract. The CITY is solely responsible for the appropriation of these funds. CONTRACTOR shall have no claim to such funds. If the compensation for completing the Contingency work is less than the Contingency amount, the savings shall revert to the CITY. The Work shall be assigned and directed by the ENGINEER, or his designee, in written form. Measurement and payments shall be in accordance with the Clause titled "INVOICING AND PAYMENT" and the Clause titled "PRICING OF ADJUSTMENTS."

The Allowance is that sum of money included in the Total Contract Price that is under the control of the ENGINEER, or his designee, to pay for the scope set out for the allowance item. Once the scope of work for the allowance items is fully defined and issued to the CONTRACTOR, measurement and payments shall be in accordance with the Clause titled "INVOICING AND PAYMENT" and the Clause titled "PRICING OF ADJUSTMENTS." If the compensation for completing the allowance item work is less than the allowance amount, the savings shall revert to the CITY. If the compensation for completing the allowance item work is more than the allowance amount, the CONTRACTOR shall be paid the difference. The difference shall be funded by either the issuance of a Project Contingency or a Change Order. All such allowances shall cover all direct, indirect, and general condition costs of the allowance work and all profit and overhead of the CONTRACTOR for the allowance work.

SC-15 TEMPORARY ACCESS AND HAUL ROADS

15.1 General. CONTRACTOR shall, at its expense, construct and maintain temporary access and haul roads as may be necessary for the proper performance of this Contract. CONTRACTOR shall submit a layout of all proposed roads prior to road construction. The layout shall show widths of roads, direction of traffic, curves, grades, and related information in sufficient detail for review by ENGINEER. Roads constructed on CITY's land or rights-of-way shall be subject to CITY's approval.

15.1.1 The CONTRACTOR's access route to the Project site shall be constructed as shown on drawings.

15.1.2 The location of access and haul routes in the Aircraft Operations Area (AOA), if applicable, are as shown on the drawings. Use of unauthorized haul routes shall not be acceptable.

15.1.3 Roads used by the CONTRACTOR for access or hauling shall be kept clean and accessible to all other Airport traffic for the entire duration of the Project. Haul trucks

must be covered and any spillage or debris buildup promptly removed from all haul routes on Airport and public roads. No separate payment shall be made for keeping the roads clear and accessible.

15.1.4 The CONTRACTOR shall control dust and debris from its operation to a level acceptable to the CITY and have on the Project vacuum sweepers, watering trucks, and other equipment necessary to control dust. All methods for controlling dust shall be subject to the CITY's approval. Dust control shall be strictly monitored due to its impact on aircraft safety. Failure to properly control dust, or to respond to any request to do so, will result in construction activities being stopped.

15.1.5 Temporary access and haul road shall be removed at the end of construction and restored to their original condition or improved.

15.1.6 All excess material produced by the CONTRACTOR's operations shall be disposed of off Airport property at an appropriate, licensed construction and demolition disposal facility at no additional cost to the CITY.

SC-16 CONTRACTORS' WORK AREA

16.1 Assignment of Work Areas. All CONTRACTOR work areas on the Jobsite will be assigned by ENGINEER. CONTRACTOR shall confine its operations to the areas so assigned. Should CONTRACTOR find it necessary or advantageous to use any additional offsite area for any purpose whatsoever, CONTRACTOR shall, at its expense, provide and make its own arrangements for the use of such additional offsite areas.

16.2 Air Operations Area Controls. At all times during the performance of this Contract, CONTRACTOR shall provide for free and unobstructed movement of aircraft in the Air Operations Area (AOA) of the Airport, shall identify all hazards to aircraft and shall provide for the control of personnel and vehicular traffic, all in accordance with Section 16.3 and 16.4. A detailed Traffic Control Plan shall be submitted for approval to the ENGINEER prior to the commencement of any construction activities.

16.3 Operating within Critical Areas. When the Work requires CONTRACTOR to conduct its operations within areas adjacent to active runways, taxiways, aprons, and/or navigational aids, the Work shall be coordinated with CITY and FAA through ENGINEER. CONTRACTOR shall request authorization from ENGINEER forty-eight (48) hours prior to any closure or interference with the Aircraft Operations. While working in the AOA, CONTRACTOR shall maintain constant communications and with the ENGINEER and shall immediately obey all instructions from the ENGINEER.

16.4 Operating Close to Aircraft. When working in close proximity to aircraft, CONTRACTOR shall:

16.4.1 Yield the right-of-way to aircraft.

16.4.2 Keep the movement of vehicles across active taxiways and aprons to a minimum.

16.4.3 Obtain proper approval from the ENGINEER before allowing any equipment or vehicles to cross an active runway.

16.4.4 Require all operators to maintain a safe and reasonable speed.

16.4.5 Utilize equipment with due regard for existing weather conditions.

16.4.6 Remove, from the Jobsite, any person operating unauthorized vehicles or equipment in a restricted area, or operating vehicles or equipment in a reckless and unreasonable manner.

16.4.7 Keep all trash and debris from taxiways, runways, and ramp areas.

16.4.8 Prohibit all vehicles and equipment from being operated within one hundred sixty (160) feet of the centerline of an active taxiway or within two hundred fifty (250) feet of the centerline of the active runway, except on Airport service roads or with the express consent of ENGINEER.

16.4.9 Immediately cease work and vacate any operations or work area at any time if instructed to do so by ENGINEER. These instructions may be issued by radio or other appropriate means. CONTRACTOR shall not return to a vacated area until authorized by ENGINEER.

16.5 Closing the AOA. When the Work requires closing the AOA, or portion of such area, CONTRACTOR shall furnish, erect, and maintain temporary markings and associated lighting conforming to the requirements of FAA Advisory Circular 150/5370-2F Operational Safety of Airports During Construction. Open-flame type lights shall not be permitted within the AOA.

16.6 Employee Parking. CONTRACTOR shall arrange employee parking outside the AOA and provide its employees transportation into the Jobsite. CONTRACTOR's access point into the AOA shall be as directed by the ENGINEER.

16.7 Storage of Equipment and Materials. Materials shall be so stored as to assure the preservation of their quality and fitness of the Work. Stored materials, even though approved before storage, may again be inspected prior to their use in the Work. Stored materials shall be located so as to facilitate their prompt inspection. The CONTRACTOR shall coordinate the storage of all materials with the ENGINEER. Materials to be stored on Airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft or ground traffic. CONTRACTOR shall not store materials on the AOA without written approval by DOA Airside Operations and the FAA. Unless otherwise shown on the plans, the storage of materials and the location of the CONTRACTOR's plant and parked equipment or vehicles shall be as directed by the ENGINEER. Private property shall not be used for storage purposes without written permission of the owner or lessee of such property. The CONTRACTOR shall make all arrangements and bear all expenses for the storage of materials on private property. All storage sites on private or airport property shall be restored to their original condition by the CONTRACTOR at his/her entire expense, except as otherwise agreed to (in writing) by the CITY or lessee of the property. CONTRACTOR shall base his bid on no stored

materials on the AOA without written approval by DOA Airside Operations and FAA. Such approval may be withheld.

16.7 Material Handling. Contractor's responsibility for materials and plant equipment required for the performance of this Contract shall include:

16.7.1 Receiving and unloading;

16.7.2 Storing in a secure place and in a manner subject to City's review. Outside storage of materials and equipment subject to degradation by the elements shall be in weather tight enclosures provided by the contractor;

16.7.3 Delivering from storage to construction site all materials and plant equipment as required;

16.7.4 Maintaining complete and accurate records for City's inspection of all materials and plant equipment received, stored and issued for use in the performance of this Contract.

16.8 Construction Lighting for Night Work. The Contractor shall cooperate with the FAA and the City when aligning his construction floodlights so as not to interfere with aircraft pilots or air traffic controllers' vision. When requested by the City, the Contractor will respond quickly to adjust the lighting as directed.

16.9 Height Restrictions. FAA Regulation for use of cranes and other elevated equipment will be strictly enforced. The Contractor shall be responsible for submitting FAA Form 7460 to the City and obtaining FAA approval prior to Contractor's use of any elevated equipment. Allow a minimum of 45 days for the Form 7460 to process through FAA.

16.10 Protection of Employees. When the project is within the vicinity of large jet aircraft operations the Contractor shall take all precautions necessary to protect his employees, equipment, and work in progress from aircraft noise and jet engine blast.

SC-17 CLEANING UP

17.1 Clean Work Areas. CONTRACTOR shall, at all times, keep its work areas in a neat, clean and safe condition. While working in the AOA, the CONTRACTOR shall keep the areas immediately adjacent to the Jobsite clean at all times. The CONTRACTOR shall sweep adjacent pavement areas at least once daily or as directed by the ENGINEER. If grass within the construction limits exceeds ten (10) inches in height, the CONTRACTOR is responsible for mowing. CONTRACTOR shall, on a daily basis, remove from the Work area all its equipment and uninstalled materials while maintaining temporary walls and protective barriers to provide a neat and safe area for the public. Upon completion of any portion of the Work, CONTRACTOR shall promptly remove from the Work area all its equipment, construction plant, temporary structures, and surplus materials not to be used at, or near, the same location during later stages of the Work.

17.2 Rubbish and Salvage. Upon completion of the Work and prior to final payment, CONTRACTOR shall, at its expense, satisfactorily dispose of all rubbish, remove all plant,

buildings, equipment, and materials belonging to CONTRACTOR and return to CONTRACTOR's warehouse or Jobsite storage area all salvageable CITY supplied materials. CONTRACTOR shall leave the premises in a neat, clean and safe condition.

17.3 Failure to Comply. In the event of CONTRACTOR's failure to comply with the foregoing requirements, CITY may accomplish same at CONTRACTOR's expense.

17.3 Maintenance. Contractor shall maintain the Work including any provisionally accepted portions thereof and including any portions occupied by City or put into service until final acceptance of the Work as a whole. Use shall not constitute acceptance, relieve Contractor of its responsibilities, or act as a waiver by the City of any terms of this contract.

SC-18 COORDINATION AND WORK ON AIRPORT PROPERTY

18.1 For some portions of this Project, construction will occur within the Security Identification Display Area (SIDA). The SIDA is the airport security area with restricted access. The CONTRACTOR will be required to meet all requirements for entering and operating in these areas as described in the Exhibit titled "AIRPORT SECURITY REQUIREMENTS."

18.2 All CONTRACTOR personnel, including subcontractors, engaged in work within the SIDA shall be Airport badged and fingerprinted as required in the Exhibit titled "AIRPORT SECURITY REQUIREMENTS." Due to the time necessary to complete the badging and fingerprinting process, the CONTRACTOR may start the process after contract Award and before construction NTP.

18.3 All construction activities within the SIDA shall be conducted in a manner acceptable to the CITY and FAA to provide acceptable levels of safety, security, and access for all Airport operations. Periodic meetings will be held to coordinate the activities of this contract with other Airport operations.

18.4 All costs associated with establishing and maintaining SIDA security shall be included in the price bid for mobilization unless included in a separate Special Provisions (SP) item.

18.5 The CONTRACTOR shall cooperate with existing and future Contractors working in the area and at all times will coordinate its efforts to maintain necessary construction and hauls routs and to assure that all contracts continue on a timely basis.

SC-19 PROTECTION OF AIRPORT OPERATIONS SYSTEMS

19.1 Location of Airport Operations Systems. In addition to CONTRACTOR's general obligations in the Clause titled "CONTRACTOR'S WORK AREA," numerous Airport operations systems, including, but not limited to, radio receivers and transmitters, U.S. Weather Bureau facilities, Navigation Aids, Communication and Security systems and associated electrical cables will be in use during the performance of Work. CONTRACTOR shall protect such systems at all times. Airport Operations Systems may be shown on drawings, marked by ENGINEER, or obvious from visual inspection but CONTRACTOR shall inquire and inspect to determine the location of any and all such systems and shall be responsible to avoid damage to any of them at all times.

19.2 Damage to Airport Operations Systems. If any portion of any Airport operations system is damaged by CONTRACTOR, or anyone operating under CONTRACTOR's control or direction, CONTRACTOR shall immediately notify ENGINEER in writing and propose both temporary and permanent repairs to restore system functions and return the system to its original condition at no additional cost to the CITY. The material, workmanship, and methods for repairs must all be approved by ENGINEER and such repairs may be witnessed or inspected by owners or operators of such systems as well as ENGINEER. If in the opinion of ENGINEER, CONTRACTOR is not qualified to perform such repairs, they may be performed by others and the reasonable costs of such repairs shall be deducted from payments otherwise due CONTRACTOR.

SC-20 DELAY FOR OPERATIONS

20.1 Restrictions to Access. Access to work areas may be restricted from time to time by necessity of Airport operations. CONTRACTOR has taken into account and provided in its planning, scheduling, and pricing for disruptions including, but not limited to, clearing traffic congestion or accidents, repairs to Airport facilities, heightened Security conditions and the like.

20.2 Closures. Runway and Taxiway closures at any time, or duration, are prohibited during the following holidays:

20.1.1 Memorial Day Weekend: Thursday through Tuesday

20.1.2 Labor Day Weekend: Thursday through Tuesday

20.1.3 One week prior to Thanksgiving through the Monday after Thanksgiving

20.1.4 One week prior to Christmas day through one week after New Year's Day

SC-21 CUTTING AND PATCHING

CONTRACTOR shall be responsible for all cutting, fitting, and patching required to complete the Work. The ENGINEER, at his discretion, may request the uncovering of the Work to provide for alterations, restoration, or refinishing of existing work. A written request to the ENGINEER, in advance of cutting or patching items of work which may affect structural value or integrity, is required for approval.

EXHIBIT C; QUANTITIES, PRICING, AND DATA FORMS

CITY OF ATLANTA
DEPARTMENT OF AVIATION

HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

PROJECT NUMBER FC-8075
F3 A380 RECONFIGURATION

EXHIBIT C
QUANTITIES, PRICING AND DATA

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EXHIBIT “C”

FORM A; SCHEDULE OF QUANTITIES AND PRICES

EXHIBIT "C"

FORM A. SCHEDULE OF QUANTITIES AND PRICES

01) SCOPE OF WORK

This project will allow for an A380 Aircraft (Group 6) to be accommodated on the new Concourse F. Currently no gate on Concourse F can accommodate the A380 and it is the desire of the Department of Aviation (DOA) to have the ability to have a Group 6 aircraft gated on Concourse F. Gate F3 was chosen as the best location; however both the terminal and airside areas will require improvements. The airside improvements to Gate F3 include an addition of a second loading bridge, new fuel pit and relocation of the aircraft lead-in line. Concourse improvements include a new vertical transportation core and tie-in to the CBP sterile corridor, additional millwork for the new bridge, and extension of the concourse level sterile corridor to tie-in to the new vertical transportation core. The new vertical transportation core will include a stair, elevator and an escalator.

02) UNIT & LUMP SUM PRICES

Unit and Lump Sum prices quoted in Form A -1 Schedule of Unit & Lump Sum Prices shall be firm all-inclusive prices. Payment of the Unit and/or Lump Sum prices shall constitute full payment for performance of the corresponding work and shall cover all costs of whatever nature incurred by the CONTRACTOR in accomplishing the Work in accordance with the provisions of this Contract.

03) QUANTITIES

The quantities where noted in the Schedule of Unit & Lump Sum Prices, are approximations subject to variations as stated in 5.0 and no claim shall be made for deficiency or over-run, actual or relative. Payment will be made for the actual quantities of each Schedule of Unit Prices item incorporated into the Work in accordance with the Contract requirements based on the unit prices established in the Schedule.

04) PERFORMANCE AND PAYMENT SECURITIES

The cost of the Performance and Payment Bonds are to be distributed through the various items of work.

05) ADJUSTMENTS

All prices are fixed for the duration of the Contract and are not subject to escalation for any reason. Payment of the Total Contract Price shall constitute full payment for performance of the Work and covers all costs of whatever nature incurred by CONTRACTOR in accomplishing the Work in accordance with the provisions of the Contract.

The CITY reserves and shall have the right to make such adjustments in the Work as may be necessary or desirable to complete the Work originally intended in an acceptable manner. Unless otherwise specified herein, the CITY may make such adjustments in the Work as may increase or decrease the originally awarded contract quantities. Adjustments shall not invalidate the Contract nor release the surety, and the CONTRACTOR agrees to accept payment for such adjustments as if the altered work had been a part of the original Contract. The adjustments which are for work within the general scope of the Contract shall be covered by Change Order issued by the ENGINEER. Change Orders for altered work shall include extensions of Contract time where, in the ENGINEER's opinion, such extensions are commensurate with the amount and difficulty of added work.

If the CITY and the CONTRACTOR are unable to agree on a unit adjustment for any Contract item that requires a change order, the CITY reserves the right to terminate the Contract with respect to the item and make other arrangements for its completion.

All Change Orders shall require consent of the CONTRACTOR'S surety and an increase of the performance and payment bonds.

Adjustments shall not increase the total cost of the project, based on the originally estimated quantities and the unit prices bid. Should it become necessary for the best interest of the CITY to make changes in excess of those herein specified, the same shall be covered by Change Order.

06) **<u>REQUIRED SUBMITTALS</u>**

When notified by the Department of Procurement (DOP), the CONTRACTOR will within ten (10) days submit the following documents to CITY executed by CONTRACTOR and its Surety, or issued by CONTRACTOR'S insurers providing the insurance required by the Contract, as applicable, the following:

a) Performance Bond;

b) Payment Bond; and

c) Accord Certificate of Insurance.

07) **<u>OWNER'S CONTROLLED INSURANCE PROGRAM</u>**

The CITY, at its option, may consider the implementation of the Owner's Controlled Insurance Program. Items under the Base Bid shall include the CONTRACTOR'S cost of procuring and maintaining Automobile Liability Insurance and Builders Risk Insurance as stipulated in Exhibit D; Insurance and Bonding.

EXHIBIT “C”

FORM A-1; SCHEDULE OF UNIT AND LUMP SUM PRICES

CITY OF ATLANTA
DEPARTMENT OF AVIATION
HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

FC-8075
F3 A380 RECONFIGURATION

EXHIBIT "C"
FORM A-1 SCHEDULE OF UNIT & LUMP SUM PRICES

ITEM NO.	PRELIMINARY CONSTRUCTION QUANTITY	ITEM WITH UNIT OR LUMP SUM PRICE WRITTEN IN WORDS	UNIT PRICE IN FIGURES		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
SP-1-1	LUMP SUM	LS, MOBILIZATION, AT _____ _____ PER LUMP SUM				
SP-2-1	ALLOWANCE	AS REQUIRED, PROJECT CONTINGENCY, AT **ONE MILLION DOLLARS AND ZERO CENTS_____** _____ PER ALLOWANCE			**1,000,000**	**00**
SP-3-1	LUMP SUM	LS, AS-BUILTS, AT _____ _____ PER LUMP SUM				
	LUMP SUM	LS, BUILDING, AT _____ _____ PER LUMP SUM				

ITEM NO.	PRELIMINARY CONSTRUCTION QUANTITY	ITEM WITH UNIT OR LUMP SUM PRICE WRITTEN IN WORDS	UNIT PRICE IN FIGURES		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
		TOTAL BASE BID _____ _____				
	LUMP SUM	**<u>ADDITIVE ALTERNATE #1</u>** **CONTRACTOR'S INSURANCE COST, AT** _____ _____ **PER LUMP SUM**				

EXHIBIT “C”

FORM B; ESSENTIAL SUBCONTRACTOR QUALIFICATION STATEMENT

EXHIBIT "C"

FORM B. ESSENTIAL SUBCONTRACTOR QUALIFICATION STATEMENT

This Form "B", Essential Subcontractor Qualification Statement is submitted for the following proposed Essential Subcontractor:

Company Name:_____ Phone:_____

Address: _____ Facsimile:_____

_____

Number of Years in business:_____

Contact Person:_____ Email:_____

Scope of Work to be performed by Subcontractor on this Project:_____

_____

As applicable:

License(s) held:_____ Number:_____ Expires: _____

_____ _____ _____

Certification(s) held:_____ Expires:_____

_____ _____

References: (a minimum of two (2) references are required)

1. Prime Contractor: Company Name _____

   Address _____

   City, State, Zip _____

   Phone _____

   E-mail _____

   Project Name: _____

Location of Project: _____

Contact Person: _____

Phone Number: _____

Date(s) of Project: _____

Description/Summary of Services: _____

Value/Amount of Subcontract: _____

2. Prime Contractor: Company Name _____

Address _____

City, State, Zip _____

Phone _____

E-mail _____

Project Name: _____

Location of Project: _____

Contact Person: _____

Phone Number: _____

Date(s) of Project: _____

Description/Summary of Services:_____

Value/Amount of Subcontract:_____

EXHIBIT “C”

FORM C; PRELIMINARY CONTRACT SCHEDULE

EXHIBIT "C"

FORM C. PRELIMINARY CONTRACT SCHEDULE

In accordance with the Invitation to Bid (ITB) the Bidder shall submit a preliminary project schedule meeting the following requirements:

1. Produce the schedule in P6 software or equivalent.
2. Provide a hard copy of the schedule on 11” X 17” paper with a minimum font size of 10pt. The document shall be in color. The Critical Path shall be in Red.
3. Show the continuity and flow of the work.
4. The level of detail in the schedule shall match the level of detail in the Work Plan (FORM D).
5. The number of tasks shall be reasonable with the cost of the project and the baseline schedule requirements. (i.e., a bid of $3 million would be approximately 20 construction tasks included, a bid of $10 million would be over 40 construction tasks indicated).
6. Show all contract milestones as stated in SC-02.
7. Items that require long lead times for procurement and /or work requiring coordination with other agencies must be identified.
8. Show construction activities in no more than three geographically separated locations at any one time.

Failure to provide a preliminary schedule as described above may result in the bid being found non-responsive.

EXHIBIT “C”

FORM D; PROJECT ORGANIZATION AND WORK PLAN

EXHIBIT "C"

FORM D. PROJECT ORGANIZATION AND WORK PLAN

In accordance with the Invitation to Bid (ITB) the Bidder shall submit information regarding the project Organization meeting the following requirements:

1. Organization chart with the names and titles of key personnel proposed to manage this project.
2. Organization chart shall include Representative whom Project Manager shall report to. A written description of representative's authority shall be defined.
3. A written description of the organization, defining lines of authority, responsibility, and communication.
4. A written description outlining the overall working of the organization with particular emphasis on Home Office/Site interfaces and the procedures for monitoring and controlling the work.

In accordance with the Invitation to Bid (ITB) the Bidder shall submit a detailed narrative project Work Plan. The intention of this work plan is for the Bidder to explain the means and methods used in making the preliminary schedule tasks occur as indicated in FORM "C". For the purposes of this submittal means and methods is defined as the resources made available and procedures or techniques to be used in meeting the preliminary schedule provided in FORM"C". The Work Plan shall meet the following requirements:

1. The level of detail in the Work Plan shall be the same as the level of detail in the schedule.
2. Discuss the plan for making all contract Milestones as stated in SC-2 and shown on the preliminary schedule.
3. Discuss the number of crews the bidder will utilize for the project. Show how and which crews will be associated with each scope of work.
4. Provide the work hours and days of work (ie, 8 hours per day-6 days per week). These work hours and days of work shall be coordinated with and support the preliminary schedule in Form C and meet the contract requirements.
5. Identify any item of procurement or required coordination with other agencies that may be problematic or are critical to the completion of the work.
6. Include a description of the work the Bidder will self-perform and the work performed by Subcontractors. This is in addition to the information provided elsewhere since that information my not be available to the review of the Work Plan.
7. Show how each scope of work will be completed when limited to working at no more than three geographically separated locations at one time.

Failure to provide an organization and work plan as described above may result in the bid being found non-responsive.

EXHIBIT “C”

FORM E; SAFETY PROGRAM

EXHIBIT "C"

FORM E. SAFETY PROGRAM

The Bidder must demonstrate that it is committed to implementing a first rate safety program and that it has an exceptional safety and environmental record. The Bidder and its essential subcontractors identified on Form B must submit their current Experience Modification Rate (EMR). If an EMR is not available Bidder or essential subcontractor must submit a written statement detailing the Firm's safety record on its last five projects including contact names and numbers where the City can verify the safety record statement.

The Bidder must provide a Log and Summary of OSHA violations and any fines or settlements of its Company, Firm, or joint venture partners for the past thirty-six (36) months. Attach the Log and Summary of Occupational Injuries and Illnesses as required by the U. S. Department of Labor for the past thirty-six (36) months. Provide OSHA Recordable Incident Rate (Year 2009) and OSHA Lost Days Away Incident Rate (Year 2009). This is applicable to site construction and installation activities only.

Bidder is to complete attached Safety and Health History (SHH) form.

SAFETY AND HEALTH HISTORY FORM

1A. List your Firm's Interstate Experience Modification Rate (EMR) for the three (3) most recent years and total hours worked.

	20_____	20_____	20_____
a. EMR	_____	_____	_____
b. Hours Worked	_____	_____	_____

1B. If the state where the jobsite is located has an EMR rating system, provide the state EMR for the three (3) most recent years and total hours worked.

	20_____	20_____	20_____
a. EMR	_____	_____	_____
b. Hours Worked	_____	_____	_____

2. SAFETY PERFORMANCE

2A. List safety performance incident rates for the three (3) most recent years:

	20_____	20_____	20_____
a. OSHA Recordable Incident Rate	_____	_____	_____
b. Lost Workday Case Incident Rate	_____	_____	_____

2B. Use your OSHA No. 200 Log to fill in the three (3) most recent years:

	20_____	20_____	20_____
a. Number of first aid cases	_____	_____	_____
b. Number of lost workday cases.	_____	_____	_____
c. Number of restricted workday cases.	_____	_____	_____
d. Number of cases with medical attention only.	_____	_____	_____
e. Number of fatalities.	_____	_____	_____

3. Check your type of work:

___ Non-Residential Building
___ Heavy (Non-Highway) Construction
___ Mechanical
___ Electrical
___ Other (State Type): _____
__ Earthwork
__ Concrete
__ Architectural

SAFETY AND HEALTH HISTORY (Continued)

4. Are accident reports (OSHA 200) and report summaries sent to the following and how often?

	No	Yes	Monthly	Quarterly	Annually
a. Project Superintendent/Site Mgr.	___	___	___	___	___
b. Vice President/Mgr. of Construction	___	___	___	___	___
c. Safety Director	___	___	___	___	___
d. President of Firm ___	___	___	___	___	

5. Do you hold site safety meetings for field employees both Manual and Non-Manual?
Yes ___ No ___

How Often?
Weekly ___ Bi-Weekly ___ Monthly ___ Less Often, As Needed ___

6. Do you conduct project safety inspections?
Yes ___ No ___

If yes, who conducts this inspection?

TITLE	HOW OFTEN?

7. How are accident records and accident summaries kept? How often are they reported?

	No	Yes	Monthly	Annually
a. Accidents totaled for the entire company	___	___	___	___
b. Accidents totaled by project ___	___	___	___	
(1) Subtotaled by superintendent	___	___	___	___
(2) Subtotaled by foreman ___	___	___	___	

8. How are the costs of individual accidents kept? How often are they reported?

	No	Yes	Monthly	Annually
a. Costs totaled for the entire company	___	___	___	___
b. Costs totaled by project	___	___	___	___
(1) Subtotaled by superintendent	___	___	___	___
(2) Subtotaled by foreman ___	___	___	___	

SAFETY AND HEALTH HISTORY (Continued)

9. List key Safety and Health personnel planned for this project. Please list name, expected position and safety performance on their last three projects (OSHA Recordable and Lost Workday Case Incident (LWCI) rates). When a project has not been specified, list key company personnel.

NAME	POSITION	PROJECT	OSHA	LWCI

10. Do you have a written safety program?

Yes ___ No ___

If yes, submit a copy for evaluation.

11. Do you have an orientation program for new hires?

Yes ___ No ___

If yes submit a copy for evaluation. Does it include instruction on the following?

	Yes	No		Yes	No
a. Head protection	___	___	i. Fire protection	___	___
b. Eye protection	___	___	j. First aid facilities	___	___
c. Hearing Protection	___	___	k. Emergency procedures	___	___
d. Respiratory protection	___	___	l. Toxic substances	___	___
e. Safety belts and lifeline	___	___	m. Trenching and excavation	___	___
f. Scaffolding	___	___	n. Signs, barricades, flagging	___	___
g. Perimeter guarding	___	___	o. Electrical safety	___	___
h. Housekeeping	___	___	p. Rigging and crane safety	___	___
			q. Road Safety (Driving)	___	___

SAFETY AND HEALTH HISTORY (Continued)

12. Do you have a program for newly hired or promoted foremen?

    Yes ___ No ___

    If yes submit a copy for evaluation. Does it include the following?

	Yes	No		Yes	No
a. Safe work practices	___	___	e. First aid procedures	___	___
b. Safety supervision	___	___	f. Accident investigation	___	___
c. Toolbox meetings	___	___	g. Fire protection and prevention	___	___
d. Emergency procedures	___	___	h. New worker orientation	___	___

13. Do you hold craft "toolbox" safety meetings?

    Yes ___ No ___

    How Often?

    Weekly ___ Bi-Weekly ___ Monthly ___ Less Often, As Needed ___

14. Do you have a written Hazard Communication program?

    Yes ___ No ___

    If yes, how is it implemented on each project?

    _____
    _____
    _____
    _____

15. Do you have/require Material Safety Data Sheets (M.S.D.'s) for material/chemicals/equipment?

    Yes ___ No ___

    If yes, explain field procedure for informing craft workers about potential hazards:

    _____
    _____
    _____
    _____

SAFETY AND HEALTH HISTORY (Continued)

16. List three (3) client references that could verify the quality and management commitment of your safety program.

Name	Address	Phone No.
a._____	_____	_____
	_____	
b._____	_____	_____
	_____	
c._____	_____	_____
	_____	

EXHIBIT “C”

FORM F; RESUMES OF KEY PERSONNEL

EXHIBIT "C"

FORM F. RESUMES OF KEY PERSONNEL

Bidder to provide a resume for each key person to be assigned to the Contract, containing at least the following information on each person (attach and properly designate additional pages, if necessary):

POSITION: _____

TITLE: _____

a. Name:

b. Years of Experience:

c. Education/Qualifications:

d. Present Position in Bidder's Company (***include professional experience***):

e. Project Experience (***include Title/Scope/ Role and contract value for each project performed***):

f. Safety performance metrics from the last three (3) projects (First Aid cases, Recordable Incident Rate and Lost Workday Case Rate)

g. Employment History- include Title and Role at Company:

Resumes are required for the following positions: Project Manager, Safety Manager Superintendent and Quality Control Manager all of whom would be assigned full time to the Contract. Refer to Special Conditions 8.2 for additional qualification requirements.

Key personnel will be listed in the Special Condition titled "KEY PERSONNEL" (SC-8), restricting their replacement without CITY consent.

Failure to provide a complete resume as described above may result in the bid being found non-responsive.

EXHIBIT “C”

FORM G; SUMMARY OF QUALITY CONTROL PROGRAM

EXHIBIT "C"

FORM G. SUMMARY OF QC PROGRAM

Bidder to provide a summary description of the Quality Control (QC) Program (refer to Exhibit I) to be implemented in performance of the Work. This summary shall include information on the organization of the program, including the authority and responsibility of all involved personnel. As a minimum the Bidder shall submit the following information in narrative form:

(1) Quality Control Program Management.

(2) Items of work in this project where Quality Control Testing will be accomplished.

(3) Corrective Action program.

NOTES:
Final program will be approved as submitted under the Contract requirements

EXHIBIT “C”

FORM H; WORK IN PROGRESS

EXHIBIT "C"
FORM H. WORK IN PROGRESS

The following contracts are currently in progress or in bid stage for the following OWNERS or Prime Contractors:

Item No.	Customer Name, Address, Representative and Phone No.	Work Description	Location	Value	Start/Stop

NOTES:
Work Description: Describe work scope and then indicate if prime, subcontract or in bid stage.
Start/Stop: Provide schedule starting date and completion by mo/yr, e.g. Jan93/Sep94.

EXHIBIT “C”

FORM I; EXPERIENCE STATEMENT

EXHIBIT "C"

FORM I. EXPERIENCE STATEMENT

The Bidder submits the following statement as to its experience qualifications. In the case of a joint venture **or LLC**, separate forms will be submitted for previous experience of the joint venture and the experience of each party of the joint venture **or LLC.**

1. This company has been engaged in the contracting business under its present business name for _____ years.
2. Experience in work of a nature similar in type and magnitude to that set forth in the Bid extends over a period of _____ years.
3. All awarded contracts have been satisfactorily completed, except as follows (Name any and all exceptions and reasons therefore, attaching additional pages if necessary):

_____

_____

_____

_____

4. The following contracts, covering work similar in type and magnitude to that set forth in the Bid, have been satisfactorily completed within the last five (5) years.

5. Column completion notes:
   a. Work Description: Describe work scope and then indicate if prime or subcontract.
   b. Start/Stop: Provide starting date and actual/forecast completion by mo/yr, e.g. Jan 93/Sep94.
   c. Schedule and Budget: State either "over", "on", or "under" the Contract schedule and budget.

EXHIBIT "C"
FORM I. EXPERIENCE STATEMENT (continued)

Item No.	Customer Name, Address, Representative and Phone No.	Work Description	Location	Value	Start/Stop	Schedule	Budget

EXHIBIT D; INSURANCE AND BONDING/CONSTRUCTION SAFETY AND HEALTH PLAN

HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

FC-8075; F3 A380 RECONFIGURATION

EXHIBIT "D", CONSTRUCTION SAFETY AND HEALTH PLAN

The CONTRACTOR is required to provide a Site Specific Safety and Health Plan (Plan). This Plan is part of the Contract Documents. The CONTRACTOR must, at all times, comply with all aspects of the approved Plan as well as ensure that all employees and subcontractors comply with the provisions of the Plan. This Plan is a "living document" and will be updated as needed. This Site Specific Safety and Health Plan must be developed in accordance with the guidelines in Appendix 1 of this document.

The Site Specific Safety and Health Plan must be submitted in writing to the Engineer and approved prior to commencing Work at the Jobsite.

Costs for performing all Work necessary to provide a secure site must be incidental to the prices for other items of Work, and not priced separately.

EXHIBIT D

CONSTRUCTION SAFETY AND HEALTH PLAN (OCIP)
FC-8075 (F3 A380 Reconfiguration)

1.0 Safety and Health Plan.

1.1 The City of Atlanta ("CITY") has established this Construction Safety and Health Plan ("Plan") to promote safety and to minimize and control hazards and risks associated with construction projects at the Airport.

1.2 It is our goal to have zero safety incident Projects where all personnel can perform assigned tasks in a safe environment in accordance with governmental requirements and industry standards as specified in paragraph 2.0 of this document.

1.3 In this Plan, CITY's Safety Representatives include City of Atlanta's Office of Enterprise Risk Management, its CITY Controlled Insurance Program Safety (OCIP) Director, the Program Safety Manager, designated CITY Safety professionals performing as Owner Representative, and any other designee of CITY. In the event of any conflicting determinations among the CITY's Safety Representatives and / or consultants, the decision of the Director of CITY's Office of Enterprise Risk Management shall prevail.

1.4 The following CONTRACTOR submitted plans require approval by CITY before construction work can be started:

1.4.1 Site Specific Safety Plan (see paragraph 8.0 of this document)

1.4.2 Fire Prevention Plan (see paragraph 9.0 of this document)

1.4.3 Hazard Communication Plan (see paragraph 10.0 of this document)

1.4.4 Traffic Control Plan (see paragraph 11.0 of this document)

1.4.5 Trench Excavation Plan (if required) (See paragraph 12.0 of this document)

1.5 If a project is designated to be covered under the OCIP insurance coverage, the CONTRACTOR must first enroll the company through the OCIP web-based system and, additionally, ensure all subcontractors are properly enrolled. No contractor or subcontractor personnel will be allowed on a construction site until

all OCIP enrollment requirements are complete; OCIP badging is complete; the Project Safety Manager is approved; and required Plans, per paragraph 1.4, are approved.

2.0 Government Requirements and Industry Standards.

2.1.1 CONTRACTOR will comply with all Governmental Requirements and industry standards pertaining to safety and health at any Jobsite, including, but not limited to:

2.1.1.1 OSHA Construction Safety and Health Regulations, CFR Part 1926
2.1.1.2 CFR Part 1910
2.1.1.3 NFPA Standards
2.1.1.4 Operational Safety on Airport Construction (FAA 150/5370-2C)
2.1.1.5 N.E.C Standards
2.1.1.6 ANSI Standards
2.1.1.7 EPA Standards
2.1.1.8 MUTCD Standards

3.0 Responsibilities. This Plan is part of the Contract Documents. CONTRACTOR must, at all times, comply with all aspects of this Plan as well as ensure that all employees and subcontractors comply with the provisions of this Plan. CONTRACTOR will provide to CITY, and any person designated by CITY, access to CONTRACTOR personnel and to CONTRACTOR owned facilities for the purpose of performing audits and inspections of CONTRACTOR, CONTRACTOR personnel and/or any of the relevant information relating to the Plan and/or this Agreement. CONTRACTOR is subject to being audited under this Plan at any time during the term of this Agreement. CONTRACTOR shall provide full cooperation to CITY and its designated persons in connection with audit functions and examinations by regulatory authorities.

3.1 Contractor Responsibilities.

3.1.1 CONTRACTOR must include the obligations of this Plan in all of its written employment agreements, Subcontracts, purchase orders and any other documents utilized by it in obtaining goods and services relating to CONTRACTOR's performance of this Contract and Work on the Project. The failure of CONTRACTOR to submit any reports required by this Plan or to violate any of its provisions shall be sufficient cause to terminate CONTRACTOR'S right to proceed with the work. Stoppage or termination to proceed under this provision should not give rise to CONTRACTOR's right to seek damages or other relief for any resulting delay.

Noncompliance with any provision is sufficient cause for the City to delay approval of CONTRACTOR'S invoices for progress payments.

3.1.2 CONTRACTOR's Project Safety Manager may conduct as many inspections as he/she deems necessary on a daily basis. However, CONTRACTOR **must conduct** at least one (1) inspection per day of CONTRACTOR's Work, Jobsites and storage areas to assure safe conditions and practices. The Project Safety Manager will determine the number of daily inspections based on the sensitivity of the work being performed and in a sufficient manner to monitor safe operations on the Project.

3.1.3 Provide for training of all Employees in all Plan requirements, to include OCIP and CONTRACTOR safety orientation as well as trade training.

3.1.4 Immediately report to CITY'S Safety Representatives of any death, injury or damage to property at any Jobsite (or Work storage area) on the Airport or any other property adjacent to or near the Airport at which Work under this Contract is performed, per paragraph 7.0 of this document.

3.1.5 Full cooperation in the conduct of inspections by CITY's Safety Representatives, governmental agencies and other agencies of competent jurisdiction, e.g. OSHA. Copies of citation notices received by CONTRACTOR or its subcontractors from such agencies must be submitted to the CITY's Safety Representatives immediately upon receipt.

3.1.6 Use of equipment and protective devices as required by applicable regulatory agencies and CITY.

3.1.7 Immediate correction by CONTRACTOR of any unsafe conditions or unsafe acts by its employees, subcontractors, vendors, suppliers, etc.

3.1.8 Medical surveillance requirements for personnel exposed to hazardous substances, e.g. radiation badges.

3.1.9 Safety requirements and procedures for decontamination facilities, e.g. protective clothing and warning signs.

3.1.10 The use of forms and other information attached to this Plan, or such other forms or versions of those forms that CITY may, from time to time, direct CONTRACTOR to use.

3.1.11 Thorough investigation of safety incidents to ensure the inclusion of witness statements, completed incident forms, development of lessons learned that are fully distributed through the contractor's team and its subcontractor's, and incident investigation follow-up when new information has been obtained.

4.0 CONTRACTOR Obligations. The CONTRACTOR acknowledges that the effectiveness of this Plan depends on the active participation and cooperation of the CONTRACTOR, its Subcontractors and all Employees.

4.1 **General.** CONTRACTOR must:

4.1.1 Employ a full- time site dedicated Project Safety Manager per shift. The Project Safety Manager shall ensure that all of the Contractor's and its Subcontractors' activities under this Contract are in compliance with this Plan, the Contractor's Site-Specific Safety Plan, all Governmental Requirements and applicable industry standards. The CONTRACTOR's Project Safety Manager must submit weekly reports to the CITY's Safety Representatives each Monday on the previous week's inspections. CONTRACTOR's Project Safety Manager must utilize the Contractor's Safety Performance Report as required by OCIP.

4.1.1.1 The CONTRACTOR's responsibility cannot be delegated to subcontractor, suppliers or other persons. CONTRACTOR and lower tier subcontractor shall have a safety representative as a member of its organization at the jobsite whose duty it shall be to conduct its safety program and monitor subcontractor's compliance with the requirements of this document and preventing unsafe conditions and accidents. CONTRACTOR shall submit the qualifications (Resumes) of all proposed safety representatives to the CITY's Safety Representatives for review and consent prior to mobilization on the site. If the subcontractor's projected workforce is a total of twenty-five (25) or less an appropriately trained and experienced supervisor shall be given the duties of Safety Representative. If the subcontractor's projected workforce is twenty-five (25) or more a full-time safety professional shall be assigned to the site. When the subcontractor's total trade work force exceeds one hundred fifty

(150) or more an additional safety professional shall be assigned. CONTRACTOR will be in compliance with paragraph 4.2: *Training Attendance Requirements.*

4.1.2 Comply with applicable Governmental Requirements, industry standards, and Airport Regulations and Requirements, as outlined in this Plan and the Contract Documents.

4.1.3 Provide safety incident data to the City's Safety Representatives, as required.

4.1.4 Must return OCIP badges to the OCIP Office when CONTRACTOR's employees are no longer working on the Project.

4.1.5 CONTRACTOR is ultimately responsible for accident prevention and Jobsite safety. This responsibility may not be delegated to Subcontractors or other Persons.

4.1.6 **Experience Modification Rate (EMR) Requirements for Subcontractor(s):**

4.1.6.1 Contractor shall not, without the prior written approval of ENGINEER, subcontract with any entity which exceeds the following safety ratings for the previous year.

4.1.6.1.1	EMR:	1.00
4.1.6.1.2	LWDC:	2.00
4.1.6.1.3	OSHA Recordable:	4.00

4.1.6.2 If the Contractor elects to enter into a subcontract with any entity that exceeds the above minimum requirements, the Contractor shall submit supporting documents to the CITY identifying the reason(s) for the Subcontractor's rate(s) being higher than the above stipulated rates. The additional documents to be submitted include the previous three (3) years OSHA 300 Logs, the previous three (3) years EMR ratings and any other documents deemed necessary by the ENGINEER to complete the review. In addition, the Contractor will provide, in writing, to the

ENGINEER those additional safety oversight and mitigation measures to include changes to its work plan that the Contractor will implement in monitoring and in assisting the "at risk" Subcontractor until that portion of the Contract is complete. The ENGINEER, the Program Safety Manager and the OCIP Safety Director will review the submitted documents. The ENGINEER will render a decision regarding acceptance of the "at risk" Subcontractor on the project site and/or into the OCIP.

4.2 Training Attendance Requirements.

4.2.1 All Employees must attend a required Project Safety Orientation Class provided by the CONTRACTOR prior to starting Work on any Airport project. The orientation will cover all requirements outlined in section 4.4.1. After completion of the Project Safety Orientation Class, workers will receive an OCIP badge that must be worn on the outer layer of clothing between the belt and the shoulder.

4.2.2 CONTRACTOR, upon request, must provide evidence of the competent person's training for critical items of work (e.g., trench excavation).

4.3 CONTRACTOR Project Safety Manager Approval Process.

4.3.1 CONTRACTOR shall submit a resume(s) showing the experience and qualifications for Contractor's proposed Project Safety Manager(s) to the CITY's Safety Representatives prior to mobilization at any Jobsite. The minimum qualifications for a CONTRACTOR Project Safety Manager must have verifiable experience administering a safety program with a comparable size workforce on a similar type project. The Program Safety Manager and the CITY's OCIP Safety Director will review the submitted resumes for the Contractor's proposed original or successor Safety Manager(s) to assure that the minimum qualifications are met.

4.3.2 CONTRACTOR's project manager and superintendent must have a minimum of OSHA 30 safety training.

4.3.3 CONTRACTOR's Project Safety Manager must be OSHA 500 authorized.

4.3.4 CONTRACTOR is solely responsible for ensuring that its Project Safety Manager is of the caliber and quality to ensure compliance with the Construction Safety and Health Plan and the Contractor's Site-Specific Safety Plan.

4.3.5 The CITY reserves the right to interview a proposed candidate to better ascertain knowledge and experience before approving or disapproving a candidate. After the Project Safety Manager is approved, the CITY reserves the right to remove CONTRACTOR'S Project Safety Manager at any time for non-performance and/or non- compliance with The Construction Safety and Health Plan.

4.4 **CONTRACTOR's Project Safety Manager Responsibilities.** Contractor's Project Safety Manager must perform daily safety inspections of all Jobsites to eliminate unsafe acts and/or conditions in violation of the Contract Documents, Contractor's Site-Specific Safety Plan, and OSHA regulations.

4.4.1 Ensure that all workers attend, prior to commencing Work, an orientation program coordinated by the CONTRACTOR that will include, as a minimum, a review of: (a) hazards present in the area of Work; (b) the personal protective equipment and apparel employees must use or wear as specified under OSHA, and this Plan, (c) accident/incident reporting procedures; and (d) the panel of physicians available for treatment. Meetings must be conducted to accommodate all language requirements of the CONTRACTOR's Employees attending.

4.4.2 Ensure all Employees and subcontractors are made aware of the steps to take in the event of an accident or incident and the location of first aid facilities.

4.4.3 Provide weekly written reports to CITY'S Safety Representatives of all observed unsafe conditions or practices at any Jobsite, in violation of the Contract Documents, Contractor's Site-Specific Safety Plan, OSHA, Governmental Requirements or industry standards, specifically detailing all corrective actions taken.

4.4.4 Conduct root cause analysis following ALL personnel, equipment, and near-miss incidents.

4.4.5 Assist Program Safety Manager in the follow up root cause analysis, to include all documentation requested by the Program Safety Manager.

4.4.6 Review safety meeting reports submitted by all Job Superintendents and take necessary action to ensure that meaningful weekly safety meetings are being conducted.

4.4.7 Implement safety-training programs for all Job Superintendents and Employees applicable to specific responsibilities of each position.

4.4.8 Control the availability and use of necessary safety Equipment, including Personal Protective Equipment (PPE) for all Employees.

4.4.9 Cooperate with Safety Managers of other contractors, and take necessary steps to promptly implement appropriate safety recommendations.

4.4.10 Hold safety meetings on a weekly basis. Documentation of topics discussed and attendees must be maintained by CONTRACTOR and provided to the CITY'S Safety Representatives on the Monday following each week of the Project Work. Meetings must be conducted to accommodate all language requirements of the CONTRACTOR's Employees attending.

4.4.11 Provide monthly man-hour reports to the OCIP Administrator on the Monday following the 10th of the month. CONTRACTOR will ensure compliance of his staff and his subcontractors.

4.4.12 Attend the scheduled OCIP Safety Meeting at time and location determined by the OCIP Safety Director. The schedule of OCIP Safety meetings will be provided at the start of the project.

5.0 Miscellaneous Safety Requirements.

5.1 **Safe Operations.** CONTRACTOR is fully and solely responsible for conducting all operations under this Contract at all times in such a manner as to avoid the risk of endangerment to health, bodily harm to individuals and damage to property. CONTRACTOR must continually and diligently inspect all equipment, materials and Work to discover any conditions that might involve such risks

and is solely responsible for discovery and correction of any such conditions.

5.2 **Safety Orders.** CONTRACTOR must have copies of appropriate Federal, State and Local Safety Regulations at all Jobsites available for Employees to review and must comply with all provisions.

5.3 **General Safety Provisions**. CONTRACTOR must protect the health and safety of Employees, the public and other Persons, prevent damage to property, Materials, supplies, and Equipment and avoid interrupting the normal operation of the Airport. Although the list below is not exhaustive, CONTRACTOR must:

5.3.1 Ensure only approved safety cans are used for flammable and combustible liquids. "No Smoking or Open Flame" signs and fire extinguishers must be provided where required or as directed by owner's safety representative. Approved safety cans must be metal with flash arresters and spring-loaded tops.

5.3.2 Prevent construction/maintenance activities or materials from hampering any crash-fire-rescue vehicle access to any parts of the Airport.

5.3.3 Continuously remove all bird attractions, such as edibles (food scraps, etc.) or other miscellaneous garbage, trash, or pooled water at all Jobsites where CONTRACTOR is performing Work.

5.3.4 Secure all material and equipment to prevent displacement from wind or jet blast. No survey or barricade tape is to be used on any project inside the Aircraft Movement Area (AMA).

5.3.5 Have temporary electrical service equipped with ground fault circuit interrupters.

5.3.6 Provide adequate and proper fencing, barricading, marking, and lighting of construction, maintenance or other sections of the Airport that are temporarily closed to normal Airport use.

5.3.7 Ensure that all Employees working on, erecting, dismantling or modifying any scaffolding are trained by a competent person.

5.3.8 The CONTRACTOR must ensure all documentation of project safety training as well competent person training are maintained and are easily accessible, if required.

6.0 Protection of the Public and Property. CONTRACTOR must take all steps necessary to ensure protection of the public and property, including, but not limited to, adhering to the following requirements:

6.1 When it is necessary to maintain public use of Jobsites involving sidewalks, entrances to buildings, lobbies, corridors, aisles, stairways, and vehicular roadways, CONTRACTOR must protect the public with appropriate guardrails, lighting, barricades, temporary fences, overhead protection, temporary partitions, shields, and adequate visibility. This mandatory protection must guard against harmful radioactive rays or particles, flying materials, falling or moving materials and equipment, hot or poisonous materials, explosives and explosive atmospheres, flammable or toxic liquids and gases, open flames, energized electric circuits, or other harmful exposures.

6.2 Sidewalks, entrances to buildings, lobbies, corridors, aisles, doors, or exits that remain in use by the public must be kept clear of obstructions to permit safe ingress and egress of the public at all times.

6.3 Appropriate warnings, signs and instructional safety signs must be conspicuously posted where necessary. In addition, a signalman must control the movement of motorized equipment in areas where the public might be endangered, in accordance with the MUTCD.

6.4 Sidewalk sheds, canopies, catch platforms, and appropriate fences must be provided when it is necessary to maintain public pedestrian traffic adjacent to the erection, demolition or structural alteration of outside walls on any structure.

6.5 A temporary fence must be provided around the perimeter of above ground operations adjacent to public areas, except where a sidewalk shed or fence is required. Perimeter fences must be at least six (6) feet high. They may be constructed of wood or metal frame and sheathing, wire mesh or a combination of both. When the fence is adjacent to a sidewalk near a street intersection, at least the upper section of the fence must be open wire mesh from a point not over four (4) feet above the sidewalk and extending at least twenty-five (25) feet in both directions from the corner of the fence. Fences, which serve also as a component of the airfield security fence or within the Air Operations Area (AOA), shall be constructed in accordance with applicable Airport specifications.

6.6 Safe and adequate pedestrian zones and public transportation stops, as well as pedestrian crossings of the work at intervals not exceeding three hundred (300 feet) (90 m) also must be maintained, unless otherwise modified by CITY.

6.7 CONTRACTOR must furnish, erect, and maintain all barricades, warning signs and markings for hazards necessary to protect the public and the Work. When used during periods of darkness, such barricades, warning signs and hazard markings must be suitably illuminated, in accordance with the MUTCD.

6.8 Warning signs and lights, meeting Airport and FAA requirements, must be maintained from dusk to sunrise along the guardrails, barricades, temporary sidewalks, and at every obstruction to the public. These items must be placed at both ends of the protections or obstructions and not over twenty (20) feet apart alongside of the protections or obstructions.

6.9 Temporary sidewalks must be provided when a permanent sidewalk is obstructed by CONTRACTOR's operations. Guardrails must be provided on both sides of temporary sidewalks.

6.10 Fuel-burning lanterns, burn barrels, torches, flares, or other open-flame devices, are prohibited.

7.0 Accident Investigation and Reporting.

7.1 **ALL ACCIDENTS, INCIDENTS, NEAR MISSES, UNSAFE ACTS OR UNSAFE CONDITIONS MUST BE <u>IMMEDIATELY</u> REPORTED PER THE INCIDENT REPORTING PROTOCOL AND FOLLOWED UP WITH A WRITTEN REPORT WITHIN TWENTY-FOUR (24) HOURS OF THE OCCURRENCE. THIS PROTOCAL DOCUMENT WILL BE PROVIDED UPON ENROLLMENT IN THE OCIP.**

7.2 **First Aid. All accidents which occur from operations or Work performed at the Airport <u>must</u> be referred to the listed panel of physicians, except in cases of extreme emergency. This list will be provided to the CONTRACTOR upon enrollment in the OCIP.**

7.3 **Emergency Telephone Numbers. CONTRACTOR <u>must post</u> a list of emergency telephone numbers; to include** doctor and ambulance, fire, etc., next to telephones at the Project.

7.4 **Posted panel of physicians.** CONTRACTOR must post the Panel of Approved Physicians furnished by the OCIP Insurance Carrier in a conspicuous location where it can be seen by all Employees.

7.5 CONTRACTOR must secure the affected area immediately after the accident in order to prevent any alteration of the scene before the investigation. The area is to be cordoned off and an individual posted by CONTRACTOR to restrict unauthorized personnel as necessary.

7.6 CONTRACTOR shall not make any news releases or statements to the public regarding any matters related to the Project.

7.7 CONTRACTOR must obtain witness statements when there has been an incident/accident. The witness must sign and date the statement. CONTRACTOR must provide the CITY'S Safety Representatives with all witness statements within twenty-four (24) hours of completion of witness statements.

7.8 The Incident/Accident Report form must be filed within twenty-four (24) hours of the occurrence with the CITY's Safety Representative, the Program Safety Manager, and the OCIP Safety Director.

7.9 Appropriate drug screening must be conducted after any incident or accident within four (4) hours.

7.10 CONTRACTOR will conduct a root cause analysis with the appropriate parties involved in the incident and other stakeholders within 48 hours of the incident. A detailed summary report of the results of the analysis will be provided to the CITY's Program Safety Manager and the OCIP Safety Director.

8.0 Site-Specific Safety Plan.

8.1 **General:** This Plan is intended as a universal document for all work the CONTRACTOR is to perform per the Contract Documents. Once approved by the CITY's Office of Enterprise Risk Management, it must be fully briefed and disseminated to all contractor personnel and subcontractor personnel. This Plan is a "living document" and will be updated as needed.

8.2 Site specific safety plan must be developed in accordance with guidelines in Appendix 1 of this document.

9.0 Fire Prevention Plan / Program.

9.1 **General.** A Fire Prevention Plan / Program must be submitted in writing to the ENGINEER, for review and coordination with other Jobsite activities prior to commencing Work at any Jobsite. Such program must include:

9.1.1 At a minimum, OSHA and NFPA standards.

9.1.2 Restriction of burning to designated areas. No unauthorized fires shall be permitted on Jobsite.

9.1.3 Assignment of fire watches, trained and equipped to prevent or control fires, for all welding and burning operations. Fires should be monitored for three hours after the burning.

9.1.4 Proper identification, storing, handling and use of inflammable Material to prevent accidental ignition.

9.1.5 Adequate fire extinguishing Equipment appropriate for the operations being performed must be provided and Employees must be trained in the maintenance and use of such Equipment.

9.1.6 Evacuation procedures and fire drills as required by the Program Safety Manager.

10.0 Hazard Communication Plan / Program.

10.1 **General.** A Hazard Communication Plan / Program must be submitted in writing to the Program Safety Manager and the OCIP Safety Director for review and coordination with other Jobsite activities prior to commencing Work at any Jobsite. This Program shall include:

10.1.1 Receipt/Identification of Material Safety Data Sheets (MSDS) for Materials being brought onto the Jobsite by CONTRACTOR or its Subcontractors.

10.1.2 Employee training on MSDS's and in the handling and disposal of Materials that fall under statutory regulations.

10.1.3 Medical Surveillance Program. CONTRACTOR will establish a medical surveillance program to monitor the health of employees whose work environment may be exposed to

occupational hazards. Health records will be maintained for thirty (30) years after the last date of employment.

11.0 Traffic Control Plan.

11.1 **General.** The CONTRACTOR must also submit to DOA Operations for approval a comprehensive plan detailing how traffic will be maintained on all Work under this Contract. For vehicular and pedestrian traffic, CONTRACTOR must furnish, erect and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual of Uniform Traffic Control Devices (MUTCD) for Streets and Highways (published by United States Government Printing Office).

12.0 Trench Excavation Plan.

12.1 **General.** Before excavating any trench five (5) feet or more in depth, CONTRACTOR must submit to ENGINEER and CITY's Safety Representatives a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for the Employees' protection from the hazard of caving ground during the excavation of such trench. The Plan must be designed per OSHA standards.

13.0 Construction Requirements.

13.1 **Fall Protection Requirements.** These fall protection requirements are mandatory for all trades, involved in performing Work on the Project.

13.1.1 CONTRACTOR must apply and enforce 100% fall protection for all work performed six (6) feet or more above ground or finished floor level.

13.1.2 CONTRACTOR must take all practical measures to eliminate, prevent and control fall hazards. The Project must be surveyed prior to the commencement of any Work to identify all hazards of Personnel falling from elevations. First consideration must be given to the elimination of those hazards. If a fall hazard cannot be practically eliminated, second consideration must be given to implementing effective permanent means of fall protection.

13.1.3 All Employees who are working where fall hazards cannot be eliminated or falls prevented must be uniformly equipped,

trained and given refresher training every twelve (12) months to minimize adverse effects of accidental falls.

13.1.4 All employees must utilize a full body harness with two (2) shock-absorbing lanyards to allow continuous protection.

13.1.5 Guardrail systems consisting of a top rail, mid-rail and toe plate must be installed on perimeter edges or scaffolding.

13.2 **Eye, Face and Head Protection Policy.** All personnel shall at all times wear American National Standard Institute approved safety glasses, hard hats and face shields (as needed) while working on the Jobsite.

13.3 **Lighting and other Hazard Markings**. CONTRACTOR must furnish, erect and maintain markings and associated lighting of open trenches, excavations, temporary stock piles and its parked construction Equipment that may be hazardous to the operation of emergency fire-rescue or maintenance vehicles on the Airport in reasonable conformance to FAA guidelines, including FAA Advisory Circular 150/5370-2D, Operational Safety on Airports during Construction. CONTRACTOR must identify each motorized vehicle or piece of construction equipment in reason conformance to FAA Advisory Circular 150-5370-2D.

14.0 Safety Not Separately Priced. Costs for performing all Work necessary to provide safety measures must be incidental to the prices for other items of Work, and not priced separately.

15.0 Enhanced Project Safety Rules. The project safety rules attached as Appendix 2 to this Exhibit will be briefed to all personnel and posted on the project site. These rules are intended to enhance OSHA requirements and to establish policy for projects on the Hartsfield-Jackson Atlanta International Airport (HJAIA).

Appendix 1 to Exhibit D

Components of a CONTRACTOR Health and Safety Plan

Section 1 – This section should include a safety commitment letter signed by the President of your company. The following items must be addressed by this letter:

a. Company commitment to being incident and injury free, and your company's philosophy on safety.

b. Company acknowledgement that they will support and participate in a light duty/return to work policy. Reference the "Return to Work" section in the OCIP Manual.

c. Company acknowledgement that they will commit to drug free workplace.

d. Company acknowledgement that they will comply with OSHA Standards 29 CFR 1926, 29 CFR 1910 and 46 CFR (if applicable)

e. Project Safety Manager's name and lines of authority, his authority regarding safety matters.

f. The following attachments should follow the commitment letter:
   1. Project Safety Manager and Alternate Safety Manager's resumes (must meet specification qualifications).
   2. Contact List for Supervisory Staff:
      i. Name
      ii. Job Title
      iii. Office Telephone Number
      iv. Cellular Telephone Number
      v. E-mail address
   3. List of Subcontractors:
      i. Name of Subcontractor
      ii. Address
      iii. Contact Person
      iv. Office Telephone Number
      v. Cellular Telephone Number
      vi. E-mail address

Section 2 – This section should include your company disciplinary policy which incorporates Section 6 of Appendix 2, Safety Rules for All Projects.

Section 3 – This section should include your company drug policy which incorporates Section 2 of Appendix 2, Safety Rules for All Projects.

Section 4 – This section should include the site specific job hazard analysis for your project. It should take the tasks in your project schedule, analyze the hazards and list the proposed safety measures to abate those hazards.

Section 5 – This section should include your health and safety program administration.

a. How you intend to conduct the on-site, day-to-day operations of your program and roles / responsibilities of those in your organization in compliance with state, federal and local jurisdictions, commitment to safety education and training.

b. How you handle new hire training, employee responsibilities, first aid, CPR, Return to Work Program, etc.

c. Include in this section how you will address the items included in 29 CFR 1926 Subpart C General Safety and Health Provisions.

Section 6 – This section should be broken up into safety categories. At a minimum, it shall include sections on the following:

a. Safe Work Practices
b. Housekeeping
c. Personal Protective Equipment
d. Respiratory Protection
e. Hearing Protection
f. Fall Protection
g. Fire Prevention
h. Ladder, Stairway and Ramp Safety
i. Scaffolding
j. Electrical Safety
k. Lockout / Tag out Procedures
l. Tool safety
m. Personal Hoists / Man-lifts
n. Welding and Cutting
o. Compressed Gas Cylinders
p. Excavation and Trenching
q. Mobile Equipment Operation and Operator Training
r. Trucking
s. Steel Erection
t. Cranes & Rigging
u. Hazardous Material Handling
v. Hazard Communication Compliance
w. Confined Space Entry Program
x. Concrete and Masonry Construction
y. Demolition
z. Explosives
aa. Work Zone Safety – MUTCD
bb. Site Security

cc. Miscellaneous – (Include any applicable items not covered above needed to successfully complete your contract.

Note: Not all items in Section 6 may be used in the course of your construction. If an item is not relevant, you may leave it out of your plan, but indicate under that item that it is not needed for your project. There may also be items not included above that are relevant, but which are not included above. Those items must still be addressed in your plan.

A failure to include items in your safety plan which may be needed later will not relieve you of the responsibility to comply with all government standards that would apply and we reserve the right to require a supplemental safety submission to address that specific issue.

Appendix 2 to Exhibit D

Safety Rules for All Projects

1. **OCIP Site Badges and OCIP Safety Orientation.**

   a. Badges will be issued upon completion of the required safety orientation and will be good until the expiration date shown on the badge. If a worker changes companies or projects, that worker may come in with a Safety Orientation Sign-Off Sheet from the CONTRACTOR'S Project Safety Manager for the new project. Information in the OCIP database will be updated and a new badge issued. Specified times for badging will be given to the contractor at the pre-construction meeting.

   b. All workers shall display their OCIP badge on the outer layer garment of clothing between the belt and shoulder. Workers who are on site without a badge will be asked to leave the project.

   c. Workers who lose their badge will be required to pay a $20.00 replacement fee for a new badge.

2. **Drug and Alcohol Testing.**

   a. Use and/or possession of intoxicants, alcohol or drugs, are strictly prohibited. Use and/or possession will result in immediate termination and removal from the project.

   b. Drug testing shall be a regular part of your program and include the following types of testing:

      i. Post Accident – a worker who has an accident will be drug tested at the hospital or clinic. This applies to property and personnel incidents.

      ii. For Cause – workers who exhibit behavior of a nature consistent with possible drug use will be subjected to immediate drug testing. Failure to comply with a request for testing will result in immediate removal from the project.

      iii. Random – random testing will be done at the company level. The cost of all drug testing will be borne by the CONTRACTOR.

3. **Personal Protective Equipment (PPE).**

   a. All contractor personnel, DOA personnel and owner representatives, City of Atlanta Personnel, Vendors, Suppliers, and all visitors to the jobsite will dress as follows:

i. Hardhats / construction helmets– must be worn 100% of the time while workers are on the project. The bill will face the front. No caps of any kind will be worn under hardhats. Hard hats must meet the applicable ANSI standards.
ii. Safety glasses will be worn 100% of the time while workers are on the project. Safety glasses must meet the applicable ANSI standards.
iii. Shirts with sleeves (minimum 4") – no cut offs or tank tops are allowed.
iv. Long pants extending to the boot
v. Work boots
vi. Reflective vests
vii. Hearing protection in accordance with OSHA standards
viii. Work gloves (as required by contractor internal policies)

b. The following items of clothing or manner of dress are not considered appropriate attire and will not be allowed:
   i. Cut-off shirts (sleeves or midriff)
   ii. Workers without shirts
   iii. Tennis shoes or hiking boots
   iv. Glasses that are not safety glass (meet ANSI Z87 standard)
   v. Jewelry – rings, earrings, body piercing, necklaces, etc. will not be worn around or near moving parts or tools.

4. **Housekeeping.** Housekeeping shall be done on a daily basis or as needed to ensure a safe working environment. Dumpsters shall be provided on each project for the removal of construction debris. Construction debris shall be removed to dumpsters daily or more often as needed. Work areas shall be cleaned as needed to provide for worker safety. Trash receptacles shall be provided on site for the disposal of cans, garbage and trash. These receptacles shall be clearly marked "Trash" and shall be emptied as needed to comply with sanitary requirements.

5. **Restrictions.**

a. No glass containers are allowed on the job site. Workers may use aluminum cans or plastic bottles and these must be disposed of properly.

b. When working on the Aircraft Operations Area (AOA), workers are to place all uneaten food; food wrappers, bottles and cans back in their lunch box and remove them. No debris (Foreign Object Debris (FOD) is to be left on the AOA.

c. No use of music devices are allowed on the jobsite, including, but not limited to radios, cellular phones, cassette players, CD player, or IPODs.

d. No yellow caution tape, red danger tape or survey tape is to be used on projects inside the Aircraft Operations Area (AOA).

6. **Imminent Danger to Life and Health situations (IDLH).** Anyone (e.g., visitors, consultants, excluded contractors, OCIP enrolled contractors, etc) who observes, has knowledge of, or is observed acting in a manner, which expose them or a coworker to serious injury or death will be disciplined as follows unless the act is so egregious that it requires immediate termination:

   a. first occurrence – Seventy-Two (72) hour suspension from Project. This suspension period will exclude weekends and all holidays. Within two (2) hours of the suspension, CONTRACTOR must provide CITY's Program Safety Manager with documentation of who has been suspended and when they are allowed back on the Project. Included in the documentation will be the date and type of re-training that will occur before the suspended individual is allowed to return to work. The CONTRACTOR must confiscate the individual's OCIP badge and provide evidence in the documentation. The badge can be returned to the individual upon completion of re-training requirements.

   b. second occurrence – Removal from Project

   c. Incidents that would result in a violation of this policy include, but not limited to the following:
      1) Fall protection issues (not being properly anchored)
      2) Excavation issues (no trench box or sides of the excavation not properly sloped)
      3) Electrical safety - failure to use proper lockout / tag out procedures
      4) Welding or cutting without proper eye protection
      5) Ladder safety – dangerous practices
      6) Riding in the back of a pick-up truck
      7) Confined Space Entry Safety (monitor, permit, training, etc.)
      8) Riding in or driving a truck or operating heavy equipment without using a seatbelt. The driver will be held responsible for compliance of the seatbelt policy by all passengers.

7. **Temporary Power.** All temporary power shall be on ground fault circuits at all times. If outlets are not ground fault circuit interrupter (GFCI) protected, a (GFCI) pigtail shall be used between the tool and the power source. All GFCI circuits should be tested before being used. They are mechanical devices, which can fail.

8. **Cranes.** The following additional requirements to OSHA will be followed when operating a crane on any project:

   a. Signalmen will stand where they may be clearly seen by the operator. They must be properly trained and have no other duties while they are signaling the crane operator.

   b. FAA Form 7460 must be filed and approved before crane use on Airport property.

9. **Ladders.** Fiberglass ladders only are acceptable for use on the project.

10. **Loitering.** There will be no loitering in the parking lots once the workday is completed. All employees should leave the job site in a reasonable period of time after the completion of their shift.

11. **Hot Work.** The following procedures will be followed for all hot work: cutting, grinding or welding:

    a. Flash arrestors shall be installed at the regulator on all cutting torches. An additional flash arrestor shall be installed on the manifold if used.

    b. Flash shields or blinds shall be used to prevent exposure of workers in the vicinity any welding operation. All efforts shall be made to prevent exposure of workers to ultraviolet rays and radiation energy.

    c. Fire extinguishers of the proper size and type shall be provided in all areas where hot work such as cutting, welding, grinding, etc. is taking place. The minimum size and type of fire extinguisher that is acceptable is a 5lb. ABC fire extinguisher. Fire extinguisher inspection tags must be in place on the unit and inspections must be current (within the last 6 months).

    d. "Hot Work Permits" must be obtained from the Atlanta Fire Inspector prior to the use of any open flame cutting, welding, etc. A copy of the permit must be on site at all times during any "Hot Work" activity.

12. **Protection.** See section 6 of this document.

13. **Respect.** Airport passengers and airline employees will be treated with the utmost respect and courtesy. Anything less may result in removal from the project site.

14. **Harassment.** Harassment of any kind (e.g., sexual, personal, property, etc) will not be tolerated in any area controlled by the HJAIA. Proof of harassment will be grounds for removal from the project and possible action by the CONTRACTOR.

15. **Work Place Violence.** All acts of work place violence will be reported to your supervisor, who shall report in accordance with the project's incident reporting protocol. This protocol document will be provided upon enrollment in the OCIP.

16. **Accidents or Incidents.** All accidents, incidents, near misses, unsafe acts or unsafe conditions must be immediately reported to your supervisor, who must immediately report the occurrence in accordance with the Project's incident reporting protocol and followed up with a written report within twenty-four (24) hours of the occurrence. This incident protocol document will be provided upon enrollment in the OCIP.

    a. First Aid – All accidents which occur from operations or work performed at the airport must be referred to the listed panel of physicians, except in case of extreme emergency.

    b. Emergency Telephone Numbers – A list of emergency telephone numbers, to include doctor, ambulance, police and fire numbers shall be posted at all telephones on the project.

END OF DOCUMENT

City of Atlanta, Department of Aviation
Atlanta Hartsfield International Airport Expansion Project
Insurance Program

Insurance Information Form (Page 1)

Contractor Name:
Subcontractor To
(if applicable):
Address:
Phone:
Project Name: _____ Contract No.:_____
Contract Amount: _____ Est. Payroll: $ _____
Est. Start Date: _____ Est. End Date:_____

I. Workers' Compensation Information (Project Site Only):
(*See next two pages for classification codes).*

	Classifications	**W. C. Code**	**Current Rate x Payroll Per $100 of Payroll**	**Premium**
1.	_____	_____	$_____ X $_____	= $_____
2.	_____	_____	$_____ X $_____	= $_____
3.	_____	_____	$_____ X $_____	= $_____
4.	_____	_____	$_____ X $_____	= $_____
5.	_____	_____	$_____ X $_____	= $_____

(Attach Worksheet if more than five codes are used)

Totals: $_____ $_____

Experience Modifier: X
Modifier Premium:
Employers' Liability (Coverage One -B): +
Total Modified Premiums: $
Regular Workers' Compensation Insurer:
_Experience Rating Date (Policy Effective Date):
_Interstate Bureau I.D. #
_Federal Employer I.D.#

City of Atlanta, Department of Aviation Atlanta Hartsfield International Airport Expansion Project Insurance Program

Insurance Information Form (Page 2)

Classifications	GL Code	Current Rate x Payroll Per $100/$1000 of Payroll	Premium
II. General Liability:		$ _____ X $_____	= $_____
III. Excess/Umbrella Liability		$ _____ X $_____	= $_____
IV. Completed Operations (Five Years)		$ _____ X $_____	= $_____
V. Lower-Tier Contractor Premium (Excluding Auto):			= $_____
VI. Total Premium (I+II+III+IV+V):			$_____
VII. Overhead and Profit on Insurance Premiums:			+ $
VIII. Total Amount Excluded from Bid (VI + VII):			$

Agreement: Contractor agrees to permit the City of Atlanta or its Agent to inspect the insurance policies and payroll records used in determining the premium cost outlined above. (As per the General Conditions of the Contract).

Signed by:_____ Title:_____

Print Name: _____ Date:_____

Contractor's Insurance Broker or Agent:

Name:_____ Contact: _____

City:_____ Phone: _____

(Include Area Code)

Workers' Compensation Classification Codes

Code	Description
8601	Architect, or Engineer – Consulting
5188	Automatic Sprinkler Head Installation
5190	Cable Installation and Drivers
5403	Carpentry
5437	Carpentry-Trim and Cabinet
5610	Cleaner-Debris Removal
8810	Clerical Office Employees
5213	Concrete Construction
5221	Concrete or Cement Work-Floors, Driveways, Yards or Sidewalks and Drivers
6325	Conduit Construction – For Cables or Wires, and Wires and Drivers
5606	Contractor – Executive Supervisor
6229	Drainage or Irrigation System Construction, and Drivers
6204	Drilling NOC and Drivers
3724	Electrical Apparatus Installation or Repair, and Drivers
7538	Electrical light or Power Line Construction, and Drivers
5190	Electrical Wiring
5160	Elevator Erection or Repair
6217	Grading or Land, and Drivers
6400	Fence Erection – Metal
9521	Floor Covering Installation
6319	Gas, Steam, or Water Main Connection, and Drivers
5462	Glaziers – Away from Shop
6217	Grading or Land, and Drivers
5479	Insulation Work NOC
5057	Iron and Steel Erection
6229	Irrigation System Construction
0042	Landscape Gardening
5022	Masonry
3724	Milwright work, and Drivers
6003	Pile Driving
5183	Plumbing, and Drivers
7219	Rigging, and Drivers
6306	Sewer Construction – All Preparation, and Drivers
Code	Description

5538	**Sheet Metal Work – Shop and Outside, and Drivers**
5703	**Shoring (including Sheeting, Bracing, Decking, etc.)**
3726	**Tank Erection or Repair – Metal – Within Buildings**
5445	**Wallboard Installation**

Other

CITY OF ATLANTA

HARTSFIELD-JACKSON

Atlanta International Airport

OWNER CONTROLLED INSURANCE PROGRAM (OCIP) MANUAL

Effective Date: 07/01/2014
Manual Date: 06/23/2014 v1

FC–8075, F3 A380 RECONFIGURATION D.05.26.001

Neill Davis, OCIP Administrator, Resurgens Risk Management
Office: 404-766-8715 | Cell: 404-725-6103 | Fax: 404-559-2395
Neill.Davis@atlanta-airport.com
Website: www.rrmgt.com

RRM Resurgens Risk Management

Willis

INTRODUCTION

City of Atlanta (Owner) has purchased certain insurance coverages outlined in this manual under an Owner Controlled Insurance Program (OCIP) for Contractors of all tiers working on the Project who are enrolled in the OCIP. **Participation in the OCIP is mandatory, except for those identified as Excluded Parties, BUT ENROLLMENT IS NOT AUTOMATIC**. You must comply with the OCIP registration and enrollment procedures outlined in this manual.

The City of Atlanta has determined that the OCIP is a **"Bid Net"** program, which means that Contractor's charges for the insurance coverages provided by the Owner (as outlined in Section 6) must be **EXCLUDED** from bid(s). The successful Contractor must warrant that its base price for the original scope of work and subsequent change orders will **EXCLUDE** all insurance charges for the coverages provided by the Owner for the Jobsite, including workers' compensation, employers' liability, general liability, excess liability, builders' risk, and contractors' pollution liability.

The successful Contractor must sign on and complete the online OCIP registration and enrollment, and provide the required documentation to estimate its excluded insurance charges. These estimates will be tracked by the OCIP Administrator *for reporting purposes only*.

Instructions for online OCIP registration and enrollment are detailed in Section 8.

The insurance coverage provided by the OCIP, as well as your rights and responsibilities under the program, are outlined in this manual and are as much a part of your Contract as the actual work specifications. All terms and conditions of this OCIP Manual are incorporated by reference into your Contract, and you are required to bind all your lower-tiered subcontractors to the terms, conditions and requirements of this manual.

NOTE: This Manual does not, and is not intended to, provide coverage interpretations or complete information about coverages. The terms and conditions of the insurance policies will govern how coverage is applied. The information herein is not intended to alter any provisions of the actual contract documents of the Contractors, and if any such conflict occurs, the contract documents will govern.

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SECTION 1 - DIRECTORY

Owner: **City of Atlanta/Department of Aviation**
Hartsfield-Jackson Atlanta International Airport

Project Development Director
Ted Allen
Phone: 404-530-5512
Email: ted.allen@atlanta-airport.com

Risk Management - COA
Kathy Lloyd
Phone: 404-330-6877
Cell: 404-569-0794
Email: klloyd@atlantaga.gov

Risk Management - DOA
Catrina Gilbert
Phone: 404-382-2240
Cell: 404-387-4399
Email: catrina.gilbert@atlanta-airport.com

OCIP Program Management: **Willis Insurance Services of Georgia, Inc.**

OCIP Account Advocate-
Joan Bahret
Phone: 404-302-3809
Cell: 404-903-8810
Email: joan.bahret@willis.com

OCIP Claims Consultant-
David Simmons
Phone: 404-224-5062
Cell: 770-617-1390
Email: david.simmons@willis.com

OCIP Program Administration: **Resurgens Risk Management (RRM)**

OCIP Program Manager-
Marlene Butler
Phone: 678-298-5126
Email: mbutler@rrmgt.com

OCIP Administrator-
Neill Davis
Phone: 404-766-8715
Cell: 404-725-6103
Fax: 404-559-2395
Email: neill.davis@atlanta-airport.com

OCIP Safety Director-
Tarik Kenyetta
Phone: 404-766-8715
Cell: 404-772-5944
Email: tarik.kenyetta@atlanta-airport.com

SECTION 2 - DEFINITIONS

Contract: For purposes of this OCIP Manual only, the written agreement between City of Atlanta and the Construction Manager or General Contractor; or between the General Contractor and its Subcontractors; or between the Subcontractor and its lower tiered subcontractors.

Construction Manager (CM): The team retained by the Owner to assist in the management of construction projects.

Construction Safety and Health Plan: The manual that identifies the requirements for the Project's safety and loss prevention program as established by the Owner.

Contractor: For purposes of this OCIP Manual only, Contractor includes construction managers, prime or general contractors, and subcontractors of all tiers that perform work on the Project Site.

Enrolled Contractor(s): A Contractor of any tier who has been awarded work and met the requirements to become enrolled in the OCIP as evidenced by a certificate of insurance issued by the OCIP Administrator. The Owner may, at its discretion, include a Contractor in the OCIP who otherwise would be an Excluded Party by definition.

Excluded Party(ies): Material Hauler(s), contract haulers or truckers, architects/engineers, consultants, manufacturing representatives, vendors, Suppliers, material dealers, guard services, janitorial services, food services, or others merely making deliveries to or pickups from the Jobsite are excluded from the OCIP coverage. In addition, EIFS Contractors, asbestos abatement or other hazardous material Contractors, demolition or blasting Contractors, and Contractors whose contracts are less than $20,000 will be excluded from the OCIP coverage. The Owner may, at its discretion, exclude others from the OCIP.

> ***NOTE: although not covered under the OCIP, all Excluded Parties performing work onsite are required to complete the online OCIP registration in order to provide satisfactory evidence of insurance in compliance with all minimum insurance requirements detailed in this manual.***

General Contractor(s): The firm identified in the Contract with the Owner to construct this Project.

General Contractor's Project Manager: The individual assigned by the General Contractor with overall Project responsibility.

Insured: Owner and all Enrolled Contractors and any other party named as an Insured on the OCIP certificates of insurance.

Insurer(s): Zurich American, Lloyds of London, Catlin and Chartis.

Insurer(s) Loss Control Representative(s): The individual(s) assigned to the OCIP by the Insurer(s) with safety and loss control responsibilities.

Jobsite: For purposes of this OCIP Manual only, the premises as defined in the contract documents appropriate to each project and any scheduled offsite location if dedicated solely to the project and approved by the Owner and Insurers. This shall not include operations at the Enrolled Contractor's regularly established workplace, plant, factory, office, shop, warehouse, yard or other property, even if such operations are for fabrication of materials to be used at the jobsite.

SECTION 2 – DEFINITIONS *(CONTINUED)*

Materials Hauler: Any entity whose role on the Project is to transport materials to and from the Project site. A Materials Hauler is designated as an independent contractor. The designation of Materials Hauler may be made by scope of contract, by primary function on the Project, or by definition. Nothing contained in the Contract Documents shall create any contractual relationship whatsoever between the Owner and any Materials Hauler. By definition, "Materials Haulers" are **not** considered Enrolled Contractors for OCIP coverage purposes.

OCIP: A program under which Workers' Compensation, Employer's Liability, General Liability and Excess Liability insurance are procured by the Owner for all Enrolled Contractors of every tier while performing specified operations at the project specific Jobsite.

OCIP Claims Consultant: The individual assigned by the OCIP Program Management who is responsible for coordinating the claims handling between the Owner, Enrolled Contractors and the Insurer(s).

OCIP Program Management: Willis Insurance Services of Georgia, Inc.

OCIP Program Administration: Resurgens Risk Management (RRM) is responsible for the day-to-day administration of the OCIP.

OCIP Safety Director: The person employed by the OCIP Program Administration with safety and loss prevention responsibilities for the Project.

Offsite: Premises other than the Jobsite.

Onsite: See Jobsite definition.

Owner: City of Atlanta.

Project Site: See Jobsite.

Project Safety Manager: The individual assigned by the General Contractor who supervises its employees and all Subcontractors for safety at the Jobsite.

Site Safety Representative: The individual(s) assigned to perform Onsite safety duties.

Subcontractor: Any individual, firm, or corporation undertaking construction or other services under a Contract with a General Contractor or its Subcontractors to furnish labor, services, materials and/or equipment, and/or perform operations at the Project site.

Supplier: A person or organization supplying materials or equipment needed for the completion of the Work by virtue of an agreement ("Supply Agreement") with the General Contractor or Subcontractor; or by scope of contract, by primary function on the Project, or by definition. Nothing contained in the Contract Documents shall create any contractual relationship whatsoever between the Owner and any supplier. By definition, "Suppliers" are **not** considered Enrolled Contractors for OCIP coverage purposes.

SECTON 3 - GENERAL PROVISIONS

Each Contractor shall comply with the provisions stated below:

1. Mandatory Compliance

Failure to comply with the registration, enrollment and all other requirements outlined in this manual may be deemed non-compliance with the terms of the Contract, and payments may be withheld until requirements are satisfactorily completed and approved by the OCIP Administrator.

2. Meeting Attendance

At the request of the Owner, OCIP Program Management and OCIP Program Administration, Contractors shall attend meetings held to explain and discuss the OCIP.

3. OCIP Manual Incorporated into Bid Specifications and Contract

This OCIP Manual and the Construction Safety and Health Plan will be a part of the bid specifications and bidders are expected to be familiar with the requirements prior to submitting their bids. In addition, this OCIP Manual and the Construction Safety and Health Plan are incorporated into each successful bidder's awarding Contract and accordingly, all provisions require mandatory compliance.

4. Commencement of Work

Contractors shall not commence work at the Jobsite until:

a) Enrolled Contractors have received a certificate of insurance issued by the OCIP Administrator and provided a certificate for offsite activities as required in this manual, or

b) Excluded Parties have provided a certificate of insurance as required in this manual, and

c) All Parties have met the requirements of the Construction Safety & Health Plan.

SECTION 4 - SAFETY AND LOSS PREVENTION

Protecting people and property are of paramount importance to the success of this Project. Incidents on this Project can be controlled and prevented through safe work practices. All Contractors and Subcontractors and each of their employees are responsible for safety on this Project.

Active participation by the Contractors and Subcontractors in all project safety and loss prevention programs is mandatory. They must demonstrate to their employees complete support and continuing involvement in all safety and loss prevention programs.

1. Safety Policy Statement

It is the objective of the General Contractor and the Owner that a safe work place is provided. The General Contractor and all others employed on the Project will conduct their work in a safe manner consistent with good construction safety practices in addition to all written requirements.

The General Contractor and the Owner require full compliance with these safety guidelines, with all federal, state and local laws, statutes, ordinances, rules, regulations, requirements and guidelines of government authorities, agencies and any other authorities having control or responsibilities bearing on the performance of this Project work.

Contractors and subcontractors are charged with the responsibility of preventing the occurrence of incidents or conditions that could lead to injuries or illness. The ultimate success of our safety program depends fully upon the total cooperation of every individual employee, and it is the employer's responsibility to ensure that safety rules and procedures are enforced and to further ensure that effective training and education programs are employed. Work will be performed in a safe manner to protect all employees, visitors, the public and adjacent property.

2. Project Safety and Loss Prevention Program

Contractors and Subcontractors shall ensure that their bids include the cost to maintain a safety and loss prevention program that meets or exceeds the requirements contained in the Construction Safety & Health Plan.

The General Contractor will have a Project Safety Manager. This individual will be a technical advisor to the General Contractor's Project management team and will be responsible for monitoring Contractors' and Subcontractors' compliance with all safety and loss prevention programs. The Project Safety Manager, along with the General Contractor's Project Manager will attend all OCIP meetings between the Owner, Willis, RRM and the Insurers.

Section 4 - SAFETY AND LOSS PREVENTION *(CONTINUED)*

The Project Safety Manager has authorization to stop any work that may stem from non-compliance with safety procedures.

Contractors and Subcontractors will be solely responsible for implementing the safety and loss prevention program and shall designate an Onsite safety competent person to direct their Onsite safety efforts. The safety competent person is responsible for directly overseeing the Contractor's and Subcontractor's employees to ensure that their safety programs and actions adhere to and comply with safety standards as established by federal, state, and local codes and regulations, and the **Construction Safety & Health Plan**.

3. Construction Safety & Health Plan

The Owner has developed a **Construction Safety & Health Plan**. The goal of this program is to eliminate injuries to employees and to reduce construction interruptions due to accidents by setting safety requirements. The **Construction Safety & Health Plan** is available to all bidders during the bidding process and will be incorporated into the successful bidders' Contracts.

Effect on Future Modifications: **The premium and loss experience on this Jobsite will be reported to the appropriate rating authorities in the normal manner for use in calculating future experience modifications. The fact that the loss experience on this Project will impact the Contractors' future insurance costs further underscores the importance of compliance with the Construction Safety & Health Plan.**

SECTION 5 - RETURN TO WORK POLICY

All Enrolled Contractors are required to comply with the Owners' Return-to-Work policy as outlined below.

Purpose

1. The purpose of the program is to place employees in temporary job positions while recovering from on-the-job injuries. The Owner and the Insurer are committed to working together to promote safety, recovery, and successful return of injured employees to temporary, modified work following a work related injury. Any injured employee who is placed in a modified work position is placed in that position for a **limited time only.**

Procedures

2. The General Contractor and the Owner will cooperate with the Insurer in conjunction with the Enrolled Contractor to facilitate the return to work of any injured employee capable of modified work status.

3. The Insurer's adjuster will communicate with the managed care clinic or treating physician to determine the injured employee's temporary restrictions.

4. Once the employee is released to modified work, the Insurer's adjuster will coordinate with the managed care nurse and/or treating physician and the employer to facilitate the injured employee's return to work.

5. Upon being released to return to modified work, the injured employee will report to his/her employer for modified work assignment.

6. The employer will obtain from the employee (and provide copies to the General Contractor) the return to work status instructions from the treating physician.

7. The employer is required to accommodate the injured employee to the fullest extent and facilitate the return to work.

8. **Follow Up/Communication with Insurer:** It will be the responsibility of the Insurer's adjuster to maintain communication with the treating physician and employer to facilitate the prompt return to work of an employee to full work status. Should the employee reach maximum medical improvement and still be precluded from returning to full work status, the Insurer's adjuster will confer with the General Contractor and the employer regarding reassignment of the employee or to determine if further action required.

SECTION 6 - INSURANCE PROVIDED BY THE OWNER

The Owner has procured, and will maintain at its own expense, the insurance coverages described below for all Enrolled Contractors. The limits of liability purchased apply collectively to all Insureds. The Owner intends to maintain Workers' Compensation, General Liability and Excess Liability coverage until Notice of Final Acceptance. Products/Completed Operations coverage is extended for 8 years after said notification as specified in the policy. Summaries of the insurance coverages provided by the Insurer(s) are as follows:

1. Workers' Compensation Insurance

Workers' Compensation insurance, as prescribed by the laws of the State of Georgia, and Employer's Liability insurance is provided with the following limits of liability:

$1,000,000	Each Accident
$1,000,000	Each Disease - Each Employee
$1,000,000	Each Disease - Policy Limit

This insurance will cover employees of all Enrolled Contractors while they are performing work at the Jobsite. Offsite operations are **excluded**.

2. Commercial General Liability Insurance

Commercial General Liability insurance is provided for activities at the Jobsite. The Policy has the following limits of liability (limits reinstate annually, except during Products/Completed Operations coverage extension):

$2,000,000	Each Occurrence
$5,000,000	General/Annual Aggregate
$5,000,000	Products/Completed Operations Aggregate (All Projects Combined)*
$2,000,000	Personal Injury and Advertising Liability
$ 300,000	Damage to Rented Premises
$ 10,000	Medical Expense

Contractor will assume the responsibility for the first $25,000 of any Property Damage Liability claim that is within the purview of this policy.

*The Products/Completed Operations aggregate is a single limit for both the policy and extension periods as defined in the policy. Includes Warranty/Repair Work Coverage Extension which provides **general liability** coverage during warranty or repair work undertaken by Enrolled Contractors during their contractual warranty period, but not to exceed two (2) years after the Enrolled Contractor's OCIP coverage is terminated at the conclusion of their work (as defined by the policy). ***NOTE, however, that Contractor's workers' compensation Injuries while involved in warranty/repair work shall be covered under the Contractor's practice policy and not the OCIP.***

Section 6 - INSURANCE PROVIDED BY THE OWNER (CONTINUED)

3. Excess Liability Insurance

Excess General Liability and Employer's Liability coverages will be provided with limits of $50,000,000 each occurrence and in the aggregate. The limits are excess of the primary limits described in Items 1 and 2 above.

4. **Builders' Risk:** Owner shall procure and maintain Builders' Risk insurance which provides "all risk" coverage on the buildings, structure or work, and property of the Owner in the care, custody and control of the Contractor. The policy or policies shall be in the name of the Owner, and Contractors as their interests shall appear, and this shall be so stated on the ACORD certificate of insurance.

The policy will cover structures and materials during the course of construction that are part of the project and will provide coverage for materials while in domestic transit, or while stored temporarily away from the project site subject to policy sublimits.

Contractor will assume the responsibility for the first $25,000 of any claim that is within the purview of this policy.

Owner and Contractor waive all rights against each other for damages caused by fire or other perils to the extent covered by insurance obtained pursuant to this Builders' Risk insurance section or any other property insurance applicable to the work. Contractor shall require, by appropriate agreement, written where legally required for validity, similar waivers in favor of the Owner and the Contractor by Subcontractors. With respect to the waiver of rights of recovery, the Owner shall be deemed to include, to the extent covered by property insurance applicable thereto, its consultants, employees and such agents and representatives. The Contractor waives as against any separate contractor all rights for damages caused by fire or other perils in the same manner as is provided above as against the Owner. The Owner shall require, by appropriate agreement written wherever legally required for validity, similar waivers in favor of the Contractor by any separate contractor and its subcontractors.

5. Contractors Pollution Legal Liability

The Owner will maintain Contractors Pollution Liability coverage for the duration of this contract for onsite activities. **Pollution Legal Liability** insurance covering pollution incidents at, under or emanating from the Project Site will be provided with coverage for third-party bodily injury, property damage, cleanup costs and defense costs. The policy will be written with a limit of at least **$10,000,000.**

The first $25,000 of any claim that stems from the operations of the Contractor, its subcontractors or sub-consultants will be fully borne by the Contractor as determined by the Owner.

Section 6 - INSURANCE PROVIDED BY THE OWNER (CONTINUED)

6. Certificates of Insurance

The OCIP Administrator will issue certificates of insurance for Commercial General Liability, Workers' Compensation/Employers' Liability, Excess Liability and other required coverages to the Construction Manager (if applicable), General Contractor and each Enrolled Subcontractor.

7. Insurance Policies

The summary of coverages contained in this OCIP Manual is prepared for the convenience of those involved in the Project and should not be construed in any way as an exact and binding analysis of coverage. In case of any claim or question with respect to coverage, the original policies will prevail as the sole binding documents. Each Enrolled Contractor will receive a Workers' Compensation policy. Specimen General Liability and Excess Liability policies are available upon request.

8. OCIP Insurance Premiums

The Owner is responsible for the payment of the OCIP premium. All return insurance premiums, insurance dividends, or monies due or to become due in connection with the OCIP shall be to the benefit of the Owner and are hereby assigned to the Owner.

9. OCIP Cancellation, Termination or Modification

Notwithstanding any other provision in this manual, it is the Owner's intent to keep the OCIP in force throughout the term of the Project. However, the Owner reserves the right to cancel, terminate or modify the OCIP or any portion thereof. To exercise this option, the Owner will provide 30 calendar days advance, written notice to all Insureds covered under the OCIP.

Enrolled Contractors will be required to immediately affect replacement insurance coverage, equivalent to what is currently required for Offsite and Excluded Parties. The reimbursement for the cost of such replacement insurance will be calculated on a pro-rata portion of the Enrolled Contractors' Form 2. Written evidence of such insurance must be provided to the Owner prior to the actual cancellation or termination date of the OCIP.

10. Contract Termination

Upon completion of all their work at the Project Site, Contractors whose practice policies have been endorsed with a Designated Workplace Exclusion Endorsement, or similar language, should advise their broker/agent of their work completion and request the endorsement be deleted from their policies. The endorsement must be deleted prior to any Contractor undertaking warranty work at the Project Site.

Section 7 - INSURANCE PROVIDED BY THE CONTRACTORS AND ALL SUBCONTRACTORS

Enrolled Contractors and Excluded Parties will, at their own expense, carry and maintain at least the following insurance policies and minimum limits of liability on forms and with insurance companies acceptable to the Owner:

1. Business Automobile Liability Insurance

All Enrolled Contractors and Excluded Parties must provide Automobile Liability insurance covering the operation, maintenance and use, loading and unloading of all owned, hired, and non-owned vehicles on or away from the Project Site. The policy shall be endorsed to name the Owner, and other entities as required by contract, as additional insureds, on a primary and non-contributing basis and shall be endorsed with a Waiver of Subrogation in favor of the Owner and other entities as required by contract. Such insurance will provide coverage not less than that of the standard Commercial Automobile Liability policy with combined single limits not less than:

- Operations in the Non-AOA* area: $ 2,000,000
- Operations in the AOA* area: $10,000,000

*AOA = Aircraft Operations Area

- In accordance with Section 22-181(b) of Chapter 22, Code of Ordinances of the City of Atlanta, all vehicles requiring access to the restricted areas of the airport must be covered by an automobile liability policy in the minimum amount of ten million ($10,000,000) combined single limit for personal injury and property damage. The $10,000,000 limit of liability will also be imposed on any parties transporting workers, materials and/or equipment to the Airport site from parking lots or similar facilities.
- Contractual liability, if not provided in the policy form, is to be provided by endorsement.
- If hazardous materials or waste are to be transported, the Commercial Automobile Liability policy will be endorsed with the MCS-90 endorsement in accordance with the applicable legal requirements.

2. Workers' Compensation and Employer's Liability

All Enrolled Contractors must have Workers' Compensation and Employer's Liability insurance covering all employees for injuries that occur away from the Project site or after project completion or OCIP termination or cancellation.

Section 7 - INSURANCE PROVIDED BY THE CONTRACTORS AND ALL SUBCONTRACTORS *(CONTINUED)*

Excluded Parties must provide this coverage for all operations relating to this Project. The policy must contain a waiver of subrogation endorsement in favor of the Owner and other entities as required by contract, and provide not less than the following limits:

a. Workers' Compensation - Statutory Limits

b. Employer's Liability -

$1,000,000	Each Accident
$1,000,000	Each Disease - Each Employee
$1,000,000	Each Disease - Policy Limit

Note that the Owner does not permit Workers' Compensation Exemption Status.

3. Commercial General Liability Insurance

All Enrolled Contractors must have General Liability insurance covering third party losses that occur away from the Project, and after Notice of Final Acceptance or OCIP termination or cancellation. Excluded Parties must provide this coverage for all operations relating to this Project.

Coverage must be on an ISO Occurrence Form acceptable to Owner, and shall include, but not be limited to, Premises-Operations, Personal Injury, Blanket Contractual Liability, Property Damage (with exclusions K&L removed), Fire Legal Liability, Independent Contractors, explosion, collapse and underground, and Products/Completed Operations. Provided below are the minimum insurance limits required:

Limits	**All Parties**
$1,000,000	Each Occurrence
$2,000,000	General Aggregate
$2,000,000	Products/Completed Operations Aggregate*
$1,000,000	Personal Injury and Advertising Liability
$ 300,000	Damage to Premises Rented to You

*Including term up to 5 years after substantial completion

4. Umbrella/Excess Liability

The General Contractor Only: $10,000,000 Each Occurrence/Aggregate

Umbrella/Excess Liability insurance, insuring against bodily injury, personal and advertising injury, and property damage, and all other coverages as specified above (Employers' Liability, Commercial General Liability and Commercial Automobile Liability). Coverage must be follow form and must apply as excess of the scheduled underlying policies. The General Liability, Automobile Liability and Employers' Liability limit requirement may be met by primary coverage or a combination of primary and Umbrella/Excess insurance.

SECTION 7 - INSURANCE PROVIDED BY THE CONTRACTORS AND ALL SUBCONTRACTORS *(CONTINUED)*

5. Aviation Liability

If required by the Owner, All Enrolled Contractors and Excluded Parties must provide Aviation Liability insurance covering all owned, non owned, and hired aircraft, used, operated, or hired by the Contractor or the applicable Subcontractor in connection with the Project, including bodily injury, property damage, and Passenger Liability with a minimum limit of $10,000,000 each occurrence.

6. Watercraft Liability

If required by the Owner, All Enrolled Contractors and Excluded Parties must provide Watercraft Liability and/or Protection and Indemnity insurance covering all owned, non-owned, and hired watercraft, used, operated, or hired by the Contractor or Subcontractor in connection with the Project, including bodily injury with a minimum limit of $1,000,000 each occurrence.

7. Professional Liability (<u>Architecture & Engineering Design Only</u>)

Per Claim Made and in the Aggregate $5,000,000

- Contractor/Consultant shall procure and maintain during the life of this contract Professional Liability insurance, including a three year Extended Reporting Provision.
- Owner reserves the right to provide this coverage and, should it elect to do so, will execute a deductive change order to remove the cost of this coverage from the contract price.

8. Qualifications of Insurers

Each Insurer of an Enrolled Contractor or Excluded Party who provides any insurance coverage required by this section must meet each of the following requirements:

- The Insurer must be authorized by the State of Georgia to transact property and/or casualty insurance business in the State of Georgia;
- The Insurer must have an A.M. Best Policyholder Rating of a "A-" and a Financial Rating of "Class VIII" or higher.

9. **Certificate of Insurance**

Prior to commencing any work at the Jobsite, all Enrolled Contractors and Excluded Parties must provide the Owner with a Certificate of Insurance. Failure of any party to provide such certificates of insurance will not be relief from the responsibility to carry and maintain such insurance. Certificates should be sent to the OCIP Administrator.

Coverage must include and Certificates of Insurance must evidence (see sample in forms section):

a) Reference to: City of Atlanta, Hartsfield-Jackson Atlanta International Airport

Section 7 - INSURANCE PROVIDED BY THE CONTRACTORS AND ALL SUBCONTRACTORS *(CONTINUED)*

b) Additional Insured: shall include City of Atlanta and others as required by contract as additional Insureds (as respects General and Automobile Liability). Coverage must be primary and non-contributory.

c) Waiver of Subrogation: shall obtain a waiver of subrogation in favor of City of Atlanta and others as required by contract (as respects Workers' Compensation).

d) Notice of Cancellation: All required policies shall be endorsed to provide that notice of cancellation shall be given to Owner by insurance agent/broker or carrier, or if unavailable, Contractor/Subcontractor must provide Owner with thirty (30) days advance written notice of cancellation or non-renewal (ten (10) days in the event of cancellation for non-payment of premium).

e) The insurance requirements described in the OCIP manual are not intended to, and shall not in any way, limit or quantify the liabilities and obligations each Contractor assumes pursuant to its contract. The insurance requirements are an independent contract provisions and shall survive the termination or expiration of this contract or any subcontract.

10. **Other Insurance Needed As Determined by Enrolled Contractors**

The OCIP, as previously outlined, is intended to afford broad coverage and relatively high limits of liability, but may not provide all the insurance needed. Enrolled Contractors should have their insurance agent, broker or consultant review the coverages and limits outlined herein for adequacy against your existing program. In order to eliminate duplicate insurance premiums, Enrolled Contractors should amend their insurance program to recognize coverage provided to them under this OCIP. It is suggested that Enrolled Contractors' General Liability and Workers' Compensation policies exclude coverage for this Jobsite <u>only to the extent coverage is provided by the OCIP</u>. In this manner, any broadened coverages or limits under the Enrolled Contractors' insurance program will still be available to them. Any insurance for higher limits or other coverages that are required by the Contract, by law, or needed for the Enrolled Contractors' protection must be purchased separately. Any premiums, deductibles or self-insured retentions under any additional coverages shall be borne by Enrolled Contractors.

Contractors' policies of insurance covering their owned or leased machinery, watercraft, vehicles, tools, or equipment against physical loss or damage must include waiver of subrogation endorsements in favor of the Owner and the General Contractor, their employees, agents or assigns.

SECTION 8 - OCIP ONLINE REGISTRATION FORMS

Step 1 - Online Registration Process

The OCIP utilizes an online enrollment program through Resurgens Risk Management. Contractors and all Subcontractors shall complete the online registration as outlined below.

Key Information You Will Need To Begin

1. FC Number (ex. FC-9999)
2. Company's Federal Identification #
3. Certificate of Insurance
4. Workers' Compensation and General & Umbrella Liability Policies' Declarations Page + Rate Sheets
   - Note: Contractors whose current insurance program is a large deductible or loss sensitive plan will be required to provide additional documentation (including but not limited to three to five years payroll and loss history) so your insurance costs can be calculated appropriately. Contact the OCIP Administrator for additional instructions.
5. Estimated Contract Value & Labor by Workers' Compensation Classification Code

New Users

1. Go to OCIP online registration site at https://www.hjiaocip.com/
2. Complete New User Registration information on OCIP main page.
3. Verify your account by entering the user validation code, which will be sent via email.
4. Wait for General Contractor's online approval; then proceed with registration process.

Existing Users

1. Go to OCIP online registration site at https://www.hjiaocip.com/
2. Enter username / password.
3. Under the heading New OCIP Registration, select Register, enter project number.
4. Update user profile, select awarding contractor; then proceed with online registration.

Completing Online Forms

1. Complete Form 1, Check the Signature Box, Send.
2. Complete Form 2, Check the Signature Box, Submit.
3. Review your Submittal Form, Send.
4. You will receive a notice which states "Your Registration application is complete."
5. Email or fax the following to Neill Davis @ Neill.Davis@atlanta-airport.com or (404) 559-2395
   a. Insurance Certificate (See sample certificate in Forms Section)
   b. General Liability Additional Insured Endorsement (Comparable to CG 20 10 11/85)
   c. Workers Compensation and General & Umbrella Liability Policy Declaration and Rate Sheets
      i. Note: Contractors whose current insurance program is a large deductible or loss sensitive plan will be should also forward three to five years payroll and loss history. The OCIP Administrator may request additional information to verify your insurance costs.

For detailed registration instructions, go to https://www.hjiaocip.com/
Select "Instructions" at the bottom of the page.

SECTION 8 - OCIP ONLINE REGISTRATION FORMS (CONTINUED)

Step 1 - Online Registration Process

Important Notes

☆ 1. The Contractor hereby warrants the accuracy of the information provided to the OCIP Administrator and OCIP insurers, and on the OCIP website; and agrees that the Owner, the OCIP Administrator, and the OCIP insurers may audit the Contractor's records at any time to confirm the accuracy of the information provided, including any changes in the work as referenced in the Contract.

☆ 2. Contractors or Subcontractors may not commence work on this Project until enrollment is complete which requires that all forms are received, approved, and a certificate of insurance is provided by the OCIP Administrator to the Enrolled Contractor.

☆ 3. Enrollment is NOT automatic – Contractors are required to submit a separate registration for each project/contract they are performing work under. Excluded Contractors (those not eligible to participate in the OCIP due to contract value or scope of services) are also required to complete the online registration.

☆ 4. Failure to submit the completed forms and documentation to the OCIP Administrator within 30 days of the initial request may result in a delay of your monthly progress payments.

5. Accurately estimate payroll anticipated for this Contract (initial bid and all change orders) to develop an accurate estimate of the insurance costs to be tracked by the OCIP administrator. At completion of the each Enrolled Contractor's work, a final audit will be conducted of the actual payroll, receipts and insurance costs. Insurance costs should be based on rates in force at the time of the Contract Award and are **not** subject to change during the project period.

6. Accurately utilize valid classification codes as defined in the latest version of the NCCI (National Council on Compensation Institute) Scopes Manual. These will also be audited and will be subject to change by the OCIP Administrator should the work being performed not coincide with the classification codes and rates submitted in the Form 2.

SECTION 8 - OCIP ONLINE REGISTRATION FORMS (CONTINUED)

Step 2 – Updating Enrollment to Include Work Modifications or Change Orders

Enrolled Contractors must submit a Form 3 – Supplemental Insurance Information Form for *any* scope of work modifications or change orders which exceed twenty percent (20%) of their original contract amount.

Completing Online Form

1. Go to https://www.hjiaocip.com/
2. Sign into user account.
3. Select the applicable project number from the drop down box under Active Enrollments.
4. Select Form 3.
5. Provide additional contract value, scope of work, start/end dates, estimated man-hours and new Workers Compensation and General Liability codes, rates, etc.
6. Enter your name in the “Form Completed By” field, insert phone number, Submit.
7. Acceptance is subject to General Contractor’s approval.

SECTION 8 - OCIP ONLINE REGISTRATION FORMS (CONTINUED)

Step 3 – Online Payroll Reporting

Enrolled Contractors must submit a Form 5 - Monthly Man Hours Report for payroll associated with **Onsite** work for this Project, from the date of enrollment until a closeout form has been submitted. Payroll reports are due by the 10th of each month.

Form 5 – Monthly Man Hours Report

1. To submit online payroll reports, go to https://www.hjiaocip.com/
2. Sign into your user account
3. Select the applicable project number from the drop down box under Active Enrollments
4. Select Form 5
5. Enter reporting month/year, payroll, hours (regular and overtime) and OSHA 300 information

Important Notes

1. Payroll must be submitted separately for each contract awarded.

2. If no work is performed at the site during the reporting period, a report must still be submitted showing "Zero Payroll/Receipts".

3. Use of Class Code 8810 shall apply ONLY to Onsite clerical employees who remain in the Onsite trailer and do not walk the Project.

4. Use of Class Code 5606 shall apply ONLY to individuals dedicated full time to this Project site, who work mainly inside the onsite trailer, and supervised through foreman. Those who directly supervise work must be classified under the governing (majority) class code. Individuals classified under 5606 may not have their time split with another class code.

5. Accurately utilize valid classification codes as defined in the latest version of the NCCI (National Council on Compensation Institute) Scopes Manual. These will also be audited and will be subject to change by the OCIP Administrator should the work being performed not coincide with the classification codes and rates submitted.

Failure to promptly provide payroll information will result in a delay of your monthly progress payments.

SECTION 8 - OCIP ONLINE REGISTRATION FORMS *(CONTINUED)*

Step 4 – Notice of OCIP 85% Milestone

Form 4 – Notice of OCIP 85% Milestone

Enrolled Contractors will receive a notification from the system or the OCIP Administrator upon earning 85% of their insurance costs being tracked. At this point, subcontractors are required to update their contract information online as outlined below.

1. Go to https://www.hjiaocip.com/
2. Sign in to user account
3. Select the applicable project number from the drop down box under **Active Enrollments**
4. Select Form 4
5. Insert estimated date of completion
6. Provide names of subcontractors completing work on the same date. Use this space to explain if completion is delayed and why.
7. Update company information if necessary
8. Enter form completed by and phone number and submit

Important Notes

a. Confirm that Contract work is 85% complete, or advise of any changes in the scope of work.

b. Verify that all payroll and hours have been reported accurately.

SECTION 8 - OCIP ONLINE REGISTRATION FORMS *(CONTINUED)*

Step 5 – Completion of Work

Form 6 – Notice of Completion

Each Enrolled Contractor will submit a Form 6 - Notice of Completion**,** once the Enrolled Contractor has completed all of its work (including punchlist items).

1. To submit an online Form 6 – Notice of Completion Form, go to https://www.hjiaocip.com/
2. Sign into user account.
3. Select the applicable project number from the drop down box under Active Enrollments.
4. Select Form 6.
5. Insert date of completion.
6. Insert Final Workers Compensation Payroll and Final General Liability Payroll and/or Receipts.
7. Provide names of subcontractors completing work on the same date.
8. Update company information if necessary.
9. Enter your name in the “Form Completed By” field, insert your phone number, Submit.
10. Acceptance is subject to General Contractor’s approval.

SECTION 9 - FORMS SECTION

Form 1 – OCIP Registration Form (Part I)

Hartsfield-Jackson Atlanta International Airport OCIP

Attention: Neill Davis, OCIP Administrator / ndavis@rrmgt.com
1201 Peachtree St. Bldg. 400 Ste. 1730, Atlanta, GA 30361
Fax (404) 591-3515

FORM 1 - REGISTRATION FORM (PART 1)

NOTE: The Primary Contractor must complete the Hartsfield-Jackson Atlanta International Airport OCIP Form 1 for EACH subcontractor on the project, as well as for the Primary.

* Fields marked with asterisk are REQUIRED for submission of this form.

FORM 1.1: COMPANY CONTACT INFORMATION

Project ID*

Project Name*

Name of Firm*

FEIN*

Address*

City, State, Zip*

Phone Number

Contractor is *

Incorporated ☐ Partnership ☐ Sole Prop. ☐ Joint Venture ☐

Web Address

Ownnership

African-American ☐ Hispanic ☐ Female ☐ Disadvantaged ☐

Office Contact Name*	Phone*	Ext*	Fax*	E-Mail*
Safety Contact Name	Phone	Ext	Fax	E-Mail
Site Contact	Phone	Ext	Fax	E-Mail
Payroll Contact	Phone	Ext	Fax	E-Mail

SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 1 – OCIP Registration Form (Part I) *(Cont.)*

FORM 1.2: CONTRACT INFORMATION

Type of Work*

Start Date (mm/dd/yyyy)*

Est. Completion (mm/dd/yyyy)*

Contract Value*

Est. # of Subs

Awarding Contractor*

Primary Contractor

FORM 1.3: CONFIRMATION

Form 1 completed by (Print or type the name of person completing form)*

Date Completed *

Title

Phone*

I certify that I am the above-described person, and that I am legally authorized and eligible to submit the information contained in this form on behalf of the above-described contractor in relation to work to be performed within the scope of the Hartsfield-Jackson Atlanta International Airport OCIP program. I affirm that all information contained in this document is true and complete to the best of my knowledge.

Signature*

© 2012 Resurgens Risk Management, Inc.

SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 2 – OCIP Registration Form (Part 2)

Hartsfield-Jackson Atlanta International Airport OCIP

Attention: Neill Davis, OCIP Administrator / ndavis@rrmgt.com
1201 Peachtree St. Bldg. 400 Ste. 1730, Atlanta, GA 30361
Fax (404) 591-3515

FORM 2 - REGISTRATION FORM (PART 2)

NOTE: Required insurance coverages and limits are shown in the contractor instruction materials.
Information disclosed on this form is subject to audit and adjustment throughout the term of the project.
After completing this form, fax your policy declaration pages and schedule rate sheets to (404) 591-3515.

NO certificates or policies will be provided under the OCIP until this form and all related documents are received.

* Fields marked with asterisk are REQUIRED for submission of this form.

FORM 2.1: INSURANCE PROVIDER INFORMATION

Project

Project Name

Contractor

FEIN

CURRENT INSURANCE INFORMATION

Required insurance coverages and limits are shown in the Bid Brochure, Paragraph "A".
Information disclosed on this form is subject to audit and adjustment throughout the term of the construction project.

Insurance Broker or Agent Company*

Insurance Broker Address

Insurance Contact

Phone*

Fax

Email

FORM 2.2: WORKMENS COMPENSATION INFORMATION

Workers Comp Insurance Co.

Policy Period(mm/dd/yyyy)* to

Policy Number*

WC Experience Modifier*

Deductible

Retention

SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 2 – OCIP Registration Form (Part 2) *(Cont.)*

FORM 2.2: WORKMENS COMPENSATION INFORMATION (cont.)

*WC Code**	*Rate**	*Est. Payroll**	*Premium**

Subtotal*:	
Increased Limit Factor	
Experience Modifier	
Standard Premium	
Deduct Credit	
Drug Free Workplace Credit	
Premium Discount	
Expense Constant	
Terrorism	
Total WC Premium*	

It is extremely important to accurately estimate payrolls for this contract. Payroll should be raw wages without burden, fringes or overtime premium, but should include sick, vacation, holiday pay and imputed income.

After submitting this form, fax a copy of your declaration page and schedule rate sheet; no enrollment will be processed until they are received.

FORM 2.3: GENERAL LIABILITY INFORMATION

Current GL Insurance Company _____ Policy Period (mm/dd/yyyy)* _____ to _____ GL Policy Number* _____

GL Rate Based On (select one)*:

☐ Payroll ☐ Receipts ☐ Receipts per $100 ☐ Receipts per $1000 ☐ Flat Rate Premium

SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 2 – OCIP Registration Form (Part 2) *(Cont.)*

FORM 2.3: GENERAL LIABILITY INFORMATION (cont.)

GL Code*	Rate*	Est. Payroll/ Receipts*	Premium*

Subtotal*

It is extremely important to accurately estimate payrolls anticipated for this project if GL premiums are based on payroll and to accurately estimate receipts if GL premiums are based on receipts..

Premium Discount:

After submitting this form, fax a copy of your declaration page and schedule rate sheet; no enrollment will be processed until they are received.

Total GL Premium*

Estimated Subcontractor Premiums (Submit cost identification sheet for each subcontractor or calculate 3% of subcontractor value for each subcontractor's estimated insurance cost) *

FORM 2.4: UMBRELLA & EXCESS COVERAGE

Umbrella Insurer	Coverage Limit	Policy Period (mm/dd/yyyy)	Policy Number	Premium
		to		

Excess Insurer	Coverage Limit	Policy Period (mm/dd/yyyy)	Policy Number	Premium
(if none or unknown, leave these spaces blank)			*(enter number values, or leave blank if none or unknown)*	
		to		

Premium

Profit & Overhead

This amount must equal the insurance credit indicated on your bid proposal. "Grand Total Premiums" represents the amount of insurance premiums the contractor has excluded from the bid amount since the Owner is furnishing the construction insurance.

Grand Total Premiums

SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 2 – OCIP Registration Form (Part 2) ***(Cont.)***

FORM 2.5: AUTO INSURANCE INFORMATION

Current Auto Liability Insurance Company

Policy Period (mm/dd/yyyy to mm/dd/yyyy) to

Auto Policy Number*

Liability Coverage Limit

Vehicles Covered

Vehicles On Site

Mobile Equipment

Total Auto Annual Premium

FORM 2.6: CONFIRMATION

NOTE: It is each Contractor's responsibility to notify its own insurance carrier to exclude all work to be done under this contract from its current insurance program.

City of Atlanta as sponsor of the OCIP, or their Agent, is granted permission by Contractor to inspect the insurance and receipt records used in determining the above credit. At completion of the work, City of Atlanta's Agent shall audit the project receipt records of Contractor and adjust contract amount for final audited insurance premiums in accordance with the insurance premium audit provisions of the insurance policy. Any and all returns of premiums, dividends, discounts or other adjustments to any OCIP policy is assigned, transferred and set over absolutely to City of Atlanta. This assignment is valid for insurance policies whose premiums have been paid by City of Atlanta on behalf of such Contractor.

Fax all supporting information to the number above as soon as you have completed this form. NO certificates or policies can be provided until this form and all related documents are received.

Signed (Name of person completing form)*

Date Completed

Title

Phone*

I understand that this web-based form constitutes a legal document. I certify that I am the above-described person, and that I am legally authorized and eligible to submit the information contained in this form on behalf of the above-described contractor in relation to work to be performed within the scope of the Hartsfield-Jackson Atlanta International Airport OCIP program. I affirm that all information contained in this document is true and complete to the best of my knowledge.

Signature

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SECTION 9 - FORMS SECTION *(CONTINUED)*

Basis of Insurance Cost Calculation – Coverage and Limits

1. **Workers' Compensation** - Applicable Statutory Limits

2. **Employer's Liability** – $ 500,000 Each Accident
   $ 500,000 Each Disease - Each Employee
   $ 500,000 Each Disease - Policy Limit

3. **Commercial General Liability** –
   $ 1,000,000 Each Occurrence
   $ 2,000,000 General Aggregate
   $ 2,000,000 Products/Completed Operations Aggregate*
   $ 1,000,000 Personal Injury and Advertising Liability
   $ 300,000 Damage to Premises Rented to You

*Including term up to 5 years after substantial completion

4. **Umbrella/Excess Liability** -

   The General Contractor: $10,000,000 Each Occurrence/Aggregate

SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 3 – Change Order Form

Hartsfield-Jackson Atlanta International Airport OCIP

Neill Davis, OCIP Administrator / ndavis@rrmgt.com
1201 Peachtree St. Bldg. 400 Ste. 1730, Atlanta, GA 30361
Fax (404) 591-3515

FORM 3 - CHANGE ORDER FORM

Contractor: FEIN:

Address: City, State, Zip

Office Contact Name: Phone & Ext.: Office Contact E-Mail: Fax:

Project ID: Contract Value: Type of Work:

Awarding Contractor: Prime Contractor: Start Date (mm/dd/yyyy): Est Completion Date (mm/dd/yyyy):

For work to be performed under this Contract/Change Order: Information disclosed on this form is subject to audit and adjustment throughout the term of the construction project.

*WC Code**	*Rate**	*Est. Payroll**	*Premium**

SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 3 – Change Order Form *(Cont.)*

GL Rate Based On*

☐ Payroll ☐ Receipts ☐ Receipts per $100 ☐ Receipts per $1000 ☐ Flat Rate Premium

*GL Code**	*Rate**	*Est. Payroll/ Receipts**	*Premium**

It is extremely important to accurately estimate payrolls for this contract. Payroll should be raw wages without burden, fringes or overtime premium, but should include sick, vacation, holiday pay and imputed income.

Premium Discounts	
Total GL Premium	
Estimated Subcontractor Premiums (Fax Cost Identification Sheet for Each Subcontractor or Calculate 3% of Subcontractor value for Each Subcontractor's Estimated Insurance Cost)	
Umbrella Premium	
Excess Liability	
TOTAL	

Name (Print or Type)

Phone

Title

Date Completed

I certify that I am the above-described person, and that I am legally authorized and eligible to submit the information contained in this form on behalf of the above-described contractor in relation to work to be performed within the scope of the Hartsfield-Jackson Atlanta International Airport OCIP program. I affirm that all information contained in this document is true and complete to the best of my knowledge.

Signature

© 2012 Resurgens Risk Management, Inc.

SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 4 – Notice of Substantial Completion (85%)

Hartsfield-Jackson Atlanta International Airport OCIP

Attention: Neill Davis, OCIP Administrator / ndavis@rrmgt.com
1201 Peachtree St. Bldg. 400 Ste. 1730, Atlanta, GA 30361
Fax (404) 591-3515

FORM 4 - NOTICE OF SUBSTANTIAL COMPLETION (85%)

Contractor:		FEIN:	

Please be advised, we are scheduled to complete our work for

Awarding Contractor:		Prime Contractor:	
Project ID:		Completion Date:	
Project Name:			

We used the following subcontractors, who will also complete their work on the date shown above

○ This is our only job at Hartsfield-Jackson Atlanta International Airport
○ We are still working on the following jobs at Hartsfield-Jackson Atlanta International Airport:

Awarding Contractor	Job Name and Description	Prime Contractor

Final insurance audits may be made under the applicable policies. Please show who in your office (or another location if applicable) is responsible for this information

Name:			
Phone:		Fax:	
Email:			
Address:			
City:		State:	Zip:

Form Completed by (printed or typed name):	Phone:
Title:	Date:

Signature

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SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 5 –Man Hours & Payroll/Receipts Form

Hartsfield-Jackson Atlanta International Airport OCIP

Attention: Neil Davis, OCIP Administrator / ndavis@rrmgt.com
1201 Peachtree St. Bldg. 400 Ste. 1730, Atlanta, GA 30361
Fax (404) 591-3515

FORM 5 - MANHOURS & GL PAYROLL/RECEIPTS FORM

Contractor
Project ID
Address
City, State ZIP
Office Contact
Office Phone ext.
Fax
Email
Payroll Contact
Payroll Phone ext.
Fax
Email
Awarding Contractor
Primary Contractor

Month **Year** **Pay & Hours**

WC Code	Total WC Pay	Hours Reg	Hours OT
TOTALS			

GL Rate Based On*
☐ Payroll ☐ Receipts ☐ Receipts per $100 ☐ Receipts per $1000 ☐ Flat Rate Premium

SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 5 –Man Hours & Payroll/Receipts Form *(Cont.)*

Payroll or Receipts & Hours

GL Code	Total Payroll/Receipts	Hours Reg	Hours OT
TOTALS			

Umbrella Deduct

Payroll or Receipts & Hours

	Total Payroll/Receipts	Hours Reg	Hours OT
TOTALS			

OSHA 300 Log: Illness & Injury

How many cases of work-related injuries and illnesses occurred during this reporting period?

I certify that I am the above-described person, and that I am legally authorized and eligible to submit the information contained in this form on behalf of the above-described contractor in relation to work to be performed within the scope of the Hartsfield-Jackson Atlanta International Airport OCIP program. I affirm that all information contained in this document is true and complete to the best of my knowledge.

Form Completed by (printed or typed name):

Date Completed

Title

Phone

Signature

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SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 6 – Notice of Completion

Hartsfield Jackson Atlanta International Airport OCIP

Attention: HJAIA OCIP Administrator / bjaiaocipadmin@rrmgl.com
1201 Peachtree St. Bldg. 400 Ste. 1720, Atlanta, GA 30361
(404) 520-2305

FORM 6
COMPLETION OF WORK

Contractor:		FEIN	
Please be advised, we have completed our work for			
Awarding Contractor		Prime Contractor	
Project ID / Title:		Completion Date	

Initial Contract Value:		Final Contract Value:	
Estimated Hours:		Final Hours Worked:	
Initial Payroll:		Final Payroll:	

Estimated WC Payroll:

WC Code	Rate	Estimated WC Payroll
	Total:	

Final WC Payroll:

WC Code	Rate	Final WC Payroll
	Total:	

Est. GL Receipts/Payroll:

GL Rate Based On ○ Payroll Per $100 ○ Payroll Per $1000 ○ Receipts Per $100 ○ Receipts Per $1000 ○ Flat Premium

GL Code	Rate	Est. GL Receipts/Payroll
	Total	

SECTION 9 - FORMS SECTION *(CONTINUED)*

Form 6 – Notice of Completion *(Cont.)*

Final GL Receipts/Payroll:

GL Rate Based On ○ Payroll Per $100 ○ Payroll Per $1000 ○ Receipts Per $100 ○ Receipts Per $1000 ○ Flat Premium

GL Code	Rate	Final GL Receipts/Payroll
	Total	

Initial Bid Deduct _____ (Initial WC Prem + GL Prem +Umb Prem)

Final Bid Deduct : _____ (Final WC Prem + GL Prem +Umb Prem)

We used the following subcontractors, who will also complete their work on the date shown above

○ This is our only job at Hartsfield Jackson Atlanta International Airport
○ We are still working on the following jobs at Hartsfield Jackson Atlanta International Airport:

Awarding Contractor	Job Name and Description	Prime Contractor

Final insurance audits may be made under the applicable policies. Please show who in your office (or another location if applicable) is responsible for this information

Name _____

Phone _____ Fax _____

Email _____

Address _____

City _____ State _____ Zip _____

Form Completed by (name) _____ Phone _____

Title _____ Date _____

Signature _____

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City of Atlanta, Hartsfield-Jackson Atlanta International Airport

Sample Certificate

ACORD™

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
INSURANCE AGENT'S NAME **ADDRESS** **CITY, STATE ZIP CODE** **TELEPHONE NO. (INCLUDING AREA CODE)**	PHONE (A/C, No. Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	NAIC#
INSURED **YOUR COMPANY NAME** **ADDRESS** **CITY, STATE, ZIP CODE** **TELEPHONE NO. (INCLUDING AREA CODE)**	INSURER A : ABC Insurance Company	
	INSURER B : DEF Insurance Company	
	INSURER C : GHI Insurance Company	
	INSURER D : JKL Insurance Company	
	INSURER E :	
	INSURER F:	

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN. THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYY)	POLICY EXP (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY PRO-JECT LOC			Policy Number	MO/DAY/YR	MO/DAY/YR	EACH OCCURRENCE DAMAGES TO RENTED PREMISES(Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS-COMP/OP AGG	$1,000,000 $300,000 $ $1,000,000 $2,000,000 $2,000,000
B	AUTOMOBILE LIABILITY ANY AUTO X ALL OWNED AUTOS X HIRED AUTOS SCHEDULED AUTOS X NON-OWNED AUTOS			Policy Number	MO/DAY/YR	MO/DAY/YR	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY(Per person) BODILY INJURY(Per accident) PROPERTY DAMAGE (Per accident)	See Limit* $ $ $ $
C	UMBRELLA LIAB X EXCESS LIAB CLAIMS-MADE DED RETENTION $			Policy Number	MO/DAY/YR	MO/DAY/YR	EACH OCCURRENCE AGGREGATE	SEE Limit Requirements
D	WORKERS COMPENSATION AND EMPLOYERS ' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below	N/A		Policy Number	MO/DAY/YR	MO/DAY/YR	X WC Statutory Limits OTH-ER E.L. EACH ACCIDENT E.L. DISEASE – EA EMPLOYEE E.L. DISEASE – POLICY LIMIT	 $500,000 $500,000 $500,000
	OTHER							

***Coverage Limit Requirements:**
****AOA = Aircraft Operations Area**
$ 2,000,000 Combined Single Limit – Operations in NON-AOA**
$10,000,000 Combined Single Limit – Operations in AOA**

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)
RE: City of Atlanta, Hartsfield –Jackson Atlanta International Airport ADDITIONAL INSURED (AUTO AND GENERAL LIABILITY): City of Atlanta and General Contractor. Coverage is primary & non-contributory. WAIVER OF SUBROGATION (WORKERS' COMPENSATION) for City of Atlanta and General Contractor.

CERTIFICATE HOLDER	CANCELLATION
City of Atlanta **68 Mitchell Street, Suite 9100** **Atlanta, GA. 30303** **Email to : neill.davis@atlanta-airport.com** **Fax : 404-559-2395**	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE

PLEASE SUBMIT TO: Neill Davis, Resurgens Risk Management,
Phone No. 404.766.8715, Fax No. 404.559.2395, E-Mail Address Neill.Davis@atlanta-airport.com

RRM Resurgens Risk Management

Willis

EXHIBIT E; SCOPE OF WORK AND TECHNICAL SPECIFICATIONS

CITY OF ATLANTA
DEPARTMENT OF AVIATION
HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

PROJECT NUMBER FC-8075

F3 A380 RECONFIGURATION

EXHIBIT "E" - SCOPE OF WORK AND TECHNICAL SPECIFICATIONS

01) SCOPE OF WORK

This project will allow for an A380 Aircraft (Group 6) to be accommodated on the new Concourse F. Currently no gate on Concourse F can accommodate the A380 and it is the desire of the Department of Aviation (DOA) to have the ability to have a Group 6 aircraft gated on Concourse F. Gate F3 was chosen as the best location; however both the terminal and airside areas will require improvements. The airside improvements to Gate F3 include an addition of a second loading bridge, new fuel pit and relocation of the aircraft lead-in line. Concourse improvements include a new vertical transportation core and tie-in to the CBP sterile corridor, additional millwork for the new bridge, and extension of the concourse level sterile corridor to tie-in to the new vertical transportation core. The new vertical transportation core will include a stair, elevator and an escalator.

02) CONSTRUCTION

CONTRACTOR shall perform the work in accordance with the furnished specifications and instructions. Work areas will be outside of the AOA.

03) TECHNICAL SPECIFICATIONS

The following specifications and technical documents form a part of the contract:

CITY OF ATLANTA
DEPARTMENT OF AVIATION
HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

PROJECT NUMBER FC-8075
F3 A380 RECONFIGURATION

EXHIBIT E

TECHNICAL SPECIFICATIONS

The following specifications and technical documents form a part of the contract:

SPECIAL

SP- 1	Mobilization
SP- 2	Project Contingency
SP- 3	As-Builts

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

Refer to owners Division I

DIVISION 01 - GENERAL REQUIREMENTS

Refer to owners Division I

DIVISION 02 - EXISTING CONDITIONS

024119	Selective Demolition

DIVISION 03 – CONCRETE

032000	Concrete Reinforcing
033000	Cast-Place-Concrete

DIVISION 04 - MASONRY

042200	Unit Masonry

DIVISION 05 - METALS

051200	Structural Steel Framing
054000	Structural Metal Studs
053000	Steel Decking
055000	Metal Fabrications
055100	Steel Stair System
055213	Pipe and Tube Railings
057005	Metal Column Covers
057300	Interior Ornamental Metal Railings
057509	Stainless Steel Base

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

061000 Carpentry, General
061600 Sheathing
064023 Casework and Millwork

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

071100 Damp-Proofing
071326 Sheet Membrane Waterproofing
071800 Traffic Bearing Waterproofing
072100 Thermal Insulation
072115 Foamed-In-Place Insulation
072720 Fluid-Applied Weather Barrier
074213 Metal Wall Panels
074216 Insulated-Core Metal Panels
075419 Roofing
076200 Sheet Metal Flashing And Trim
078100 Sprayed-On Fire-Proofing
079413 Through-Penetration Fire-stop System
078443 Joint Fire-Stopping
079200 Joint Sealants

DIVISION 08 - OPENINGS

081113 Hollow Metal Doors and Frames
083113 Access Doors and Panels
084413 Glazed Aluminum Curtain Walls
085113 Interior Glazed Aluminum Partitions
087100 Door Hardware
088000 Glazing
089000 Louvers

DIVISION 09 – FINISHES

090000 Finish Materials Legend
092116 Non Load Bearing Steel Framing
092713 Glass Reinforced Gypsum Fabrications
092900 Gypsum Drywall
095125 Acoustical Ceiling Systems
095133 Acoustical Metal Pan Ceilings
096340 Stone Flooring
096513 Resilient Base and Accessories
096800 Carpeting
099113 Exterior Painting
099123 Interior Painting

DIVISION 10 - SPECIALTIES

102800 Toilet and Bath Accessories
104413 Fire Extinguishers and Cabinets

DIVISION 11 - EQUIPMENT

113100 Residential Appliances

DIVISION 12 - FURNISHINGS

N/A

DIVISION 13 – SPECIAL CONSRUCTION

135600 Aircraft Docking System

DIVISION 21 – FIRE PROTECTION SYSTEM

210517 Sleeve and Sleeve Seals For Fire-suppression piping
210518 Escutcheons For Fire-suppression Piping
211313 Wet-pipe Sprinkler Systems

DIVISION 22 – PLUMBING

220010 Plumbing General
220090 Plumbing Performance Verification
222500 Plumbing Insulation
224200 Plumbing Fixtures
224300 Drainage Systems
224400 Water System

DIVISION 23 – HVAC

230010 HVAC General
230090 HVAC Performance Verification
230095 Testing, Adjusting And Balancing
231000 Piping, Valves and Accessories
232500 HVAC Insulation
236000 Equipment
237000 Air Distribution
238000 Automatic Temperature Control

DIVISION 24 – AIR DISTRIBUTION

N/A

DIVISION 25 – TEMPERATURE CONTROL SYSTEMS

255001 Fire Alarm Base EFSO Control System

DIVISION 26 – ELECTRICAL

260120 Operation And Maintenance Of Low-Voltage Electrical Distribution
260126 Maintenance Testing Of Electrical Systems
260519 Low Voltage Electrical Power Conductors and Cables
260526 Grounding and Bonding for Electrical Systems
260529 Hangers and Supports For Electrical Systems
260533 Raceway and Boxes For Electrical Systems
260553 Identification For Electrical Systems
260903 Lighting Fixture Controls
262213 Dry-Type Transformers

262416 Panelboards
262726 Wiring Devices
262813 Fuses
262816 Enclosed Switches And Breakers
263543 Ground Power Units (400Hz)
263544 Aircraft Ground Power Cable 400 Hz And Hoist
264113 Lighting Protection System
265100 Interior Lighting
267777 Demolition

DIVISION 27 – COMMUNICATIONS

270100 General Requirements For Communications Systems
270500 Common Work Results For Communications Systems
270526 Grounding And Bonding For Communications Systems
270528 Pathways For Communications Systems
270553 Identification For Communications Systems
271500 Communications Horizontal Cabling
273000 Voice Communications System
274216 Multi-User Flight Information Display System
275116 Public Address System
275300 Distributed Antenna System
275416 Common Use Terminal Equipment System
275900 Gate Monitoring System

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

280100 General Requirements For Security Systems
281300 Access Control System
282313 Video Surveillance System
283111 Fire Alarm System

DIVISION 31 – EARTHWORK

313000 Excavating, Backfilling, And Compacting For Structures
316000 Permanent Excavation Shoring System
316333 Micro-piles

DIVISION 32 – SITE IMPROVEMENT

P-301 Soil Cement
P-501 Portland Cement Concrete
P-605 Joint Sealing Filler
P-621 Pavement Markings

DIVISION 33 – UTILITIES

335444 Preconditioned Air Direct-Expansion Air Handling Units And Accessories

DIVISION 34 - TRANSPOTATION

347713 Passenger Boarding Bridges And Fixed Walkways

SECTION SP-1
MOBILIZATION

01) DESCRIPTION

a) This item shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various items on the project site. This item also includes the preparation and submittal of the safety plan, security plan, work plan, products submittals, etc. and other items as required by Exhibit "H" Schedule Requirements, Attachment No. 1.

b) The Contractor will be provided a staging area and material stockpile area; its limits shall be as agreed to by the City. The staging area shall be configured to have public access. This item is also intended to compensate the Contractor for all costs for providing all temporary fencing and gates required at access routes to the Contractor staging/storage area and the removal of the same at the completion of the project, and to provide final clean-up and restoration of the Contractor staging/storage area. All required utilities for the Contractor's staging area shall be arranged and promptly paid for by the Contractor directly with the appropriate utility agency. Utility arrangements are subject to the City's approval. No separate payment shall be made for any item required for the Contractor to enclose and set up his operational areas. Contractor shall restore the site to its original condition, to the satisfaction of the City upon completion of the contract work; grassing is required as a part of the restoration. No separate payment shall be made for any restoration work.

02) BASIS OF PAYMENT

a) Partial payments will be made as follows:

Month after issuance Of the NTP	Cumulative Percent of the Price to be paid
1	30%
2	30%
3	30%

The final five percent (10%) of the amount bid for Mobilization shall be paid after demobilization and final cleanup of the Contractor staging/storage area and the entire jobsite.

The amount bid for Mobilization shall not exceed two percent (2%) of the total amount bid for the Contract, less allowances. Any amount in excess of two percent (2%) will be paid on the final pay application.

b) Payment will be made under:

Item SP-1-1- Mobilization - Per Lump Sum.

END OF SECTION SP-1

SECTION SP-2
PROJECT CONTINGENCY

01) DESCRIPTION

a) This section shall consist of work to be accomplished at the discretion and direction of the Owner per SC-14, Project Contingency/Allowances. As such, the Contractor is not to plan to commit or commit any funds associated with this Allowance without prior written approval by the Owner. It shall include items of work consistent with and related to the project which are not shown on the plans but which may be necessary for the successful completion of the contract. It is expected that work under this section will be accomplished utilizing construction items established under the other sections of these specifications.

02) GENERAL PROCEDURES

a) All work performed under this section shall comply with the various other sections of these specifications and Contract which are appropriate for each specific item of work. Additionally, the work shall be further described by the Engineer in written form and /or on modifications to the contract drawings or on supplemental drawings. In any event, no work or expenses will be allowed under this section without the prior written approval of the Engineer.

03) MEASUREMENT AND PAYMENT

a) Measurement for work accomplished under this section shall be in accordance with the various other sections of the contract and specifications corresponding to the specific items of work involved. Method of payment shall be per the Contract.

04) BASIS OF PAYMENT

a) Payment will be made under:

Item SP-2-1 – Project Contingency– Per Allowance

END OF SECTION SP-2

SECTION SP-3
AS BUILTS

1) DESCRIPTION

a) General: Do not use As-Built plans and specification documents for construction purposes; protect from deterioration and loss in a secure, fire resistive location; provide access to record documents for the Owner's reference during normal working hours.

b) Record Drawings: Maintain a clean, undamaged set of blue or black line white prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

i) Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.

ii) Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.

iii) Note related Change Order numbers where applicable.

iv) Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

v) Upon completion, submit the complete set of record drawings, complete stamped survey asbuilt drawing and electronic CAD survey files to the Owner for the Owner's records.

c) Record Specifications: Maintain one complete copy of the Project Manual (Specifications and Contract), including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

i) Upon completion of the Work, submit record Specifications to the Owner for the Owner's records.

d) Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark up of record drawings and Specifications.

i) Upon completion of mark up, submit complete set of record Product Data to the Owner for the Owner's records.

e) Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Owner for the Owner's records.

2) METHOD OF MEASUREMENT

a) Asbuilts shall be paid for as lump sum.

3) BASIS OF PAYMENT

a) Payment will be made at the proposed lump sum price to complete and deliver the asbuilt documents. The price shall be full compensation for performing the asbuilt survey and for delivering one conformed set of redlined asbuilt documents and a set of electronic CAD files as specified herein. This price shall include all materials as required, labor, equipment, tools and incidentals to complete the item. Final payment will not be made until Engineer of Record verifies the Contractor’s asbuilt documents and survey meet the requirements specified herein.

b) Payment will be made as follows:

Item SP-3-1 Asbuilts - Per Lump Sum

END OF SECTION SP-3

Hartsfield-Jackson
Atlanta International Airport

GATE "F3" RECONFIGURATION
Maynard H. Jackson Jr. International Terminal
"F" Concourse

Contract # FC-5801-A
Project WBS D.05.26.001

PROJECT MANUAL
VOLUME 1 OF 2

Divisions 02 - 14

Issue for Bid
April 17, 2015

Hartsfield Jackson + Partnership
191 Peachtree NE, Suite 2250, Atlanta, GA 30303

h-j+p

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SECTION 024119

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner's Representative.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner's Representative.

1. Coordinate with Owner's Representative.

1.05 SUBMITTALS

A. Schedule below may be used to track Contractor's progress; it may also be used to determine that selective demolition will not interfere with Owner's operations. Delete schedule submittal if not required or if selective demolition will not interfere with Owner's operations.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.

2. Interruption of utility services. Indicate how long utility services will be interrupted.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Use of elevator and stairs.

5. Locations of proposed dust- and noise-control temporary partitions and means of egress.

6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

7. Means of protection for items to remain and items in path of waste removal from building.

C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

D. Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.06 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

D. Pre-demolition Conference: Conduct conference at Project site. Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.07 PROJECT CONDITIONS

A. Conduct selective demolition so Owner's operations will not be disrupted.

B. Notify Design Consultant and Owner's Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Design Consultant and Owner's Representative. Owner will remove hazardous materials under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.08 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Design Consultant.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and preconstruction videotapes.

1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

1. Comply with Owner's requirements for existing services/systems interruptions.

B. s: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished. Where services to the existing facility must be temporarily shut down, submit "Interruption Request Form " by ASTC or TBI for approval.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor. On the "Interruption Request Form

2. Arrange to shut off indicated utilities with utility companies.

3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.03 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with Owner's requirements for access and protection specified .

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.

5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.

5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.07 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 032000

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 033000 - Cast-in-Place Concrete.

1.2 REFERENCES

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 301 - Standard Specifications for Structural Concrete.

C. ACI 315 - Details and Detailing of Concrete Reinforcement.

D. ACI 318 - Building Code Requirements for Structural Concrete.

E. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

F. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

G. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

H. AWS D12.1 - Recommended Practices for Welding Reinforcing Steel Metal Inserts, and Connections in Reinforced Concrete Construction.

I. AWS D1.4 - Structural Weld Code - Reinforcing Steel.

J. CRSI - Manual of Practice.

1.3 SUBMITTALS

A. Submit shop drawings as follows:
   1. Notify Design Professional prior to detailing reinforcing steel shop drawings.
   2. Indicate size, spacings, locations and quantities of reinforcing steel and wire fabric, bending and cutting schedules, splice lengths, stirrup spacing, supporting and spacing devices. Detail reinforcing steel in accordance with ACI 315 and CRSI Standards.
   3. Written description of reinforcement without adequate sections, elevations, and details is not acceptable.
   4. Reproduction of Structural Drawings for shop drawings is not permitted. Electronic drawing files will not be provided to the Contractor.

B. Submit a certification from each manufacturer or supplier stating that materials meet the requirements of the ASTM and ACI standards referenced.

C. Submit mill test reports.

D. Submit manufacturer's data for tensile and compressive splicers.

1.4 QUALITY ASSURANCE

A. Coordinate and schedule in a timely manner with the Structural Testing/Inspection Agency the following quality related items:
   1. Verify reinforcing steel for quantity, size, location, and support.
   2. Verify proper reinforcing steel concrete coverage.

B. Materials from each type shall be provided from the same source for the entire project.

1.5 STORAGE AND PROTECTING

A. Store reinforcing steel above ground so that it remains clean. Maintain steel surfaces free from materials and coatings which might impair bond.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Deformed reinforcing steel shall conform to ASTM A615, refer to Structural Drawings for grade (Grade 60 minimum).

B. Welded steel wire fabric shall conform to ASTM A1064.

2.2 ACCESSORY MATERIALS

A. Annealed steel tie wire shall be 16-1/2 gage minimum.

B. Bar supports shall be plastic-tipped steel Class I bar supports conforming to CRSI Specifications. Concrete brick may be used to support reinforcement to obtain proper clearance from earth.

2.3 SPLICERS

A. Tensile splicers shall be capable of developing 125% of the reinforcing steel ASTM specified minimum yield strength.

B. Compression splicers shall be the mechanical type such that the compression stress is transmitted by end bearing held in concentric contact.

2.4 DOWEL ADHESIVE

A. Adhesives for dowels into existing concrete shall **only be acceptable if they are from manufacturers approved by ICC Evaluation Services, Inc, with an evaluation service report submitted for Design Professional's review.**

PART 3 - EXECUTION

3.1 FABRICATION

A. Fabricate steel in accordance with ACI 318 and CRSI standards.

B. Bend bars cold. Do not heat or flame cut bars. No field bending of bars partially embedded in concrete is permitted, unless specifically approved Design Professional and checked by Testing and Inspection Agency for cracks.

C. Weld only as indicated. Perform welding in accordance with AWS D12.1 and or AWS D1.4.

D. Tag reinforcing steel for easy identification.

3.2 INSTALLATION

A. Before placing concrete, clean reinforcement of foreign particles and coatings.

B. Place, support, and secure reinforcement against displacement in accordance with ACI 318 and CRSI standards. Do not deviate from alignment or measurement.

C. Place concrete beam reinforcement support parallel to main reinforcement.

D. Locate welded wire fabric in the top half of slabs. Overlap mesh two squares or 8" minimum at side and end joints.

E. Furnish and install dowels or mechanical splices at intersections of walls, columns and piers to permit continuous reinforcement or development lengths at such intersections.

F. Maintain cover and tolerances in accordance with ACI and CRSI Specifications, unless indicated otherwise on Structural Drawings.

G. Welding of reinforcement is not permitted

3.3 SPLICES

A. Do not splice reinforcement except as indicated on Structural Drawings.

B. Tension couplers may be used and installed in accordance with manufacturer's specifications.

END OF SECTION 032000

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes cast-in-place concrete work indicated in the Contract Documents or otherwise required for proper completion of the work.

1.2 RELATED SECTIONS

A. Section 032000 - Concrete Reinforcement.

B. Section 051200 - Structural Steel Framing

C. Division 9 - Finishes

1.3 REFERENCES

A. ACI 207.1R - Mass Concrete

B. ACI 211.1- Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

C. ACI 214 - Recommended Practice for Evaluation of Strength Test Results of Concrete.

D. ACI 224.3R – Joints in Concrete Construction.

E. ACI 233R – Ground Granulated Blast-Furnace Slag as a Cementitious Constituent in Concrete.

F. ACI 301 - Specifications for Structural Concrete for Buildings.

G. ACI 302.1 - Guide for Concrete Floor and Slab Construction.

H. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.

I. ACI 305 - Hot Weather Concreting.

J. ACI 306 - Cold Weather Concreting.

K. ACI 308 - Standard Practice for Curing Concrete.

L. ACI 309 - Guide for Consolidation of Concrete.

M. ACI 318 - Building Code Requirements for Structural Concrete.

N. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

O. ASTM C33 - Standard Specification for Concrete Aggregates.

P. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

Q. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

R. ASTM C138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

S. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

T. ASTM C150 - Standard Specification for Portland Cement.

U. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

V. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

W. ASTM C230 - Standard Specification for Flow Table or Use in Tests of Hydraulic Cement.

X. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

Y. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

Z. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.

AA. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

BB. ASTM C495 - Standard Test Method for Compressive Strength of Lightweight Insulating Concrete.

CC. ASTM C567 - Standard Test Method for Unit Weight of Structural Lightweight Concrete.

DD. ASTM C618 - Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

EE. ASTM E1155 - Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System.

1.4 NOTICE

A. Notify Design Professional and Testing Agency not less than 72 hours prior to placing concrete.

1.5 QUALITY ASSURANCE

A. Testing Agency shall perform the following quality related items:

1. Examine concrete in truck to verify that concrete appears properly mixed.
2. Perform a slump test each 75 cubic yards of each mix design placed in any one day. Record if water or admixtures are added to the concrete at the job site. Perform additional slump tests after job site adjustments.
3. Mold four specimens per set for compressive strength testing; one set for each 75 cubic yards of each mix design placed in any one day. For each set molded, record:
   a. Slump
   b. Air content
   c. Unit weight
   d. Temperature, ambient and concrete
   e. Location of placement
   f. Any pertinent information, such as addition of water, addition of admixtures, etc.
   g. Time of batching and placing of concrete.
4. Samples are to be taken at placement. Perform one 7-day and two 28-day compressive strength tests. (Use one as a spare to be broken as directed by the Design Professional if compressive strengths do not appear adequate.) **Any additional cylinders and testing required for early concrete strength verification for post-tensioning purposes shall be at contractor's expense.**

B. The ready-mixed concrete plant shall be certified for conformance with the requirements of the National Ready Mix Concrete Association.

C. PREINSTALLATION CONFERENCES

1. Mix Design Conference: At least 30 days prior to submittal of concrete design mixes, the Contractor shall hold a meeting or telephone conference to review the detailed requirements for preparing the concrete mix designs. Participants shall include representatives from the Contractor, Owner's Testing Laboratory, Concrete Supplier, and Engineer.

2. Pre-Concrete Conference:

   a. At least 7 days prior to beginning concrete work, the Contractor shall conduct a meeting to review the proposed mix designs and to discuss required methods and procedures to produce concrete construction of the required quality. Also review requirements for submittals, status of coordinating work and availability of materials. Establish work progress schedule and procedures for materials inspection, testing and certifications. The contractor shall send a pre-concrete conference agenda to all attendees 7 days prior to the scheduled date of the conference.

   b. The Contractor shall require responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to the following:

      Contractor's Superintendent
      Laboratory responsible for the concrete design mix
      Laboratory responsible for field quality control

Concrete Subcontractor
Ready-Mix Concrete Producer
Owner's and Architect's/Engineer's Representative

3. Minutes of the meeting shall be recorded, typed and printed by the Contractor and distributed by him to all parties concerned within 5 days of the meeting. One copy of the minutes shall be transmitted to the following for information purposes:

   Owner's Representative
   Architect
   Engineer-of-Record

4. The Engineer shall be present at the conference. The Contractor shall notify the Engineer at least 7 days prior to the scheduled date of the conference.

1.6 CONCRETE MIX DESIGN

A. Establish concrete mix design proportions in accordance with ACI 318, Chapter 5.

B. Submit concrete mix designs. Include the following:
   1. Type and quantities of materials.
   2. Slump.
   3. Air content.
   4. Fresh unit weight.
   5. Aggregates sieve analysis.
   6. Design compressive strength.
   7. Location of placement in structure.
   8. Method of placement.
   9. Method of curing.
   10. Seven-day and 28-day compressive strengths.

C. Concrete supplier shall submit certifications that the materials used meet applicable ASTM Specifications. Mix designs not conforming to the above will be rejected.

1.7 SLUMP

A. Design concrete with a maximum slump of five inches.

B. If a slump greater than five inches is desired it shall be achieved with a high-range water reducer. Design the concrete mix with a high range water reducer slump of two and one-half inches plus or minus one and one-half inches. The maximum slump after high-range water reducers are added shall be eight inches.

1.8 FRESH UNIT WEIGHT

A. Normal weight concrete shall have a fresh unit weight of 140 to 152 pcf.

B. Light weight concrete shall have a fresh unit weight of 100 to 110 pcf.

1.9 AIR CONTENT

A. For normal weight and light-weight concrete, no entrained air content is required in concrete placed in foundations, interior slabs-on-grade, or for slabs, beams, and columns with interior exposure.

B. If air-entrainment is required, it should be in accordance with ACI 301.

1.10 WATER/CEMENT RATIO

A. Concrete elements shall have a maximum water cement ratio of the following, unless noted otherwise.

Compressive Strength	W/C
3000 psi	0.55 UNO
4000 psi	0.50 UNO
5000 psi or greater	0.45 UNO

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials designated by specific manufacturer's trade names are approved, subject to compliance with the quality and performance indicated by the manufacturer. Instructions and specifications, published by the manufacturer of such materials are included in and are a part of these specifications. Provide certification from manufacturer or supplier that materials designated by reference to ASTM and ACI standards meet the requirements of these standards.

2.2 CONCRETE STRENGTH

A. Provide concrete strengths indicated on the Structural Drawings.

2.3 CEMENT

A. Portland cement shall conform to ASTM C150, Type I, unless noted otherwise. Use one brand only.

2.4 AGGREGATE

A. Fine aggregate shall conform to ASTM C33, class #4M.

1. Coarse aggregate of gravel or crushed stone shall conform to ASTM C33, class #57. Size coarse aggregate in accordance with ACI 318.
2. Lightweight Aggregates: ASTM C330. Submit material certificates certifying conformance to this specification for each source of aggregate.

2.5 WATER

A. Water shall be potable and free of deleterious substances in accordance with ACI 318.

2.6 AIR ENTRAINING AGENT

A. Air entraining agent shall conform to ASTM C260.

2.7 WATER REDUCER

A. Water reducing agent shall conform to ASTM C494.

2.8 HIGH-RANGE WATER REDUCER

A. High-range water reducers (superplasticizers) shall conform to ASTM C494.

2.9 CHLORIDE

A. Use no chlorides of any form in concrete.

2.10 CURING COMPOUND

A. An acrylic cure compound with a minimum solid content of 20 percent may be used at the Contractor's option in accordance with ASTM C309, and in compliance with these specifications.

2.11 ACCELERATORS

A. Non-chloride accelerators shall conform to ASTM C494.

2.12 RETARDERS

A. Retarders shall conform to ASTM C494.

2.13 FLY ASH

A. Fly ash shall be Class F fly ash with a loss on ignition of less than five percent or Class C fly ash with a loss on ignition of less than one percent in accordance with ASTM C618.

B. Maximum fly ash content shall be limited to 20% of the total cementitious material weight.

2.14 GROUND GRANULATED BLAST FURNACE SLAG (GGBFS)

A. Ground Granulated Blast-Furnace Slag (GGBFS) shall conform to ACI 233.

B. Maximum GGBFS content shall be limited to 50% of the total cementitious material weight. Maximum total combined GGBFS plus Flyash shall be limited to 50% of the total cementitious material weight.

PART 3 - EXECUTION

3.1 HIGH-RANGE WATER REDUCERS

A. High-range water reducers are to be added at dosage recommended by the manufacturer. The slump of the concrete shall be one to four inches at the time the high-range water reducers are added. Do not permit fresh concrete containing superplasticizers to come in contact with fresh concrete not containing superplasticizers.

3.2 ADDITION OF WATER AT JOB SITE

A. Water may be added to the batch only if neither the maximum permissible water/cement ratio nor the maximum slump is exceeded.
B. Batch tickets indicating the amount of water withheld at the plant must be presented prior to adding water at the site.

3.3 PLACEMENT OF CONCRETE

A. Deposit concrete as near as practical to final position. Maximum free fall shall be six feet.

B. Do no flowing of concrete with vibrators.

C. Place floors and slabs in accordance with ACI 302.

D. Do not use aluminum equipment in placing and finishing concrete.

E. Place thickened slabs for partitions integral with floor slabs.

F. Prepare place of deposit, mix, convey, place, and cure concrete in accordance with ACI 301, ACI 304, and ACI 318. Wet forms before placing concrete.

G. Place concrete on properly prepared granular subbase. Vapor barrier is installed above granular subgrade.

3.4 TIME LIMIT

A. Deposit concrete within one and one-half hours after batching. Deposit concrete within one hour if depositing during hot weather (i.e. temperatures exceeding 85 degrees Fahrenheit) concreting operations.

3.5 VIBRATION

A. Consolidate concrete in accordance with ACI 301 and ACI 309.

3.6 CURING

A. Begin curing procedures immediately following the commencement of the finishing operation.

B. Cure concrete in accordance with ACI 308.

C. Moist cure all concrete to receive tile, stone, membranes and coatings, and should be performed as follows:

1. Place burlap and polyethylene curing blankets on the surface and keep them continuously moist with sprinklers for seven days.
2. In hot weather or wind conditions, prevent rapid mix water evaporation and possible plastic shrinkage cracking by using evaporation retarders or fog sprays.
3. In cold weather, follow recommended procedures in ACI 306 and ACI 308.

D. In other areas, if an acrylic curing compound is used, apply in accordance with manufacturer's recommendations to surfaces of concrete not protected for five days by formwork. Do not use curing compounds in areas to receive material that does not adhere to concrete cured with a curing compound unless the curing compound is water soluble.

3.7 SLAB ON GRADE

A. Concrete used in slabs on grade shall exhibit ultimate shrinkage strain no more than 0.05 percent. If tests were required to meet this criteria, concrete shrinkage tests shall be performed in accordance with ASTM C 157 on specimens moist-cured for one day. Tests shall be performed by an ACI certified technician in an ACI certified laboratory.

3.8 ENVIRONMENTAL PROVISIONS

A. Perform cold weather concreting in accordance with ACI 306.

B. Perform hot weather concreting in accordance with ACI 305.

C. Protect concrete from drying and excessive temperature for the first seven days.

D. Protect fresh concrete from wind.

3.9 CONTRACTION JOINTS

A. Do not place contraction joints in framed floors or composite slabs.

B. Place contraction joints in slabs-on-grade with a maximum spacing of approximately 18' to form a regular grid. The long dimension of the grid shall not exceed 1.5 times the short dimension of the grid. Contraction joints may be saw cut if cut within 8 hours after placement of concrete. Saw cuts shall be a depth equal to one-fourth the slab thickness by one-eighth inch wide. Alternately, in areas to receive carpeting or wood flooring contraction joints may be provided by preformed plastic strip inserts.

3.10 CUTTING CONCRETE

A. Obtain Design Professional's written approval prior to cutting concrete for installation of other work.

3.11 PATCHWORK AND REPAIRS

A. Notify Design Professional of any defective areas in concrete to be patched or repaired. Repair and patch defective areas with non-shrink grout. Cut out defective areas over two inches in diameter to solid concrete, but not less than a depth of one inch. Make edges of cuts perpendicular to the concrete surface.

3.12 DEFICIENT CONCRETE COMPRESSIVE STRENGTH

A. In the event that concrete tests indicate a 3-day, 7-day, or 28-day strength below that which was expected or specified, the Contractor with the agreement of the Design Professional shall have the mix adjusted so that subsequent concrete will comply with the minimum strength requirements. The Owner may require core specimens to be taken and tested, at the Contractor's expense. If core tests fall below minimum requirements, as determined by the Design Professional, the concrete in place will be deemed to be defective. This concrete shall be removed and replaced or strengthened in a manner acceptable to the Owner and Design Professional, at the Contractor's expense. Any demolition or repair of other materials or systems as a result of repair or replacement of defective concrete shall be at the Contractor's expense.

3.13 CONCRETE FINISHES

A. Finish concrete in accordance with ACI 301, ACI 117, and ACI 302.1.

B. See specification section 03 35 00 CONCRETE FINISHING for finishes.

C. Finish concrete slabs to flatness and levelness tolerances which correspond to F_F 25/F_L 20 minimum overall for composite of all measured values per placement and F_F 17/F_L 15 minimum for any individual floor section.

D. For concrete slabs to receive wood flooring, finish to flatness and levelness tolerances which correspondence to F_F 45/F_L 30 minimum overall for composite of all measured values per placement and F_F 30/F_L 20 minimum for any individual floor section.

E. For concrete slabs to receive owner furnished equipment, finish to floor flatness and floor levelness tolerances stated in the equipment manufacturer's recommended guidelines.

F. Floor flatness and floor levelness testing to be performed within 24 hours of concrete placement.

F. For shored construction, F_L values do not apply if slab is tested after shoring is removed.

G. For unshored construction, F_L does not apply.

H. Slabs which do not meet the flatness and levelness criteria shall be repaired or replaced.

I. The floor flatness testing shall be performed on every section of floor bound by columns or wall lines.

END OF SECTION 033000

SECTION 042200

UNIT MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Mortar and grout.
3. Reinforcing steel.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Miscellaneous masonry accessories.

B. Related Sections include the following:

1. Division 7 Section "Penetration Firestopping" for firestopping at openings in masonry walls.
2. Division 7 Section "Fire-Resistive Joint Systems" for fire-resistive joint systems at heads of masonry walls.
3. Division 7 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.

C. Products furnished, but not installed, under this Section include the following:

1. Dovetail slots for masonry anchors, installed under Division 03 Section "Cast-in-Place Concrete".

D. Products installed, but not furnished, under this Section include the following:

1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications".
2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim".

1.03 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

B. Determine net-area compressive strength (f'_m) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes. Show control joints and expansion joints, indicating locations and details.

2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement". Show elevations of reinforced walls.

3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications. Show profiles, material thicknesses, and identify sealant types used at terminations and lapped joints.

C. Samples for Verification: For each type and color of the following:

1. Accessories embedded in masonry.

D. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

1. Cementitious materials. Include brand, type, and name of manufacturer.

2. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

3. Grout mixes. Include description of type and proportions of ingredients.

4. Reinforcing bars.

5. Joint reinforcement.

6. Anchors, ties, and metal accessories.

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

F. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

G. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

H. Meeting Records: Minutes of pre-installation conference.

1.06 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

D. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.

1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches long by 48 inches high.

2. Clean one-half of exposed faces of panels with masonry cleaner indicated.

3. Protect approved sample panels from the elements with weather-resistant membrane.

4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Design Consultant in writing.

a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Design Consultant in writing.

E. Pre-Installation Conference: Conduct conference at Project site.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.08 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.02 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

2. Provide bullnose units for outside corners, unless otherwise indicated.

B. Integral Water Repellent: Provide units made with integral water repellent for units exposed to the weather, unless otherwise indicated.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.

2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Addiment Incorporated; Block Plus W-10.

b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.

c. Master Builders, Inc.; Rheopel.

C. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.

2. Weight Classification: Lightweight.

3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions, as indicated on Drawings.

4. Exposed Faces: Provide manufacturer's standard color and texture, unless otherwise indicated.

2.03 CONCRETE AND MASONRY LINTELS

A. General: Provide either concrete or masonry lintels, at Contractor's option, complying with requirements below.

B. Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.

C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.04 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

D. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

E. Aggregate for Grout: ASTM C 404.

F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Addiment Incorporated; Mortar Kick.

b. Euclid Chemical Company (The); Accelguard 80.

c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.

d. Sonneborn, Div. of ChemRex; Trimix-NCA.

G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Addiment Incorporated; Mortar Tite.

b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

c. Master Builders, Inc.; Color Cure Mortar Admix or Rheomix Rheopel.

H. Water: Potable.

2.05 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615 or ASTM A 996, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Mill-galvanized, carbon steel.

2. Exterior Walls: Hot-dip galvanized, carbon steel.

3. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.

4. Wire Size for Cross Rods: W2.8 or 0.188-inch diameter.

5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.

6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.06 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.

2. Galvanized Steel Sheet: ASTM A 653, Commercial Steel, G60 zinc coating.

3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153.

B. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire.

2. Tie Section for Steel Frame: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch- diameter, hot-dip galvanized steel wire

3. Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.097-inch- thick, steel sheet, galvanized after fabrication

4. Tie Section for Concrete: Corrugated metal ties with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.

C. Partition Top Anchors: 0.097-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

2.07 MISCELLANEOUS ANCHORS

A. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

2.08 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with Division 7 Section "Sheet Metal Flashing and Trim".

B. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim".

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.09 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.

b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.

c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.

d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.10 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Diedrich Technologies, Inc.

b. EaCo Chem, Inc.

c. ProSoCo, Inc.

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

2. Limit cementitious materials in mortar to portland cement and lime.

3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

4. Add water-repellent admixture to mortar used in joints of concrete masonry units with integral water repellent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S or N.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

2. Verify that foundations are within tolerances specified.

3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Thickness: Build composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

F. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.03 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

G. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.

2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.

3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Resistive Joint Systems."

3.04 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.

2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.

3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.

4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

C. Joints in exterior masonry shall be tight and free of any voids or separations. Penetrations in exterior walls shall be completely sealed with mortar or specified sealant, as indicated. Refer to Division 7 "Joint Sealants" for joint sealants.

3.05 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c, unless otherwise indicated.

2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls, unless otherwise indicated.

3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings, unless otherwise indicated.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.06 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.

2. Space anchors as indicated, but not more than 16 inches o.c. vertically and 36 inches o.c. horizontally.

3.07 CONTROL AND EXPANSION JOINTS

A. General:

1. Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

2. Install control and expansion joints at locations indicated on Drawings. In the event control joints are not indicated on the Drawings, space control joints at 20'-0" on center, maximum.

B. Form control joints in concrete masonry as follows:

1. Install preformed control-joint gaskets designed to fit standard sash block.

C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants", but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.08 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.09 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

2. Limit height of vertical grout pours to not more than 60 inches.

3.10 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Design Consultant's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.11 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Sections.
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 051200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes fabrication and erection of structural steel indicated in the Contract Documents or otherwise required for proper completion of the work.

1.2 RELATED SECTIONS

A. Section 053100 - Steel decking.

1.3 REFERENCES

A. AISC - Code of Standard Practice for Steel Buildings and Bridges.

B. AISC – 14th Edition of AISC Steel Manual, AISC 360-10.

C. AISC - Specification for Structural Joints Using High-Strength Bolts.

D. AWS D1.1 - Structural Welding Code.

E. AWS A5.1 - Specification for Carbon Steel Electrodes for Shield Metal Arc Welding.

F. AWS A5.5 - Specification for Low-Alloy Steel Covered Arc Welding Electrodes.

G. AWS A5.17 - Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding.

H. AWS A5.20 - Specification for Carbon Steel Electrodes for Flux Cored Arc Welding.

I. SSPC - Steel Structures Painting Manual.

J. ASTM A36 - Standard Specification for Structural Steel.

K. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

L. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

M. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

N. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

O. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

P. ASTM A325 - Standard Specification for Structural Bolts, Heat Treated, 120/105 KSI Minimum Tensile Strength.

Q. ASTM A490 - Standard Specification for Heat-Treated Steel Structural Bolts, 150 KSI Minimum Tensile Strength.

R. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Tubing in Rounds and Shapes.

S. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

T. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality.

U. ASTM A586 - Standard Specification for Zinc-Coated Parallel and Helical Steel Wire Structural Strand

V. ASTM A992 – Standard Specification for Steel for Structural Shapes for Use in Building Framing.

W. ASTM F436 - Standard Specification for Hardened Steel Washers.

X. ASTM F844 - Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

Y. ASTM A6 – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

Z. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

AA. ASTM A673 - Standard Specification for Sampling Procedure for Impact Testing of Structural Steel

AB. ANSI/AISC 341-02 – Seismic Provisions for Structural Steel Buildings

1.4 SUBMITTALS

A. Contact Design Professional's Construction Administration Division prior to detailing structural steel shop drawings.

B. Reproduction of Construction Drawings for shop drawings is not permitted. Electronic drawing files will not be provided to the Contractor.

C. Submit shop drawings for review.

D. Shop drawings shall clearly indicate the profiles, sizes, ASTM Grade, spacings and locations of all structural steel members, including connections, attachments, anchorage's, framed openings, sizes

and types of fasteners, method of tightening fasteners, cambers, and the number, type and spacing of the headed shear connectors.

E. For record only, submit written Welding Procedure Specifications (WPS) for each type of welded joint used in accordance with AWS D1.1.

F. Maintain at construction office mill certification that the steel supplied meets the specifications.

G. Maintain at construction office certification that high strength bolts supplied meet the specifications.

H. Submit certification that the fabricator meets the required qualifications and ultrasonic testing reports for complete penetration welds.

I. Submit certification that the erector meets the required qualifications.

J. Upon request, submit the erection sequence and procedures to be used by the steel erector.

K. Upon request, submit shop measurements for camber.

L. Surveys:

1. Land Surveyor Qualifications:
   A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and with a minimum of five years of experience in providing surveying services of the kind indicated.

2. Submit survey indicating elevations and locations of concrete and masonry-bearing surfaces and locations of anchor rods, bearing plates and other embedments to receive structural framing. Indicate discrepancies between actual installation and the Contract Documents.
3. Submit survey indicating final elevations and locations of columns and other major structural steel elements. Steel survey shall include column plumbness after structural steel erection. Indicate discrepancies between actual installation and the Contract Documents. Surveyor shall certify the accuracy of the survey.

For each approved fabricator that is exempt from Special Inspections of shop fabrications and implementation procedures in accordance with Section 1704.2 of the Building Code, the Contractor shall submit "Fabricator's Certificate of Compliance". Contractor shall also provide copies of fabricator's certification or building code evaluation services report and fabricator's quality control manual.

M. Structural Strand:

1. Submit certification that the material was manufactured, sampled, tested, and inspected in accordance with this specification and has been found to meet the requirements. Report of the test results shall be furnished.

1.5 QUALITY ASSURANCE

A. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Inspection of work performed at Fabricator's Shop

a. AISC Certified Fabricators:
   1) Special inspections are not required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection.
   2) Approval shall be based upon review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices by an approved special inspection agency.
   3) At completion of fabrication, the approved fabricators shall submit a certificate of compliance to the design professional stating that the work was performed in accordance with the approved construction documents.

b. Non- AISC Certified Fabricators:

   1) The special inspector shall verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
   2) The special inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work.

   3) If required by Section 1.6, the inspector shall conduct the inspections required by Section 1.6.

2. Anchor Bolts (Rods)

   a. Anchor Bolt (Rod) size, grade, configuration, and embedment shall be verified prior to placement of concrete.

3. Welded Connections

   a. Inspection shall be in accordance with AWS Structural Welding Code.

   b. Monitoring shall be periodic or continuous as indicated below and shall include:
      1) Visual inspection of all field-welded connections.
      2) Visual inspection of steel fitup prior to weld.
      3) Review of approved welding procedure specifications and verification that the welding procedure specifications are being adhered to during field welding.
      4) Verification of welder qualifications.

   c. Complete penetration groove welds
      1) The inspector shall perform continuous monitoring of these welds.
      2) Ultrasonically inspect 100% of the field welds.

   d. Partial penetration groove welds, multi-pass fillet welds, and single-pass fillet welds greater than 5/16-inch:
      1) The inspector shall perform continuous monitoring of these welds.

   e. Single-pass fillet welds less than or equal to 5/16-inch:
      1) The inspector shall perform periodic monitoring of these welds.

4. Bolted Connections

a. Inspection and testing shall be in accordance with AISC Specifications for Structural Joints using ASTM A325 or A490 Bolts.

b. The inspector shall verify (at a minimum) that bolts, nuts, washers, paint on faying surfaces, bolted parts, installation, and tightening are in accordance with the plans and specifications.

c. The inspector shall verify that all plies of connected materials have been drawn together and properly snugged.

d. The inspector shall verify that bolt tensioning techniques are in accordance with the AISC Specification for Structural Joints High-Strength Bolts.

e. Connections with Fully Tensioned Bolts:

1) Prior to visual and physical testing, tension testing using a calibration device (Skidmore-Wilhelm) must indicate tensions at least 5% in excess of the AISC minimum. Structural steel erector shall supply the tension calibration device. The inspector shall observe the pre-installation testing and calibration procedures.
2) The inspector shall perform periodic inspection (including a minimum of 10% of the connections) of bolt installation for tensioning when the turn-of-nut method with match marking techniques, the direct tension indicator, or the alternate design fastener (twist-off bolt) methods are used.
3) The inspector shall perform continuous inspection (including 100% of the connections) of bolt installation for tensioning when the calibrated wrench or the turn-of-nut method without match marking methods are used.

f. Connections with Snug Tight Bolts:
1) The inspector shall perform periodic inspection (including a minimum of 10% of the connections) of connections with snug tight bolts.

5. Headed Studs

a. Inspection and testing shall be in accordance with AWS D1.1.
b. The inspector shall verify the pre-production testing in accordance with Section 7.7.1 of AWS D1.1.
c. The inspector shall perform periodic inspection of all headed stud welding.
d. The inspector shall visually inspect 100% of the headed stud welds.
e. Bend tests shall be conducted as required by Section 7.8.1 of AWS D1.1. In addition; a minimum of 15% of all headed studs shall be subjected to bend tests. Retest all studs on any member that has a stud failing the bend test.

6. Structural Strand

a. Structural strand shall be packaged in coils or on reels at the discretion of the manufacturer. Strand shall be packaged in such a manner so that no permanent deformation of wires in the strand will occur.

7. Material Verification

a. The inspector shall conduct periodic inspections to verify high-strength bolts, nuts, and washers:
   1) Verify that the identification markings conform to the ASTM standards, specified in the approved construction documents.
   2) Verify the manufacturer's certificate of compliance.

b. The inspector shall conduct periodic inspections to verify the structural steel:
   1) Verify that the identification markings conform to the ASTM standards, specified in the approved construction documents.
   2) Verify the manufacturer's certified mill test reports.

c. The inspector shall conduct periodic inspections to verify the weld filler materials:
   1) Verify that the identification markings conform to the AWS specification, specified in the approved construction documents.
   2) Verify the manufacturer's certificate of compliance.

8. Details

a. The inspector shall conduct periodic inspections of the steel frame to verify compliance with the details shown on the approved construction documents, such as bracing, stiffening, member locations and proper application of joint details at each connection.

1.6 FABRICATOR'S QUALIFICATIONS

A. Steel fabricator shall be certified by the American Institute of Steel Construction (AISC) Quality Certification Program for Conventional Steel Buildings (Sbd). In addition, fabricator shall ultrasonically inspect 100% of the complete penetration welds performed in the shop.

B. Fabricator not certified by the AISC Quality Certification Program shall have fabrication procedures and fabricated steel tested and inspected by the testing agency approved by the design professional. Prior to delivery of structural steel to the project, submit copies of the inspection reports to the design professional. The purpose of this inspection is to enable the testing/inspection agency to verify that, in general, the steel is being fabricated in accordance with the Contract Documents. A minimum of one trip per week is recommended. The first trip should be scheduled in the early stages of fabrication. Contact the design professional prior to initial inspection. Tests and inspections shall include the following:

1. Examine mill test reports and verify that material being used is the same as the mill test reports.
2. Review the fabricator's written welding procedures. Verify that the fabricator's welding procedures are being followed. Verify that welders are certified with current papers and that they demonstrate proper techniques.
3. Observe high strength bolting procedures. Verify that shop installation of high strength bolts conform to AISC specifications.
4. Camber
   a. Measure 25 percent of all cambered steel members (in field) prior to erection for compliance with the AISC Code of Standard Practice. Camber shall be checked at mid-point of member length.
   b. Submit field camber measurements to the Structural Engineer for review.

c. Additional measurements may be required at the Structural Engineer's discretion.
5. Examine joint preparation for complete penetration joints. Ultrasonically inspect 100% of the complete penetration welds performed in the shop.
6. Examine fillet welds for proper size, profile, throat, porosity and end returns.
7. Examine steel members for lamellar tearing. Spot check dimensions and hole sizes.
8. Examine bolted areas for burrs.

1.7 ERECTOR'S QUALIFICATION

A. Erector shall be experienced in erecting structural systems similar in complexity to this project as evidenced by 10 completed projects.

B. Erector shall have a minimum of 5 years experience in the erection of structural steel or is an AISC Certified Advanced Steel Erector.

1.8 STORAGE

A. Store materials off ground to permit easy access for inspection and identification. Store steel members and packaged items in a manner that provides protection against contact with deleterious materials.

PART 2 - PRODUCTS

2.1 ANCHOR RODS

A. Anchor rods shall be threaded rods conforming to ASTM F1554 Gr. 36 unless noted otherwise on the drawings. The anchor rods shall be threaded at both ends.

B. Provide a heavy hexagonal nut threaded and tack welded to the bottom of each rod unless noted otherwise on the structural documents. The nut shall conform to ASTM F844.

C. Provide two hexagonal nuts and two plain steel washers at the top of each rod. The nuts and washers shall conform to ASTM F844.

D. Provide 3/8-inch thick plate washers (3-inch x 3-inch) with standard holes in lieu of top steel washers on base plates with oversized holes. Oversized holes are defined as any hole that is larger than a standard hole as defined in Chapter J of the AISC Specification. Recommended base plate holes as given in the AISC Manual are considered oversized holes.

2.2 ROLLED STEEL SHAPES, PLATES, AND BARS

A. Rolled steel W shapes shall conform to ASTM A992, 50 ksi minimum yield strength, unless noted otherwise on the contract drawings.

ASTM A572, Grade 50 may be substituted for ASTM A992.

B. Rolled steel M, S, HP, C, MC, and L shapes shall conform to ASTM A36, 36 ksi minimum yield strength, unless noted otherwise on the contract drawings.

C. Plates and Bars shall conform to ASTM A36, 36 ksi minimum yield strength, unless noted otherwise on the contract drawings

D. When used in the Seismic Load Resisting System, ASTM A6 Groups 3, 4, and 5 shapes with flanges 1-1/2 in. thick and thicker shall have a minimum Charpy V-Notch (CVN) toughness of 20 ft-lbs. at 70 degrees Fahrenheit. Impact testing shall be conducted in accordance with ASTM A 673 /A 673M, with the following exceptions:
   1. The center longitudinal axis of the specimens shall be located as near as practical to midway between the inner flange surface and the center of the flange thickness at the intersection with the web mid-thickness.
   2. Tests shall be conducted by the producer on material selected from a location representing the top of each ingot or part of an ingot used to produce the product represented by these tests.

E. At the contractor's option, additional shop inspections of ASTM A6 Groups 3, 4, and 5 shapes with flanges 1-1/2 in. thick and thicker, and plates that are 2-in. thick or thicker should be conducted to verify that base metal is free of defects such as lamellar tearing. If such defects are discovered during subsequent ultra-sonic testing, they shall be repaired and re-inspected at the contractor's expense.

2.3 SQUARE/RECTANGULAR HOLLOW STRUCTURAL STEEL SECTIONS

A. Square/rectangular hollow structural steel sections shall conform to ASTM A500, Grade B, 46 ksi minimum yield strength.

2.4 ROUND HOLLOW STRUCTURAL STEEL SECTIONS

A. Round hollow structural steel sections shall conform to ASTM A500, Grade B, 42 ksi minimum yield strength.

2.5 ROUND HOLLOW STEEL PIPE

A. Round hollow steel pipe shall conform to ASTM A53, Grade B, 35 ksi minimum yield strength.

2.6 NON-HIGH-STRENGTH FASTENERS

A. Non-high-strength bolts shall conform to ASTM A307, Grade A, 60 ksi minimum, where noted on the Structural Drawings.
B. Hardened steel washers shall conform to ASTM F436.

2.7 HIGH-STRENGTH FASTENERS

A. High-strength bolts shall conform to ASTM A325 or ASTM A490 as noted on the Structural Drawings.

B. Provide 3/4-inch minimum diameter bolts, unless noted otherwise.

C. Hardened steel washers shall conform to ASTM F436.

D. Spline-type tension control bolts, plain hardened washers and suitable nuts are an acceptable alternate design bolt assembly.

E. Do not use load indicating washers.

2.8 HEADED STUDS

A. Headed steel studs shall conform to the requirements of AWS D1.1.

B. Provide 3/4-inch diameter headed steel studs, unless noted otherwise.

C. Provide heat-resistant ceramic arc shields with studs.

2.9 ROUND RODS

A. Rods shall conform to ASTM, A36.

B. The rods shall be threaded at each end.

2.10 FORGED STEEL HARDWARE ITEMS

A. Structural hardware items such as clevises, turnbuckles, sleeve nuts, recessed-pin nuts, and cotter pins shall comply with the dimensions, weights, and design strengths as set forth in tables 15-3 through 15-8 (as applicable) in the AISC 360-10.

B. Material shall comply with SAE C-1035, C 1030, or other steel alloy approved equal.

2.11 EXPANSION ANCHORS

A. Expansion anchors shall be Strong-Bolt 2 supplied by Simpson Strong-Tie, Hilti Kwik Bolt TZ anchors supplied by Hilti Fastening Systems, Trubolt+ Wedge Anchors supplied by ITW Ramset/Red Head. Only anchors evaluated by the ICC Evaluation Service, Inc. (ICC-ES) with a published Evaluation Report shall be approved for use. Anchors that are to be installed in concrete that may become cracked under service loads as noted on the drawings shall be evaluated by ICC-ES according to Acceptance Criteria 193 and shall be specifically approved for use in cracked concrete. All anchors shall be approved for resisting seismic and wind loads.

2.12 ADHESIVE ANCHORS

A. Adhesive anchors shall consist of:
   1. An all-thread steel anchor conforming to ASTM A307, Grade A or ASTM A36, zinc plated in accordance with ASTM B633, unless noted otherwise on the Structural Drawings, and
   2. An adhesive conforming to AT-XP supplied by Simpson Strong-Tie (SET adhesive for masonry construction with voids), HIT HY150-SD injection adhesive (HIT HY20 adhesive for masonry construction with voids) supplied by Hilti Fastening Systems, EPCON System G5 epoxy adhesive supplied by ITW Ramset/Red Head (C6 adhesive for masonry construction with voids).
   3. Products should conform to ASTM C881-02, Type IV, Grade 3, Class A, B, & C except gel times and epoxy content and that shall consist of a two component adhesive system contained in side by side packs connected to a mixing nozzle which thoroughly mixes the components as it is injected into the hole. Consult with the manufacturer for the minimum temperature of the concrete surface allowed. The product must have passed ICC Evaluation Services, Inc. Acceptance Criteria 308 for long term creep. Anchors that are to be installed in concrete that may become

cracked under service loads as noted on the drawings shall be evaluated by ICC-ES according to Acceptance Criteria 308 and shall be specifically approved for use in cracked concrete.

2.13 STRUCTURAL STRAND

A. Strand shall consist of zinc-coated steel wire structural strand furnished with Class A weight zinc-coated interior strands and Class B weight zinc coated outer wires.

B. Provide testing of strand in accordance with ASTM A586.

2.14 WELD ELECTRODES

A. E-70 series low hydrogen electrodes shall conform to AWS A5.1, A5.5, A5.17, or A5.20.

B. Properly store electrodes to maintain flux quality.

2.15 PRIMER

A. Oxide primer shall conform to AISC Specifications, Code of Standard Practice, and SSPC Steel Structure Painting Manual, unless indicated otherwise.

B. Paint primer shall be free of lead and chromate and shall comply with State and Federal volatile organic compound (VOC) requirements.

C. Paint primer shall be compatible with finish coating.

2.16 GALVANIZING

A. Galvanized coating shall conform to ASTM A123.

B. Galvanize bolts, nuts, and washers in accordance with ASTM A153 when used to connect steel members that are specified to be galvanized.

C. Expansion anchors or adhesive anchors specified to be galvanized shall be mechanically galvanized in accordance with ASTM B695, Class 65, Type I.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Before erection proceeds, survey elevations and locations of concrete and masonry-bearing surfaces and locations of anchor rods, bearing plates and other embedments to receive structural framing, with Erector present, for compliance with requirements and specified tolerances.

1. Engage land surveyor to perform surveying.

B. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 GENERAL

A. Fabricate and erect structural steel in accordance with AISC Specifications and Code of Standard Practice.

B. Notify Design Professional and Structural Testing/Inspection Agency at least 48 hours prior to structural steel fabrication and erection.

3.3 ANCHOR BOLT (ROD) SETTING

A. Provide templates for setting anchor bolts (rods). Position anchor bolts (rods) by using templates with two nuts to secure in place prior to placement of concrete.

B. Do not erect steel where anchor bolt (rod) nuts will not have full threads.

3.4 CONNECTIONS

A. Provide a minimum of two fasteners at each bolted connection.

B. Ensure fasteners are lubricated prior to installation.

C. Provide high-strength bolted connections in accordance with AISC Specifications for Structural Joints Using High-Strength Bolts.

D. Provide connections for expansion and contraction where steel beams connect to concrete walls or concrete columns and at expansion joints. Secure nuts on bolts against loosening. (Dent threads with a chisel.)

E. Unless noted otherwise, structural drawings show conceptual connections details. The Fabricator shall be responsible for designing all connections not provided by the design professional. Where indicated, the Fabricator shall provide details that conform to the conceptual details provided in construction documents. Shop drawings that include elements designed by the fabricator must be signed and sealed by professional engineer licensed in State of Georgia. As an alternate, elements design by the fabricator shall require a signed and sealed cover letter with the shop drawings substantiating the design information. The design engineer must review and confirm in writing that the shop and erection drawings properly incorporate their design.

3.5 FASTENER INSTALLATION

A. Bolts shall be installed in holes of the connection and brought to snug tight condition. Tighten connection progressing systematically from the most rigid part to the free edges of the connection to minimize relaxation of the bolts.

B. High-strength bolts installed shall have a hardened washer under the element turned in tightening.

C. Installation and tightening of bolts shall conform to the AISC Specifications for Structural Joints.

3.6 HEADED STUDS

A. Headed studs shall be welded in accordance with AWS D1.1.

B. Locate studs directly over the web of beams with flanges less than 0.3 inches thick.

C. The minimum center spacing shall be 6 diameters along the longitudinal axis of the beam and 4 diameters transverse to the longitudinal axis of the beam.

D. Where double rows of studs are required, begin double rows at each end of the beam.

E. Remove shields after welding studs.

3.7 EXPANSION ANCHOR INSTALLATION

A. Install in accordance with manufacturer's recommendation.

B. Minimum embedment shall be equal to 6 times the anchor diameter unless noted otherwise.

C. Contractor to submit ICC Evaluation report for expansion anchor product; prior to installation.

3.8 ADHESIVE ANCHOR INSTALLATION

A. Install in accordance with manufacturer's recommendation.

B. Minimum embedment shall be equal to 9 times the anchor diameter unless noted otherwise.

C. Contractor to submit ICC Evaluation report for adhesive anchor product; prior to installation.

3.9 WELDING

A. Comply with AWS Structural Welding Code. Use prequalified weld procedures.

B. Provide end returns where fillet welds terminate at end or sides. Returns shall be continuous for a distance of not less than two times the nominal size of the weld.

C. Complete penetration joints shall be backgouged to sound metal before the second side is welded or have 1/4-inch root opening with 3/16 x 1-inch backing bar. Access holes are required. Filling access holes is not required.

D. Remove all slag and weld splatter from deposited weld metal.

3.10 SPLICING

A. Splice members only where indicated unless authorized in writing by Structural Engineer.

B. Provide shim plates at bottom flange splice at continuous beam splices with different depths.

3.11 CUTTING

A. Do not use flame cutting to correct errors unless authorized in writing.

B. Re-entrant corners shall have a minimum radius of one inch and be free of notches. Notches and gouges resulting from flame cutting shall be finished to a smooth appearance.

3.12 MILL SCALE

A. Remove loose mill scale.

3.13 BOLT HOLES

A. Cut, drill, or punch holes perpendicular to metal surfaces. Do not enlarge holes by burning. Drill or punch holes in bearing plates. Remove burrs.

3.14 PRIMING STEEL

A. Prime steel that is not encased in concrete, plaster, or sprayed fireproofing. Do not shop prime in areas to be field welded, contact surfaces of slip critical connections, or areas to receive special finishes.

B. Field prime, as required, steel that has been welded or that is not primed after connections have been tightened.

C. Verify primer requirements with Design Professional for buildings without fireproofing.

3.15 GALVANIZING

A. Galvanize shelf angles that support the exterior building veneer, for example brick shelf angles.

B. Galvanize environmentally exposed steel; for example, mechanical equipment supports.

C. Touch-up welds and abrasions in galvanized members in accordance with ASTM A780.

END OF SECTION 051200

SECTION 053100

STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Roof deck.
   2. Composite floor deck.
   3. Non-composite form floor deck.

B. Related Sections include the following:
   1. Division 3 Section "Cast-in-Place Concrete" for concrete fill.
   2. Division 5 Section "Structural Steel Framing" for shop- and field-welded shear connectors.
   3. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
   4. Division 9 painting Sections for repair painting of primed deck.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: For each type of steel deck, signed by product manufacturer.

D. Welding certificates.

E. Field quality-control test and inspection reports.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

G. Research/Evaluation Reports: For steel deck.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

D. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

E. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.

F. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

G. LEED Requirements
1. Refer to Section 01 81 19 LEED Requirements for additional project requirements, including but not limited to performance and submittal requirements that may apply to any product herein specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

1.6 COORDINATION

A. Coordinate layout and installation of trench headers, preset inserts, duct fittings, and other components specified in Division 16 Section "Underfloor Raceways" with installation of electrified cellular metal floor deck.

PART 2 - PRODUCTS

2.1 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G90 (Z275) zinc coating.
   2. Deck Profile: As indicated.
   3. Profile Depth: As indicated.
   4. Span Condition: As indicated.
   5. Side Laps: Overlapped.

2.2 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G90 (Z275) zinc coating.
   2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard gray baked-on, rust-inhibitive primer.
   3. Profile Depth: As indicated.
   4. Span Condition: As indicated.

2.3 NON-COMPOSITE FORM DECK

A. Non-composite Steel Floor Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI Publication No. **31**, and with the following:

   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G90 (Z275) zinc coating.
   2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard gray baked-on, rust-inhibitive primer.
   3. Profile Depth: As indicated.
   4. Span Condition: As indicated.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and level recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.

J. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.

K. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:
   1. Weld Diameter: 5/8 inch (16 mm), nominal.
   2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches (305 mm) apart in the field of roof and 6 inches (150 mm) apart in roof corners and perimeter, based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28 .
   3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 12 inches (450 mm), and as follows:
   1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
   2. Mechanically clinch or button punch.
   3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

   1. End Joints: Lapped 2 inches (51 mm) minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 12 inches (305 mm) apart with at least one weld at each corner.

   1. Install reinforcing channels or zees in ribs to span between supports and weld.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

   1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch (16 mm), nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
3. Weld Spacing: Space and locate welds as indicated.
4. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (910 mm), and as follows:
1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

F. Install piercing hanger tabs at [14 inches (355 mm)] apart in both directions, within 9 inches (228 mm) of walls at ends, and not more than 12 inches (305 mm) from walls at sides, unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: A qualified independent testing and inspecting agency will be engaged to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on top of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 9 Section.

C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Division 9 Section.

D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 054000

STRUCTURAL METAL STUDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Exterior non-load-bearing wall framing.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
2. Division 6 Section "Rough Carpentry" for wood blocking and hanging strips to be used in lieu of backing plates and hanging strips, if backing plates cannot be used.
3. Division 7 Section "Sheathing" for exterior wall sheathing.
4. Division 9 Section "Non-Load-Bearing Steel Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
5. Division 9 Section "Gypsum Board Shaft-Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide exterior non-load-bearing cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings, including, but not limited to, wind loads and dead loads of exterior cladding system and interior finish materials.

2. Deflection Limits: Design exterior non-load-bearing framing systems to withstand design loads without deflections greater than the following:

a. Exterior Non-Load-Bearing Framing: Horizontal deflection as required by metal panel manufacturer, but in no case less than L/360 of the wall height.

3. Design exterior non-load-bearing framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

4. Design exterior non-load-bearing framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure of 1/2 inch (upward and downward movement).

B. Cold-Formed Steel Framing, General:

1. Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions".

2. Design exterior non-load-bearing wall framing systems to accommodate horizontal deflection without regard for contribution of sheathing or finish materials.

1.04 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings:

1. Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fastener size and number or spacing. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

2. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer.

E. Research/Evaluation Reports: For cold-formed metal framing.

F. Meeting Records: Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel", and AWS D1.3, "Structural Welding Code--Sheet Steel".

D. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions".

F. Pre-Installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

1. AllSteel Products, Inc.
2. Clark Steel Framing.
3. Craco Metals Manufacturing, LLC.
4. Dietrich Metal Framing; a Worthington Industries Company.
5. Formetal Co. Inc. (The).
6. MarinoWare; a division of Ware Industries.
7. Southeastern Stud & Components, Inc.
8. Steel Construction Systems.
9. United Metal Products, Inc.

2.02 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 50 percent.

B. Steel Sheet: ASTM A 1003, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST33H or as required by structural performance.
2. Coating: G90 or equivalent.

C. Steel Sheet for Vertical Deflection Clips: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1 or 2 or as required by structural performance.
2. Coating: G90 or equivalent.

2.03 WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Section Properties: As required by structural performance; sizes, where shown on the Drawings, are minimums.
2. Exterior wall studs, other than those supporting the exterior metal wall panel system, shall be 6", 16 gage (0.0538 inch) minimum with a maximum spacing of 16" on center.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Section Properties: As required by structural performance.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Section Properties: As required by structural performance.

2.04 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.

9. Hole reinforcing plates.
10. Backing plates and hanging strips.

2.05 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners:

1. ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

2. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.06 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.07 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.

2. Cut framing members by sawing or shearing; do not torch cut.

3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

3.03 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.

2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated.

C. Stud Spacing: 16 inches or as required by structural performance.

D. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

E. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure.

2. Connect drift clips to cold formed metal framing and anchor to building structure.

F. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

H. Install backing plates and hanging strips as required to support millwork, fixtures, specialty items, and trim, unless otherwise indicated. Provide wood blocking in lieu of backing plates and hanging strips where required, in accordance with Division 6 Section "Rough Carpentry".

3.05 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000

METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Steel framing and supports for countertops.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections:

1. Division 4 Section "Unit Masonry Assemblies" for installing loose lintels, anchor bolts, and other items built into unit masonry.
2. Division 5 Section "Structural Steel".
3. Division 5 Section "Metal Stairs" for preassembled steel stairs with concrete-filled treads, industrial-type stairs with steel floor plate treads and platforms, and industrial-type stairs with steel grating treads and platforms.
4. Division 5 Section "Tube Railings".
5. Division 5 Section "Ornamental Railings".

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Aluminum Ladders: Aluminum ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.

1.05 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel".
2. AWS D1.2, "Structural Welding Code – Aluminum”.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

C. Provide allowance for trimming and fitting at site.

1.07 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: ASTM A 500, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53, standard weight (Schedule 40) unless otherwise indicated.

E. Cast Iron: Either gray iron, ASTM A 48, or malleable iron, ASTM A 47, unless otherwise indicated.

2.03 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required. Provide stainless-steel fasteners for fastening aluminum.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

D. Anchor Bolts:

1. ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

2. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Machine Screws: ASME B18.6.3.

F. Plain Washers: Round, ASME B18.22.1.

G. Lock Washers: Helical, spring type, ASME B18.21.1.

H. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

I. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

J. Post-Installed Anchors: Torque-controlled expansion anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

K. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.04 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.05 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.06 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.

2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.07 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Prime miscellaneous steel trim with zinc-rich primer.

2.08 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.09 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime with universal shop primer iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning".
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Other Items: SSPC-SP 3, "Power Tool Cleaning".

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel", for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by permanent separation as recommended by manufacturer.

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.03 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055100

METAL STAIR SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with concrete-filled treads.
2. Open grate metal stairs.
3. Roof access stairs.
4. Steel tube railings attached to metal stairs and steel grating platforms.
5. Handrails attached to walls adjacent to metal stairs.
6. Railing gates.

B. Related Sections:

1. Division 3 Section "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
2. Division 5 Section "Metal Fabrications" for steel supports for metal grating platform.
3. Division 5 Section "Tube Railings" for pipe and tube railings not attached to metal stairs or to walls adjacent to metal stairs.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs and supporting structure, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs and supporting structure shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/240 or 1/4 inch, whichever is less, unless otherwise indicated.
6. Limit deflection of treads, platforms, and framing members supporting stone treads and risers to L/720.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.

b. Concentrated load of 200 lbf applied in any direction.

c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.

b. Infill load and other loads need not be assumed to act concurrently.

D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor is 1.5, unless otherwise indicated on Drawings.

1.04 SUBMITTALS

A. Product Data: For metal stairs and the following:

1. Paint products.

2. Grout.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For qualified professional engineer.

E. Welding certificates.

F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual", for class of stair designated, unless more stringent requirements are indicated.

1. Preassembled Stairs: Commercial class.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel".

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal stairs fabrications by field measurements before fabrication.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal stairs fabrications

without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

C. Provide allowance for trimming and fitting at site.

1.07 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent for hollow structural shapes and steel plates and not less than 60 percent for rolled structural shapes.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: ASTM A 500 (cold formed).

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 coating, structural steel, Grade 33, unless another grade is required by design loads.

E. Steel Bars for Grating Treads: ASTM A 36 or steel strip, ASTM A 1011 or ASTM A 1018.

F. Galvanized Rolled-Steel Floor Diamond Plate: ASTM A 786, G90 coating, rolled from plate complying with ASTM A 36 or ASTM A 283, Grade C or D.

G. Wire Rod for Grating Crossbars: ASTM A 510.

2.03 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.04 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

C. Primer for Metal Stairs to Receive High-Performance Coating: For metal stairs indicated to receive high-performance coating, comply with Division 9 Section "High-Performance Coatings for Steel" for primer.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

G. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

2.05 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: No evidence of a welded joint.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.06 STEEL-FRAMED STAIRS

A. Stair Framing:

1. Fabricate stringers of steel channels or tubes.
2. Provide closures for exposed ends of channel or tube stringers.
3. Construct platforms of steel channel or tube headers and miscellaneous framing members as needed to comply with performance requirements.
4. Weld stringers to headers; weld framing members to stringers and headers.
5. Where stairs are enclosed by gypsum board or shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.
6. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

B. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.

1. Steel Sheet: Galvanized-steel sheet.
2. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting. For ornamental (monumental) stairs, directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
3. Shape metal pans to include nosing integral with riser.
4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

C. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

D. Configuration: As indicated on Drawings.

E. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: No evidence of a welded joint.

F. Form changes in direction of railings as follows:

1. By radius bends of radius indicated on Drawings or by inserting prefabricated elbow fittings of radius indicated on Drawings.

G. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

H. Close exposed ends of railing members with prefabricated end fittings.

I. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

J. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

1. Connect posts to stair framing by direct welding unless otherwise indicated.

2. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.

3. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

K. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

L. Gates: Form gates from steel tube of same size and shape as top rails, with infill to match guards. Provide with cam-type, self-closing hinges for fastening guard railings and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.

2.07 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. Preparation for Shop Priming:

1. Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning".

2. For surfaces indicated to receive high-performance coating, prepare surface to comply with requirements of Division 9 Section “High-Performance Coatings for Steel".

E. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel", for shop painting. Comply with requirements of Division 9 Section “High-Performance Coatings for Steel" for metal stairs indicated to receive high-performance coating.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

G. Place and finish concrete fill for treads and platforms to comply with Division 3 Section "Cast-in-Place Concrete".

3.02 INSTALLING RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

1. Anchor posts to steel by welding directly to steel supporting members.

2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

B. Attach handrails to wall with wall brackets. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as required to comply with performance requirements or as follows:

1. For concrete anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.03 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas *and* repair galvanizing to comply with ASTM A 780.

END OF SECTION 055100

SECTION 055213

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes steel tube railings not associated with metal stairs.

B. Related Sections:

1. Division 5 Section "Metal Stairs" for steel tube railings associated with metal stairs.

2. Division 6 Section "Rough Carpentry" for wood blocking for anchoring railings.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Steel: 72 percent of minimum yield strength.

C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.

b. Concentrated load of 200 lbf applied in any direction.

c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.

b. Infill load and other loads need not be assumed to act concurrently.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Railing brackets.
2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For qualified professional engineer.

E. Welding certificates.

F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with tube railings fabrications by field measurements before fabrication.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating tube railing fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

C. Provide allowance for trimming and fitting at site.

1.07 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.02 STEEL AND IRON

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Tubing: ASTM A 500 (cold formed).

C. Pipe: ASTM A 53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

D. Plates, Shapes, and Bars: ASTM A 36.

2.03 FASTENERS

A. General: Provide the following:

1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.

2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153 or ASTM F 2329 for zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2. Material for Exterior Locations: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.04 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Shop Primer for Galvanized Steel: Water based galvanized metal primer complying with MPI#134.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.05 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage**,** but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove flux immediately.

4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form changes in direction as follows:

1. As detailed.

2. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.

J. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

O. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

2.06 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.07 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.

2. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.

3. Comply with ASTM A 123 for hot-dip galvanized railings.

4. Comply with ASTM A 153 for hot-dip galvanized hardware.

5. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

6. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning".

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel", for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with universal shop primer unless zinc-rich primer is indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.02 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.

3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.03 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.04 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

D. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.05 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets to building construction as follows:

1. For concrete anchorage, use drilled-in expansion shields and hanger or lag bolts.

2. For hollow masonry anchorage, use toggle bolts.

3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.06 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

3.07 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

SECTION 057005

METAL COLUMN COVERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, apply to this Section.

1.02 SUMMARY

A. This Section includes metal column covers (CC-01, CC-02, and CC-04 Stianless Steel Trim Ring) .

B. Related Sections:

1. Division 5 Section "Metal Fabrications" for non-decorative metal fabrications and supports of metal column covers.
2. Division 5 Section "Ornamental Handrails and Railings" for decorative metal railings.
3. Division 6 Section "Interior Architectural Woodwork" for stainless steel base.
4. Division 9 Section "Non-Load-Bearing Steel Framing" for supports of metal column covers.
5. Division 9 Section “Glass-Reinforced Gypsum Fabrications” for glass-reinforced gypsum column covers.
6. Division 9 painting and coating sections for painting and coating to be applied to column covers.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Decorative metal column covers, including anchors and connections, shall withstand the effects of gravity loads without exceeding the allowable design working stress of materials involved and without exhibiting permanent deformation in any components.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include finishing materials.

B. Shop Drawings: Show fabrication and installation details for column covers.

1. Include plans, elevations, component details, and attachments to other work.
2. Indicate materials and profiles of each column cover member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
3. Indicate maximum loads imposed on building structure at points of support.

C. Samples for Verification: For each type of exposed finish required, prepared on 6-inch-square Samples of metal of same thickness and material indicated for the Work.

D. Qualification Data: For qualified Installer and fabricator.

E. Mill Certificates: Signed by stainless-steel manufacturers certifying that products furnished comply with requirements.

F. Maintenance Data: For each finish to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing column covers similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Installer Qualifications: Fabricator of products.

C. Source Limitations: Obtain metal column covers from single source.

D. Mockups: Build mockups of full-size metal column cover with required finishes applied to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Design Consultant specifically approves such deviations in writing.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Pre-Installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver column cover products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

B. Store products on elevated platforms in a dry location.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with metal column covers by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal column covers without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.08 COORDINATION

A. Coordinate layout and installation of metal column covers with support components specified in other Sections.

B. Coordinate installation of column covers with adjacent construction to ensure that wall assemblies are protected against damage.

PART 2 - PRODUCTS

2.01 SHEET METAL

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

B. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 304, stretcher-leveled standard of flatness.

2.02 MISCELLANEOUS MATERIALS

A. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.

1. Provide concealed fasteners for interconnecting column covers and for attaching them to other work unless otherwise indicated.

2.03 FABRICATION, GENERAL

A. Shop Assembly: Preassemble metal column covers in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Coordinate dimensions and attachment methods of metal column covers with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch-wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch and support with concealed stiffeners.

D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.

1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.

E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce metal column covers as needed to attach and support other construction.

F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install metal column covers. See Division 5 Section "Metal Fabrications" and Division 9 Section "Non-Load-Bearing Steel Framing" for supports of metal column covers.

2.04 COLUMN COVERS

A. Basis-of-Design: The design for metal column covers is based on column covers Series 1500 as manufactured by Pittcon Industries. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturer's:

1. Firestone Metal Products, LLC; Una-Clad
2. Forms + Surfaces
3. Fry Reglet Corporation
4. MM Systems Corporation
5. Nelson Industrial Inc.
6. Southwest Metalsmiths

B. Snap-Together Type: Form column covers to shapes indicated from metal of type and minimum thickness indicated below. Return vertical edges and bend to form hook that will engage continuous mounting clips.

1. Stainless-Steel Sheet for Exposed Metal Finish: 0.060 inch (1.6 mm) or thickness required to comply with performance requirements.

   a. Finish: Where exposed metal finish is indicated on Finish Listing, provide metal to match "Sandstone" and "Sandstone Random Swirl" by Forms + Surfaces.

2. Steel Sheet for Painted Finish (Alternate): 0.060 inch (1.6 mm) or thickness required to comply with performance requirements.

   a. Finish: Where paint or coating finish is indicated on Finish Listing, refer to paint or coating specified in Division 9 section. Paint shall be factory-applied onto steel sheet.

3. Column covers may be fabricated from prefinished metal sheet, provided unfinished edges are concealed from view.

4. Form returns at vertical joints of stainless steel column covers to provide hairline V-joints to match "Snapform" by Forms + Surfaces. Under alternate condition, form returns at vertical joints in upper metal column cover (steel sheet) to match "Sidelock" reveal type by Forms + Surfaces.

5. Fabricate column covers without horizontal joints, except where reveal joints are indicated. Where horizontal reveal joints are indicated, fabricate column covers with reveals at horizontal joints produced by forming returns on mating ends of column cover sections. Provide snap-in metal filler strips at reveals. Locate horizontal joints as indicated.

6. Fabricate base and ceiling ring as detailed.

7. Provide cut-outs for column-mounted items, as indicated on Drawings.

2.05 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved mockup. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved mockup and are assembled or installed to minimize contrast.

2.06 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Finish: Match "Sandstone" and "Sandstone Random Swirl" by Forms + Surfaces.

C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine support framing, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of column covers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach support framing to surfaces indicated to receive sprayed fire-resistive materials.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of support framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. If required, replace fire-resistive materials to thickness required for rating. Protect adjacent fire-resistive materials from damage.

3.03 INSTALLATION

A. Locate and place column cover level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install column covers.

1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

B. Use concealed anchorages.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals as indicated.

3.04 ADJUSTING AND CLEANING

A. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.05 PROTECTION

A. Protect finishes of column covers from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION 05730

SECTION 057300

INTERIOR ORNAMENTAL METAL RAILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Stainless-steel ornamental handrails and railings, with associated glass infill panels.

B. Related Sections:

1. Division 5 Section "Metal Stairs" for non-ornamental handrails and railings associated with steel stairs.

2. Division 8 Section "Glazing" for glass not associated with handrail system.

1.03 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Stainless Steel: 60 percent of minimum yield strength.

2. Glass: 25 percent of mean modulus of rupture (50 percent probability of breakage), as listed in "Mechanical Properties" in AAMA's Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."

B. Structural Performance of Handrails and Railings: Comply with requirements of ASTM E 985 for structural performance based on testing performed according to ASTM E 894 and ASTM E 935.

C. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:

1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbf applied at any point and in any direction.

b. Uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward.

c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbf applied at any point and in any direction.

b. Uniform load of 50 lbf/ft. applied in any direction.

c. Concentrated and uniform loads above need not be assumed to act concurrently.

3. Infill Area of Guards:

a. Capable of withstanding a horizontal concentrated load of 200 lbf applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.

b. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.

D. Thermal Movements:

1. Provide exterior handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

2. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.04 SUBMITTALS

A. Product Data:

1. For manufacturer's product lines of handrails and railings assembled from standard components.

2. Include Product Data for grout, anchoring cement, and paint products.

B. Shop Drawings:

1. Show fabrication and installation of handrails and railings. Include plans, elevations, sections, details, and attachments to other Work. Layout drawings shall be based on the installed embed locations.

2. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. 6-inch- long sections of each different linear railing member, including handrails, top rails, posts, balusters, and shoes.

2. Glass infill panel, 6" square.

3. Fittings and brackets.

4. Assembled full-height Samples of railings, made from full-size components, including top rail, post, handrail, infill, and associated fittings and brackets. Show method of finishing members at intersections. Samples shall be at least 24" long. Include Sample for level rails, Sample for transition from level to sloped conditions, and Sample of wall-mounted handrail.

D. Qualification Data: For qualified manufacturer, professional engineer, and installer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating ornamental handrails and railings that meet or exceed performance requirements indicated and capable of assuming engineering responsibility.

1. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

2. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this Project in material, design, and extent.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

C. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

D. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.

2. Where glazing units, including Kind FT and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

1.06 STORAGE

A. Store handrails and railings in a dry, well-ventilated, weathertight place.

B. Clearly mark and label materials for use on this project.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.08 COORDINATION

A. Coordinate installation of anchorages for handrails and railings. Furnish Setting Drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.09 SCHEDULING

A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.01 RAILING SYSTEMS:

A. Stainless-Steel Ornamental Handrails and Railings, with Associated Glass Infill Panels (Exterior Railing System):

1. Basis-of-Design Product: The design for stainless-steel handrails and railings is based on "D Line Stainless Steel Railing System" by HDI Railing Systems, with handrail mounted through glass to post. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers

a. Architectural Railings and Grilles, Inc.

b. Livers Bronze Co.

c. P&P Artec.

2. Top Rail and Handrail: Stainless Steel. Provide wall-mounted rail matching top rail where required by conditions.

3. Glass Infill Panels:

a. Uncoated Heat-Treated Float-Glass Units: Class 1 (clear) Kind FT (fully tempered) float glass, complying with ASTM C 1048; Type I (transparent flat glass); Quality-Q3.

1) Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

2) Thickness: 1/2" (12 mm).

B. Interior Wall-Mounted Railing System:

1. Basis-of-Design Product: The design for interior wall-mounted stainless steel railings is based on "Welded Stainless Steel Rail" by Livers Bronze Co. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers;

a. Architectural Railings and Grilles, Inc.

b. HDI Railing Systems

c. Julius Blum & Co., Inc.

2.02 METALS

A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

B. Stainless Steel: Grade or type designated below for each form required.

1. Tubing: ASTM A 554, Grade MT 316.

2. Pipe: ASTM A 312, Grade TP 316.

3. Castings: ASTM A 743, Grade CF 8M or CF 3M.

4. Plate: ASTM A 666, Type 316.

C. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated. Provide formed or cast brackets with predrilled hole for exposed bolt anchorage.

2.03 GLASS AND GLAZING MATERIALS

A. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent flat glass), Quality-Q3. Provide products that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16 CFR 1201 for Category II materials.

1. Glass Color: Clear.

2. Thickness for Structural Glass Balusters: As required by structural loads, but not less than 1/2" (12.0 mm).

3. Thickness for Glass Infill Panels: As required by structural loads, but not less than 1/2" (12.0 mm).

2.04 FASTENERS

A. Fasteners for Anchoring Handrails and Railings to Other Construction:

1. Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.

2. For stainless-steel handrails and railings, use fasteners fabricated from Type 316 stainless steel.

B. Fasteners for Interconnecting Handrail and Railing Components:

1. Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

2. Provide concealed fasteners for interconnecting railing components.

C. Cast-in-Place and Postinstalled Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.05 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.06 FABRICATION

A. Assemble handrails and railings in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

B. Form changes in direction of railing members as recommended by manufacturer.

C. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

E. Mechanical Connections: Fabricate handrails and railings by connecting members with railing manufacturer's standard concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

F. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.

G. Base shoe dimension shall match the existing.

H. Provide inserts and other anchorage devices to connect handrails and railings to concrete or masonry. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

I. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

J. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

K. Fabricate joints that will be exposed to weather in a watertight manner.

L. Close exposed ends of railing members with prefabricated end fittings.

M. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch or less.

N. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.07 INFILL PANEL FABRICATION

A. Glass Infill Panels: Cut glass units to final size and shape. Pre-drill with holes for handrail bracket attachment. Provide for proper edge clearance and bite on glass panels. Provide thickness required to support structural loads.

2.08 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

2.09 STAINLESS-STEEL FINISHES

A. Remove or blend tool and die marks and stretch lines, or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Directional Satin Finish: No. 4. Finish for each type of stainless steel handrail and railing shall match all other types.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.02 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing handrails and railings. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.

3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 50 feet, non-accumulative.

C. Adjust handrails and railings before anchoring to ensure alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.03 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of handrails and railings.

3.04 ANCHORING POSTS

A. Anchor posts to metal surfaces with flanges, angle or floor type as required by conditions, connected to posts and to metal supporting members. Weld flanges to post and bolt to metal supporting members. Comply with railing manufacturer's installation instructions.

3.05 ANCHORING RAIL ENDS

A. Anchor rail ends to concrete and masonry with flanges connected to rail ends and anchored with postinstalled anchors and bolts.

3.06 INSTALLING INFILL PANELS

A. Install assembly to comply with railing manufacturer's written instructions.

3.07 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

1. For hollow masonry anchorage, use toggle bolts.

2. For steel-framed gypsum board assemblies, use hanger or lag bolts set into fire-resistant wood backing between studs. Coordinate with stud installation to locate backing members.

3.08 CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water. Clean and polish glass.

3.09 PROTECTION

A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300

SECTION 057509
STAINLESS STEEL BASE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.02 SUMMARY

A. Metal base is indicated on drawings and specified herein.

B. Types of metal base in this section include:

1. Stainless steel base.

1.03 SUBMITTALS:

A. Product Data: Manufacturer's technical data for products and processes used in metal base, including finishes.

B. Shop Drawings: Shop details of fabrication and installation, including proposed joint locations, grain direction, corner details and end details.

D. Samples: Prepare samples of each type of metal finish required on metal of same thickness and alloy indicated for final work. Where finish involves normal color and texture variations, include sample sets composed of two or more units showing limits of such variations expected in completed work.

1. Include 6" long samples.

E. LEED Submittal Requirements:

1. Statement indicating material costs for each product. Information may be included on schedule of values material cost breakdown or by separate written documentation. Submit mill certificates upon arrival of steel material on Project site.

2. Credit EQ 4.1: Manufacturers' product data for sealants, adhesives, and primers including printed statement of VOC content in g/L.

3. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

4. Credit MR 5.1: Address and phone number of location of manufacturer for each product.

5. Credit MR 5.2: Manufacturer's statement indicating the locations where the base materials of each product were extracted, mined, quarried, harvested, etc. Manufacturer's statement may be letter with direct mileage to project site in lieu of releasing proprietary location.

1.04 QUALITY ASSURANCE:

A. Fabricator's Qualifications: Firm experienced in successfully producing metal base similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the work.

B. Installer Qualifications: Arrange for installation of metal base specified in this section by same firm which fabricated them.

1.05 STORAGE:

A. Store metal base systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

1.06 PROJECT CONDITIONS:

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of metal base. Do not delay job progress; allow for adjustments and fitting where taking of field measurements before fabrication might delay work.

PART 2 - PRODUCTS

2.01 METALS:

A. General: Comply with standards indicated for forms and types of metals indicated or required for metal base system components.

B. Metal Surfaces, General: For fabrication of metal base work, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

C. Stainless Steel: Grade and type designated below for each form required:

1. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.

2.02 MISCELLANEOUS MATERIALS:

A. Adhesive: Provide VOC compliant adhesive as recommended by the metal base manufacturer of use metal base a substrates to which it is attached.

2.03 FABRICATION:

A. General: Fabricate metal base to, dimensions and details shown. Provide metal base members in sizes, shapes and profiles indicated. Provide in as long a lengths as possible to minimize field joining.

1. Metal thickness: 16 gauge.

B. Hem exposed edges, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

C. Remove sharp or rough edges on exposed surfaces.

D. Mill joints to a tight, hairline fit. Form joints exposed to weather to exclude water penetration.

E. Finish exposed surfaces to smooth, sharp, well-defined lines and arrises.

F. Stainless Steel Base: Fabricate base to height required to compensate for depressions in concrete sub-floors and allowing field scribing of base to floor in order to maintain a base height of not less than that indicated. Preform all outside corners.

2.04 FINISH:

A. Remove or blend tool and die marks and stretch lines into finish.

B. Grind and polish surfaces to produce uniform, directional, textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Finish: "Sandstone"by Forms + Surfaces.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

E. Protect mechanical finishes on exposed surfaces from damage by applying a strippable temporary protective covering prior to shipment.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Field Measurements: Take field measurements prior to fabrication.

3.02 INSTALLATION, GENERAL:

A. Fit exposed connections accurately together to form tight, hairline joints. Where cutting, welding and grinding are required for proper shop fittings and jointing of metal base, restore finishes to eliminate any evidence of such corrective work.

B. Install base in lengths as long as practicable. Tightly adhere base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates

B. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units as required.

E. Restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.

1. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.

3.03 PROTECTION:

A. Protect finishes of metal base from damage during construction period by use of temporary protective coverings approved by manufacturer. Remove protective covering at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

END OF SECTION 057509

SECTION 061000

CARPENTRY, GENERAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Wood blocking and nailers.
3. Plywood backing panels.

B. Related Sections include the following:

1. Division 6 Section "Sheathing".

C. Alternate Price: The use of FSC-Certified wood for permanently-installed rough carpentry shall be priced as an alternate.

1.03 DEFINITIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.04 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.

2. Fire-retardant-treated wood.

1.05 QUALITY ASSURANCE

A. Forest Certification: Provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

3. Provide dressed lumber, S4S, unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use Exterior type for exterior locations and where indicated.

2. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction, facing out for inspection.

C. Application: Treat all rough carpentry, including the following, unless otherwise indicated**:**

1. All nailers, blocking, plywood and similar members which are permanently installed within the interior portion of the building.

2. Subflooring and underlayment for raised platforms.

2.04 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 19 percent.

B. Interior Framing: Construction or No. 2 grade and any of the following species:

1. Mixed southern pine, No. 2 grade; SPIB.

2. Spruce-pine-fir (south) or spruce-pine-fir, Construction or 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

2.05 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

2. Nailers.

B. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.

2. Spruce-pine-fir (south) or spruce-pine-fir, Construction or 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.06 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.07 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.08 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Provide blocking as indicated and as required to support facing materials, fixtures, specialty items, and trim.

C. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

D. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.

2. Use copper naphthenate for items not continuously protected from liquid water.

E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

F. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.02 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.03 PLYWOOD SUBFLOOR PANEL INSTALLATION

A. General: Comply with applicable recommendations in The Engineered Wood Association’s (APA) Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten plywood subfloor panels by glue and nail to wood framing.

3.04 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061600

SHEATHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General apply to this Section.

1.02 SUMMARY

A. This Section includes:

1. Wall sheathing.
2. Parapet sheathing.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for plywood backing panels.
2. Division 7 Section "Fluid-Applied Weather Barriers" for fluid-applied membrane weather barrier.

1.03 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

B. DELIVERY, STORAGE, AND HANDLING

C. Stack panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Georgia-Pacific Gypsum Corporation: Dens-Glass Exterior Sheathing

b. CertainTeed: GlassRoc

c. National Gypsum: XP Extended Exposure Sheathing.

d. Temple-Inland Inc.: GreenGlass Fiberglass-Faced Gypsum Sheathing.

e. United States Gypsum Company: Securock Glass-Mat Sheathing.

2. Type and Thickness: Type X, 5/8 inch thick.

3. Size: 48 by 96 inches for horizontal installation.

2.02 PARAPET WALL SHEATHING

A. Glass-Mat Water-Resistant Gypsum Sheathing: ASTM C 1177, glass-mat, water-resistant gypsum substrate, factory primed.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Dens Deck Prime manufactured by Georgia-Pacific Corporation.

b. Securock Roof Board manufactured by United States Gypsum Company.

2. Thickness: 5/8 inch thick.

3. Provide parapet wall sheathing on face of parapet walls indicated to receive roof membrane.

2.03 PLYWOOD SHEATHING

A. Plywood Sheathing:

1. Span Rating: Not less than 16/0.

2. Nominal Thickness: Not less than 15/32 inch, unless otherwise indicated.

B. Fire Treated Plywood Sheathing:

1. Provide plywood with grade designation, APA C-C PLUGGED EXT, in thickness indicated.

a. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898.

2.04 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153.

B. Screws for Fastening Plywood Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. Provide screws Compatible with fire retardant treated plywood panels.

C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.

2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code".

D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

E. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.02 PLYWOOD PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

3.03 GLASS MAT FACED SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.

2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.

3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

4. Where sheathing is indicated to receive application of air-barrier membrane, coordinate maximum joint width between sheathing boards with manufacturer of membrane. Do not exceed membrane manufacturer's allowable joint width and do not exceed joint width of 1/8" between sheathing boards or at penetrations.

B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.

C. Horizontal Installation: Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

END OF SECTION 061600

SECTION 064023

CASEWORK AND MILLWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes the following custom-grade interior architectural woodwork. Locations of custom-grade interior architectural woodwork are indicated on Drawings.

1. Plastic-laminate cabinets.
2. Plastic-laminate countertops.
3. Closet and utility shelving.
4. Plywood wall panels.

B. The use of certified wood shall be priced separately as an alternate.

C. Related Sections include the following:

1. Division 6 Section "Carpentry, General" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.03 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories and finishing materials and procedures..

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures and faucets and other items installed in architectural woodwork.

C. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish**,** with 1 sample applied to core material and specified edge material applied to 1 edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.

3. Veneer-faced products with transparent finish, 8 by 10 inches, for each species and cut. Include at least one face-veneer seam and finish as specified.

4. Stainless steel products, 12 inches long for corner guard material showing corner details; 12" square for each type and finish of sheet material.

D. Product Certificates: For each type of product, signed by product manufacturer.

E. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

F. Qualification Data: For Installer and fabricator.

G. Meeting Records: Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide AWI Quality Certification Program labels and/or certificates indicating that woodwork, including installation, complies with requirements of grades specified.

E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

F. Pre-Installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.08 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Products: Comply with the following:

1. Recycled Content of Medium-Density Fiberboard: Provide products with an average recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 10 percent.

2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.

3. Softwood Plywood: DOC PS 1**,** Medium Density Overlay, Exterior Grade, unless otherwise indicated. Where specifically indicated, provide DOC PS 1, Exposure 1.

4. Sanded Plywood: APA B-B Interior.

C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:

a. Formica Corporation.

b. Nevamar Company, LLC; Decorative Products Div.

c. Panolam Industries International Incorporated.

d. Wilsonart International; Div. of Premark International, Inc.

2.02 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.

1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.

2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.

3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:

1. Interior Type A: Low-hygroscopic formulation.

2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

3. Kiln-dry materials before and after treatment to levels required for untreated materials.

C. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

1. Product: Subject to compliance with requirements, provide "Medite FR" by SierraPine Ltd.; Medite Div.

2.03 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware".

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening**,** self-closing.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

E. Catches: Magnetic catches, BHMA A156.9, B03141.

F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

G. Drawer Slides: BHMA A156.9, B05091.

1. Standard Duty (Grade 1, Grade 2, and Grade 3): Side mounted and extending under bottom edge of drawer; full-extension with polymer rollers.

H. Door Locks: BHMA A156.11, E07121.

I. Drawer Locks: BHMA A156.11, E07041.

J. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

K. Continuous Piano Hinge: Provide heavy-duty, continuous, stainless steel, piano-type hinge.

L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Stainless Steel: BHMA 630.

M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.04 MISCELLANEOUS MATERIALS

A. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

B. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.

2. Contact Adhesive: 250 g/L.

C. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

D. Laminating Adhesive for Metals: Adhesive recommended by metal fabricator that will fully bond metal to substrate and that will prevent telegraphing and oil canning and is compatible with substrate and noncombustible after curing. Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Contact Adhesive: 80 g/L.

2. Multipurpose Construction Adhesive: 70 g/L.

2.05 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate woodwork to dimensions, profiles, and details indicated.

E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Design Consultant seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

2.06 PLASTIC-LAMINATE CABINETS

A. Grade: Custom.

B. Reveal Dimension: As indicated on Drawings.

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade HGS.
4. Edges: Grade HGS.

D. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
2. Drawer Sides and Backs: Thermoset decorative panels.
3. Drawer Bottoms: Thermoset decorative panels.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces as indicated in Finish Listing or, if not indicated, as selected by Design Consultant from manufacturer's full range.

2.07 PLASTIC-LAMINATE COUNTERTOPS

A. Grade: Custom.

B. High-Pressure Decorative Laminate Grade: HGP.

C. Colors, Patterns, and Finishes: As indicated in Finish Listing or, if not indicated, as selected by Design Consultant from manufacturer's full range.

D. Grain Direction: Parallel to cabinet fronts.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: Softwood plywood.

G. Paper Backing: Provide paper backing on underside of countertop substrate.

2.08 CLOSET AND UTILITY SHELVING

A. Grade: Custom.

2.09 PLYWOOD WALL PANELS

A. Material: Sanded plywood, fire-retardant treated.

B. Exposed Fasteners: Galvanized screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment.

C. Finish: Field painted. Refer to Division 9 Section “Interior Painting”.

PART 3 - EXECUTION

3.01 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.02 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

3. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants".

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

END OF SECTION 064023

SECTION 071100

DAMPPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes cold-applied, cut-back asphalt dampproofing applied to concrete or concrete masonry units where indicated on Drawings.

B. Related Sections include

1. Division 7 Section "Self-Adhering Sheet Waterproofing" for waterproofing.

2. Division 7 Section "Fluid-Applied Membrane Weather Barriers" for weather barrier applied to exterior sheathing.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.

B. Material Certificates: For each product, signed by manufacturers.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.05 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturer's written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.01 COLD-APPLIED, CUT-BACK ASPHALT DAMPPROOFING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ChemMasters Corp.
2. Degussa Building Systems; Sonneborn Brand Products.
3. Karnak Corporation.
4. Meadows, W. R., Inc.

B. Brush and Spray Coats: ASTM D 4479, Type I, fibered.

C. VOC Content: 2.5 lb/gal. or less.

2.02 MISCELLANEOUS MATERIALS

A. Cut-Back Asphalt Primer: ASTM D 41.

B. Patching Compound: Manufacturer's fibered mastic of type recommended by dampproofing manufacturer.

C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.

1. Proceed with dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
2. Test for surface moisture according to ASTM D 4263.

3.02 PREPARATION

A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections.

3.03 APPLICATION, GENERAL

A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.

1. Apply additional coats if recommended by manufacturer or if required to achieve coverages indicated.

2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.

B. Apply dampproofing to provide continuous plane of protection on surface where indicated on Drawings.

1. Prime portion of metal flashing to be covered with dampproofing. Lap dampproofing at least 1 inch onto primed metal flashing.

2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

3.04 COLD-APPLIED, CUT-BACK ASPHALT DAMPPROOFING

A. Apply primer and 2 brush or spray coats at a rate of 2 to 3 galllons/100 sq. ft.

3.05 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION 071100

SECTION 071326

SHEET MEMBRANE WATERPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Adhesive-coated HDPE pre-applied sheet waterproofing.
2. Molded-sheet drainage panels.
3. Insulation.

B. Related Sections include the following:

1. Division 7 Section "Hot Fluid-Applied Rubberized Asphalt Waterproofing" for waterproofing.
2. Division 7 Section "Joint Sealants" for joint-sealant materials and installation.

1.03 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, integration with expansion joint assemblies, and other termination conditions. Shop drawings shall be reviewed and approved in writing by the manufacturer prior to submission to the Design Consultant.

C. Samples: For the following products:

1. 12-by-12-inch square of waterproofing and flashing sheet.
2. 4-by-4-inch square of drainage panel.
3. 4-by-4-inch square of protection board.
4. 12-by-12-inch square of insulation.

D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

E. Qualification Data: For Installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.

G. Warranties: Special warranties specified in this Section. A preliminary sample copy of the warranty shall be submitted with the shop drawing submittal, prior to installation. The final signed warranty shall be submitted upon completion of the Work.

H. Meeting Records: Minutes of pre-installation conference.

I. Field Quality Control Test Reports: Provide daily reports, reports of flood testing observations, and acceptance reports, as specified in Field Quality Control article.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of waterproofing required for this Project.

B. Source Limitations: Obtain waterproofing materials through one source from a single manufacturer.

C. Pre-Installation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

2. Participants shall include Contractor, Design Consultant, Owner's Representative, Installer, waterproofing manufacturer's representative, and other trades with which waterproofing material comes in contact.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.06 PROJECT CONDITIONS

A. Environmental Limitations:

1. Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

2. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.07 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Manufacturer's Warranty: Manufacturer's standard or customized form for the total waterproofing system in which manufacturer agrees to repair or replace components of waterproofing system that do not comply with requirements, that fail in

material or workmanship, or that fail to remain watertight within specified warranty period.

1. Warranty repair shall include all repairs necessary to correct leaks, including the cost of materials and labor required to make the repairs. Cost of removal and subsequent replacement of materials covering the system is excluded from the warranty.
2. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in surfaces to which the waterproofing is adhered that exceed 1/8 inch in width.
3. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 ADHESIVE-COATED HDPE SHEET WATERPROOFING

A. Adhesive-Coated HDPE Sheet for Vertical Applications: 32-mil- thick, uniform, flexible sheets consisting of 16-mil-thick, HDPE sheet coated with a pressure-sensitive rubber adhesive, a protective adhesive coating, and a release liner with the following physical properties:

1. Available Product: Provide "Preprufe 160R", manufactured by W. R. Grace, & Co., for adhesive-coated HDPE sheet for vertical applications.
2. Physical Properties:
   a. Tensile Strength, Film: 4000 psi minimum; ASTM D 412.
   b. Low-Temperature Flexibility: Pass at minus 10 deg F; ASTM D 1970.
   c. Peel Adhesion to Concrete: 5 lbf/in.; ASTM D 903, modified.
   d. Lap Adhesion: 2.5 lbf/in.; ASTM D 1876, modified.
   e. Hydrostatic-Head Resistance: 231 feet; ASTM D 5385, modified.
   f. Vapor Permeance: 0.01 perms; ASTM E 96, Water Method.
   g. Water Absorption: 0.5 percent; ASTM D 570.

B. Adhesive-Coated HDPE Sheet for Horizontal Applications: 46-mil-thick, uniform, flexible sheets consisting of 30-mil-thick, HDPE sheet coated with a pressure-sensitive rubber adhesive, a protective adhesive coating, a detackifying surface treatment, an uncoated self-adhering side lap strip, and a release liner with the following physical properties:

1. Available Product: Provide "Preprufe 300R", manufactured by W. R. Grace, & Co., for adhesive-coated HDPE sheet for vertical applications.
2. Physical Properties:
   a. Tensile Strength, Film: 4000 psi minimum; ASTM D 412.
   b. Low-Temperature Flexibility: Pass at minus 10 deg F; ASTM D 1970.
   c. Peel Adhesion to Concrete: 5 lbf/in.; ASTM D 903, modified.
   d. Lap Adhesion: 2.5 lbf/in.; ASTM D 1876, modified.

e. Hydrostatic-Head Resistance: 231 feet; ASTM D 5385, modified.

f. Vapor Permeance: 0.01 perms; ASTM E 96, Water Method.

g. Water Absorption: 0.5 percent; ASTM D 570.

2.02 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of sheet waterproofing material.

C. Surface Conditioner: Low viscosity, 2-component, asphalt-modified coating recommended for surface treatment by manufacturer of sheet waterproofing material.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.

F. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.

G. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4 inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.

2. Joint Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 8 inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.

3. Tieback Covers: Prefabricated ABS plastic covers with waterproof flexible membrane covering as recommended by waterproofing manufacturer for sealing tie back anchors in soil retention systems.

H. Metal Termination Bars: Stainless steel bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers, with stainless steel mechanical fasteners.

I. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/8 inch, nominal, for horizontal applications; 1/4 inch, nominal, or two layers 1/8 inch under reinforced concrete slab.

2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

J. Expansion Joint Flashing: Manufactured from copolymer with internal polyester reinforcement.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include FlamLine 100 by Situra Inc. Product must be acceptable to waterproofing manufacturer and warranted as part of the total system warranty.

2. Configuration: As indicated on Drawings.

2.03 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel for Vertical Applications: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 16 gpm per ft.

1. Available Product: Provide Grace Construction Products; Hydroduct 220.

B. Non-Woven-Geotextile-Faced, Molded-Sheet Drainage Panel for Horizontal Applications: Manufactured composite subsurface drainage panels consisting of a non-woven-geotextile facing with an apparent opening size not exceeding No. 100 sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a horizontal flow rate not less than 2.8 gpm per ft.

1. Available Product: Provide Grace Construction Products; Hydroduct 660.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.

2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

3. Verify that compacted subgrade, gravel, or concrete mud slab is dry, smooth, sound, and free of conditions that would be detrimental to the application of the sheet membrane waterproofing system..

4. Verify that concrete substrates are smooth, float finished and monolithic.

5. Verify that vertical soil retention systems are prepared using drainage composite, plywood, shotcrete or other approved means to achieve a uniform, sound and continuous substrate ready to receive the adhesive-coated HDPE Sheet. Verify that soil surfaces that receive HDPE waterproofing meet tolerances and other requirements of waterproofing manufacturer.

6. Verify that items which penetrate subsurface to receive waterproofing are securely installed. Verify that all penetrations in waterproofing membranes are treated according to manufacturer's recommendations.

7. The waterproofing manufacturer's representative and the Owner's waterproofing representative shall coordinate and share any necessary information. The representatives shall provide a letter to the Design Consultant and the Owner's

Representative stating acceptance of substrate preparation prior to commencing waterproofing systems installation.

8. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

F. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.

1. Invert and loosely lay first sheet strip over center of prepared and sealed joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips (12 inch wide minimum) centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane 6 inches each direction from corner or install 12 inch membrane strip centered over corner.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.03 ADHESIVE-COATED HDPE SHEET WATERPROOFING APPLICATION

A. Install adhesive-coated HDPE sheets according to manufacturer's written instructions.

B. Place and secure molded-sheet drainage panels over substrate. Lap edges and ends of geotextile to maintain continuity.

C. Vertical Applications: Install adhesive-coated HDPE sheet with HDPE face against substrate. Accurately align sheets and maintain uniform 3-inch-minimum lap widths and end laps. Overlap and seal seams and stagger and tape end laps and T-joints to ensure watertight installation. Roll seams and end laps firmly. Mechanically fasten to substrate at 2 feet intervals centered in the self-adhesive selvedge prior to making the side lap. If the membrane is installed in vertical lifts and will tie into subsequent sheets of membrane, install the upper sheet behind the lower to insure that laps shed water before taping and rolling the end laps.

1. Securely fasten final top termination of membrane with continuous metal termination bar anchored into substrate and cover with detailing tape.

D. Horizontal Applications: Install adhesive-coated HDPE sheet with HDPE face against substrate. Accurately align sheets and maintain uniform 3-inch-minimum lap widths and end laps. Overlap and seal seams. Overlap, stagger, and seal end laps and T-joints with detail tape to ensure watertight installation. Roll seams and endlaps firmly with a heavy metal seam roller.

E. When ambient and substrate temperatures range between 25 and 55 deg F, install detail tape designed for low-temperature application at all laps and detailing. Apply detail tape to clean dry surfaces. During cold or damp conditions, warm the membrane selvedge and detail tape using a hot air gun to remove moisture and improve initial adhesion.

F. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

G. Seal penetrations through sheet waterproofing to provide watertight seal with prefabricated plastic covers, or detail tape patches or wraps and a liquid-membrane troweling as recommended by membrane manufacturer.

H. Construction Joints: Apply 8-inch joint tape to the surface of the membrane and centered along the line of all horizontal and vertical concrete pour joints.

I. Install sheet waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.

J. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

K. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.04 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives, tapes, or mechanical fasteners that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, where indicated, install insulation drainage panels or protection course before installing drainage panels. Install protection course over insulation drainage panels where indicated.

3.05 FIELD QUALITY CONTROL

A. Engage a full-time independent site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, protection, backfilling operations, and drainage components; and to furnish daily reports to Design Consultant.

B. Waterproofing manufacturer's representative shall coordinate with Owner's waterproofing representative and share information. The representatives shall provide a letter to the Design Consultant and the Owner's Representative stating acceptance of the waterproofing system installed.

C. Flood Testing: Flood test each horizontal deck area, including split-slab applications, for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.

2. Flood each area for 48 hours.

3. Waterproofing manufacturer's representative and Owner's waterproofing representative shall observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing, submitting report of observations.

4. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

5. Provide reports of flood testing observations.

3.06 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 071800

TRAFFIC BEARING WATERPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes traffic coatings for interior pedestrian traffic. Application also includes coating of ceiling where indicated.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete substrates.

1.03 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Show extent of each traffic coating. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.

1. Indicate treatment of joints between traffic coating and adjacent elastomeric coating on walls. Include written approval of the manufacturer certifying compatibility of traffic coating with elastomeric coating and indicating approval of joints as detailed.

C. Samples for Verification: For each type of traffic coating required, prepared on rigid backing and of same thickness and material indicated for the Work.

1. Provide stepped Samples on backing large enough to illustrate buildup of traffic coatings.

D. Qualification Data: For Installer.

E. Material Test Reports: For each traffic coating.

F. Material Certificates: For each traffic coating, signed by manufacturers, including certificate of compatibility with adjacent wall material.

G. Field quality-control test reports.

H. Manufacturer’s technical representative’s written report.

I. Maintenance Data: For traffic coatings to include in maintenance manuals. Identify substrates and types of traffic coatings applied. Include recommendations for periodic inspections, cleaning, care, maintenance, and repair of traffic coatings.

J. Warranty: Special warranty specified in this Section.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of traffic coatings required for this Project.

B. Source Limitations:

1. Obtain traffic coatings from a single manufacturer. Obtain traffic coatings from same manufacturer as elastomeric wall coatings.
2. Obtain primary traffic coating materials, including primers, from traffic coating manufacturer. Obtain secondary materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of type and from source recommended in writing by primary material manufacturer.

C. Coordination with Elastomeric Coatings on Walls: Where traffic coatings occur in same spaces or areas as elastomeric coatings on walls and where materials are jointed together, coordinate with manufacturer and installer of elastomeric coatings. Materials shall be from the same manufacturer. Materials shall be compatible, as certified in writing by manufacturer. Manufacturer shall approve, in writing, details depicted in Shop Drawings for joint systems between the two materials.

D. Mockups: Apply mockups to set quality standards for materials and execution.

1. Design Consultant will select one representative surface for each traffic coating and each substrate to receive traffic coatings. Apply each coating to at least 200 sq. ft. of each substrate to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.
2. Include mock-up of joint between traffic coating and adjacent elastomeric coating on walls. Approval shall be obtained, in writing, from both manufacturer of traffic coating and manufacturer of elastomeric coating, before proceeding with work.
3. Remove and reapply mockups until they are approved by Design Consultant.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Pre-Installation Conference: Conduct conference at Project site.

1. Before installing traffic coatings, meet with representatives of authorities having jurisdiction, manufacturer's technical representative Owner's Representative, Design Consultant, other consultants, independent testing agency, and other concerned entities. Notify participants at least seven days before conference.
2. Review requirements for traffic coatings.
3. Review coordination between traffic coating and adjacent elastomeric coating.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:

1. Manufacturer's brand name.
2. Type of material.
3. Directions for storage.
4. Date of manufacture and shelf life.
5. Lot or batch number.
6. Mixing and application instructions.
7. Color.

B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that will penetrate membrane have been installed.

1.07 WARRANTY

A. General Warranty: General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Provide Manufacturer's full waterproofing system labor and materials warranty in which traffic coating manufacturer agrees to repair or replace traffic coatings and elastomeric wall coatings that deteriorate during the specified warranty period.

1. Deterioration of waterproofing system includes the following:

a. Adhesive or cohesive failures.

b. Abrasion or tearing failures.

c. Surface crazing or spalling.

d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.

e. Joint failures.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Traffic Coatings: Complying with ASTM C 957.

B. Material Compatibility: Provide primers; base, intermediate, and topcoats; and miscellaneous materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

C. VOC Content: Provide traffic coatings, for use inside the weatherproofing system, with VOC content of 150 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.02 TRAFFIC COATING (TC-01)

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not necessarily limited to the following:

1. Liquid Plastics, Inc.; Flexideck Elastomeric Waterproofing System
2. Neogard, Division of Jones-Blair; Decorative Peda-Gard.
3. Pacific Polymers International, Inc.; Elasto-Deck 5000 HT.
4. Pecora Corporation; Pecora-Deck 800-P.

B. Primer: Manufacturer's standard factory-formulated primer recommended for substrate and conditions indicated.

C. Preparatory and Base Coats: Single- or multicomponent, aromatic liquid urethane elastomer.

D. Intermediate Coat: Single- or multi- component aromatic liquid urethane elastomer.

E. Topcoat: Single- or multi- component, aliphatic liquid urethane elastomer.

1. Color: As indicated in Finish Listing, or if not indicated, as selected by Design Consultant from manufacturer's full range.

F. Component Coat Thicknesses: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following (measured excluding aggregate):

1. Base Coat: 30 minimum wet film thickness.
2. Topcoat: 15 minimum wet film thickness.

G. Aggregate: Uniformly graded, washed silicon carbide sand or silica sand of particle sizes, shape, and minimum hardness recommended in writing by traffic coating manufacturer.

1. Spreading Rate: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following:

a. Topcoat: 8 to 10 lb/100 sq. ft.

2.03 TRAFFIC COATING

A. Basis-of-Design Product: Traffic coating system "TC-02" is based on the "Peda-Gard M No Odor Fast Turnaround" system by the NEOGARD Division of the Jones-Blair Company. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not necessarily limited to the following:

1. Liquid Plastics, Inc.; Flexideck Elastomeric Waterproofing System
2. Pacific Polymers International, Inc.; Elasto-Deck 5000 HT.
3. Pecora Corporation; Pecora-Deck 800-P.

B. Primer: Manufacturer's standard factory-formulated primer recommended for substrate and conditions indicated.

C. Preparatory and Base Coats: FC7500\FC7960 multi-component, fast-cure liquid polyurethane coating material.

D. Topcoat: FC7510 multi-component fast-cure aromatic liquid polyurethane coating material.

1. Color: FC7510 Gray

E. Component Coat Thicknesses: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following (measured excluding aggregate):

1. Base Coat: 75 sf/gal.
2. Topcoat: 125 sf/gal.
3. Aggregate: 10-15 lbs./100 sf
4. Total System: 32 dry mils, exclusive of aggregate.

F. Aggregate: Uniformly graded, washed silicon carbide sand or silica sand of particle sizes, shape, and minimum hardness recommended in writing by traffic coating manufacturer.

1. Spreading Rate: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following:

a. Topcoat: 8 to 10 lb/100 sq. ft.

2.04 MISCELLANEOUS MATERIALS

A. Joint Sealants: Manufacturer's standard one-part self-leveling or gungrade, non-staining, polyurethane sealant.

B. Sheet Flashing: Nonstaining.

1. Minimum Thickness: 60 mils.
2. Material: Sheet material recommended in writing by traffic coating manufacturer.

C. Adhesive: Contact adhesive recommended in writing by traffic coating manufacturer.

D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic coating manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer and manufacturer present, for compliance with requirements and for other conditions affecting performance of traffic coatings.

1. For the record, prepare written report, endorsed by Installer and manufacturer, listing conditions detrimental to performance.
2. Verify compatibility with and suitability of substrates.
3. Begin coating application only after minimum concrete curing and drying period recommended by traffic coating manufacturer has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.
4. Verify that substrates are visibly dry and free of moisture.

a. Test for moisture vapor transmission by plastic sheet method according to ASTM D 4263.

b. Test for moisture content by method recommended in writing by manufacturer.

5. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Clean and prepare substrates according to ASTM C 1127 and manufacturer's written recommendations to produce clean, dust-free, dry substrate for traffic coating application.

B. Mask adjoining surfaces not receiving traffic coatings, deck drains, and other deck substrate penetrations to prevent spillage, leaking, and migration of coatings.

C. Concrete Substrates: Mechanically abrade concrete surfaces to a uniform profile according to ASTM D 4259. Do not acid etch.

1. Remove grease, oil, paints, and other penetrating contaminants from concrete.

2. Remove concrete fins, ridges, and other projections.

3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.

4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

3.03 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written recommendations.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.04 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.

B. Comply with recommendations in ASTM C 1193 for joint-sealant installation. Comply with joint-sealant manufacturer's written instructions for products and applications indicated and comply with installation requirements of Division 7 Section "Joint Sealants", unless more stringent requirements apply.

3.05 TRAFFIC COATING APPLICATION

A. Apply traffic coating material according to ASTM C 1127 and manufacturer's written recommendations.

1. Start traffic coating application in presence of manufacturer's technical representative.

2. Verify that wet film thickness of each component coat complies with requirements every 100 sq. ft.

3. Broadcast aggregate uniformly into the wet coating at manufacturer’s recommended rate. Back roll coating and allow top coat to cure overnight.

B. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated, and omit aggregate on vertical and ceiling surfaces.

C. Cure traffic coatings according to manufacturer's written recommendations. Prevent contamination and damage during application and curing stages.

3.06 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field tests and inspections and prepare test reports:

1. Samples of material delivered to Project site shall be taken, identified, sealed, and certified in presence of Owner's Representative and Contractor.

2. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures.

3. Testing agency shall verify thickness of coatings during traffic coating application.

4. If test results show traffic coating materials do not comply with requirements, remove noncomplying materials, prepare surfaces, and reapply traffic coatings.

B. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after traffic coating has completely cured. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches.

2. Flood each area for 48 hours.

3. After flood testing, repair leaks, repeat flood tests, and make further repairs until traffic coating installation is watertight.

4. Owner may engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

C. Final Traffic Coating Inspection: Arrange for traffic coating manufacturer's technical representative to inspect membrane installation on completion.

1. Notify Design Consultant or Owner's Representative 48 hours in advance of date and time of inspection.

2. Manufacturer’s technical representative shall prepare a written report certifying that the traffic coating has been installed according to manufacturer's written recommendations, including verification of installed thickness.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.07 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07180

SECTION 072100

THERMAL INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Perimeter insulation under slabs-on-grade.
2. Concealed building insulation, glass-fiber blanket and board insulation,.
3. Sound attenuation insulation.

B. Related Sections include the following:

1. Division 7 Section "Thermoplastic Polyolefin (TPO) Roofing" for insulation specified as part of membrane roofing construction.
2. Division 7 Section "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
3. Division 9 Sections "Gypsum Board Assemblies" and "Gypsum Board Shaft-Wall Assemblies" for installation in metal-framed assemblies of insulation specified by referencing this Section.
4. Division 23 Section "Mechanical Insulation".

1.03 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.04 PERFORMANCE REQUIREMENTS

A. Plenum Rating: Provide glass-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.

1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm air velocity.
2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.06 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.

2. Fire-Resistance Ratings: ASTM E 119.

3. Combustion Characteristics: ASTM E 136.

C. Recycled Content: Provide glass-fiber insulation with recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.

3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.01 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:

1. Type IV, 1.60 lb/cu. ft., unless otherwise indicated.

2. Application: Perimeter and Under-Slab Insulation, including insulation on interior wall face, where indicated and covered with finish material.

3. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. DiversiFoam Products.

b. Dow Chemical Company.

c. Owens Corning.

d. Pactiv Building Products Division.

2.02 GLASS-FIBER BLANKET INSULATION

A. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

1. Application: Sound Attenuation Insulation and Concealed Building Insulation.

2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corporation: CertaPro AcoustaTherm Batts.

b. Johns Manville: Sound Control Batts.

c. Knauf Fiber Glass: Unfaced Batts and Blankets.

d. Owens Corning: Sound Attenuation Batts Fiber Glass.

2.03 AUXILIARY INSULATING MATERIALS

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facingsAdhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

B. Block off gaps or voids that would allow spray insulation to enter other cavities in construction to prevent misapplications. Mask and protect adjacent finished surfaces from over-spray and damage by application of spary insulation. Provide required ventilation for application and curing.

3.03 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated or as required to meet indicated R-Value, whichever is greater, to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.04 INSTALLATION OF FOAM-PLASTIC BOARD INSULATION

A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not otherwise indicated, extend perimeter and underslab insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

C. Protect below-grade insulation on vertical surfaces from damage during backfilling.

D. Protect top surface of horizontal insulation from damage during concrete work.

3.05 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive and use mechanical anchorage to provide permanent placement and support of units.

B. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.

4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically.

C. Apply self-supported, spray-applied cellulosic insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it flush with face of studs by using method recommended by insulation manufacturer.

3.06 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Install 3-inch-thick, unfaced glass-fiber blanket insulation over suspended ceilings at partitions in a width that extends insulation 48 inches on either side of partition.

3.07 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

B. Remove spills, overspray, and missaplications of spray insulation as they occur. Clean adjacent surfaces.

END OF SECTION 072100

5SECTION 072115

FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes foamed-in-place insulation installed in the cores of concrete masonry unit where indicated on Drawings.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry" for concrete masonry units.

2. Division 7 Section "Building Insulation" for other forms of building insulation, including spray-applied foam insulation for application in perimeter shim spaces at aluminum doors, storefront framing, curtainwall framing, steel members, and similar small cavities in exterior walls.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. QUALITY ASSURANCE

C. Source Limitations: Obtain foamed-in-place insulation through one source.

D. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.

2. Fire-Resistance Ratings: ASTM E 119.

3. Combustion Characteristics: ASTM E 136.

E. Installer Qualifications: An experienced installer who has been trained and licensed by the product manufacturer and who has not less than three years direct experience in the installation of the specified product.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Provide materials in original unopened containers with manufacturer's labels intact and legible. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.01 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

B. Foamed-in-Place Masonry Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls. Material shall comply with the following physical properties:

1. Fire-Resistance Ratings: As indicated on drawings.
2. Surface Burning Characteristics: As follows, when tested in accordance with ASTM E84:
   a. Flame Spread: 5 maximum.
   b. Smoke Developed: 5 maximum.
   c. Fuel Contributed: 0.
3. Combustion Characteristics: Non-combustible, Class A, when tested in accordance with ASTM E 84.
4. Thermal Values: R-value of 4.9 / inch at 32 degrees F., when tested in accordance with ASTM C 177.
5. Sound Abatement: Minimum STC rating of 52 when tested in accordance with ASTM E 90.
6. Shrinkage: Less than 2%.
7. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. C. P. Chemical Co., Inc.: "Tripolymer CMU Foam-in-Place Insulation".
   b. Tailored Chemical Products Inc.: "Core-Fill 500".
   c. Thermal Corporation of America: "Thermco Foam Insulation".

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

Close off openings in cavities receiving foamed-in-place insulation to prevent escape of insulation.

3.03 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Fill all open cells and voids in hollow concrete masonry walls where foamed-in-place insulation is indicated on Drawings.

C. Do not apply insulation until installation of pipes, conduits, wiring, and electrical outlets in walls is completed

D. At Contractor's option, install insulation in one of following two methods:

1. During Construction of Walls: Install insulation as masonry walls are being constructed in full thickness of masonry cores. Fill height shall not exceed that recommended by manufacturer or 15'-0", whichever is less.

2. After Construction of Walls: After masonry walls to receive foamed-in-place insulation have been constructed, pressure inject foam insulation through a series of 5/8" to 7/8" holes drilled into a mortar joint at every vertical column of block cells (approximately 8" on center) beginning at an approximate height of 4'-0" above the finished floor level. Repeat procedure at an approximate height of no more than 10' above the first horizontal row of holes, or less if needed, until the void is completely filled. Upon completion, patch holes with mortar and retool the joint to match existing joints without visible appearance of patch.

3.04 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

B. Protect partially completed walls, or completed walls not being worked on, with waterproof membrane until work of other trades completes the final protection of walls. Overhang wall at least 1'-6" on each side of wall with the waterproof covering, anchoring on each side of the wall. Provide cover of sufficient durability to withstand wind and rain.

END OF SECTION 072115

SECTION 072720

FLUID-APPLIED MEMBRANE WEATHER BARRIERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes fluid-applied membrane, vapor permeable, weather barrier.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for embedded flashings.
2. Division 6 Section "Sheathing" for wall sheathings.
3. Division 7 Section "Sheet Metal Flashing and Trim" for sheet metal flashings.
4. Division 7 Section "Joint Sealants" for joint-sealant materials and installation.

1.03 DEFINITIONS

A. ABAA: Air Barrier Association of America.

B. Weather Barrier Assembly: The collection of weather barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

C. LEED Boundary: Certain portions of the project are subject to LEED requirements, while others are not. Refer to Section 01352 "LEED Requirements" for a description and diagram of the LEED Boundary.

D. Recycled content of materials shall be defined according with the International Organization for Standardization document, ISO 14021 - Environmental labels and declarations - Self-declared environmental claims (Type II environmental labeling).

1. Post consumer material is defined as waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose.
2. Pre-consumer material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

E. Regionally Manufactured Materials: Materials that are assembled as a finished product within a radius of 500 miles from the Project location. Assembly does not include on-site assembly, erection or installation of finished components as in structural steel, miscellaneous iron or systems furniture.

F. Regionally Extracted Materials: Materials that have their source as a raw material from within a radius of 500 miles from the Project site.

1.04 PERFORMANCE REQUIREMENTS

A. General: Weather barrier shall be capable of performing as a continuous vapor-permeable weather barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Weather barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Weather Barrier Assembly Air Leakage: Not to exceed 0.04 cfm x sq. ft. of surface area at 1.57 lbf/sq. ft.; ASTM E 283.

1.05 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of weather barrier.

B. Shop Drawings: Show locations and extent of weather barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1. Include details of interfaces with other materials that form part of weather barrier.

C. Product Certificates: For weather barriers, certifying compatibility of weather barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

D. Qualification Data: For Applicator.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for weather barriers.

F. Meeting Records: Minutes of pre-installation conference.

G. LEED Submittals:

1. LEED Action Plans: Provide preliminary submittals within 14 days of date established for the Notice to Proceed indicating how the following LEED requirements will be met.

2. LEED Product Data:

a. Credit MR 4.1 and Credit MR 4.2: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.

b. Credit MR 5.1 and Credit MR 5.2: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

3. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:

a. Credit MR 4.1 and 4.2: Recycled content.

b. Credit MR 5.1 and 5.2: Regionally manufactured, extracted, harvested, or recovered materials.

H. Field quality-control reports.

1.06 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying weather barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Pre-Installation Conference: Conduct conference at Project site.

1. Include installers of other construction connecting to weather barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.

2. Review weather barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by weather barrier manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Store rolls according to manufacturer's written instructions.

D. Protect stored materials from direct sunlight.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Apply weather barrier within the range of ambient and substrate temperatures recommended by weather barrier manufacturer. Protect substrates from environmental conditions that affect performance of weather barrier. Do not apply weather barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.09 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Project Warranty: Submit Installer's warranty, signed by Installer, covering the Work of this Section, including all components of fluid-applied air barrier membrane system, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

C. Material Warranty: Manufacturer’s standard form in which manufacturer agrees to replace fluid-applied air barrier membrane materials that fail within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to maintain air permeance rating not to exceed .004 cfm/sq. ft. when tested per ASTM E 2178, within warranty period.

b. Failure to maintain a vapor permeance rating greater than 10 perms when tested in accordance with ASTM E 96, Method 9.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 FLUID-APPLIED MEMBRANE WEATHER BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Weather Barrier: Elastomeric, polymer-modified, or acrylic membrane.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle Coatings & Waterproofing; Barritech VP.

b. Grace, W. R. & Co.; Perm-A-Barrier Liquid VP.

c. Meadows, W. R., Inc.; Air-Shield LMP.

d. Tremco Incorporated; ExoAir 220R.

2. Physical and Performance Properties:

a. Membrane Air Permeance: Not to exceed 0.004 cfm x sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.

b. Membrane Vapor Permeance: Not less than 11 perms; ASTM E 96.

2.02 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by weather barrier manufacturer for intended use and compatible with weather barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne or solvent-borne primer recommended for substrate by manufacturer of weather barrier material.

C. Counterflashing Strip: Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil-thick, crosslaminated polyethylene film with release liner backing.

D. Butyl Strip: Vapor-retarding, 30- to 40-mil-thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.

E. Joint Reinforcing Strip: Weather barrier manufacturer's glass-fiber-mesh tape.

F. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

G. Adhesive and Tape: Weather barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

H. Stainless-Steel Sheet: ASTM A 240, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

I. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft. density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

J. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil-thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance of 37 perms.

K. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Division 7 Section "Joint Sealants".

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for weather barrier application.

B. Mask off adjoining surfaces not covered by weather barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

E. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for weather barrier.

3.03 JOINT TREATMENT

A. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and with weather barrier manufacturer's written instructions. Apply first layer of fluid weather barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid weather barrier membrane over joint reinforcing strip.

3.04 TRANSITION STRIP INSTALLATION

A. Install strips, transition strips, and auxiliary materials according to weather barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous weather barrier.

1. Coordinate the installation of weather barrier with installation of roofing membrane and base flashing to ensure continuity of weather barrier with roofing membrane.

2. Install butyl strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over both substrates.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by weather barrier sheet in same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall weather barrier membrane continuously to roofing membrane weather barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials as indicated.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of weather barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply adhesive-coated transition strip so that a minimum of 3 inches of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Adhesive-Coated Transition Strip: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of weather barrier membrane with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to weather barrier with an additional 6-inch-wide, counterflashing strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.05 WEATHER BARRIER MEMBRANE INSTALLATION

A. Apply weather barrier membrane to form a seal with strips and transition strips and to achieve a continuous weather barrier according to weather barrier manufacturer's written instructions.

B. Apply weather barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by weather barrier sheet in same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

D. Apply a continuous unbroken weather barrier to substrates according to the minimum thickness recommended by weather barrier manufacturer, but not less than 60-mil wet film thickness. Apply membrane in full contact around protrusions such as masonry ties.

E. Apply strip and transition strip a minimum of 1 inch onto cured weather membrane according to weather barrier manufacturer's written instructions.

F. Do not cover weather barrier until it has been tested and inspected by Owner's testing agency.

G. Correct deficiencies in or remove weather barrier that does not comply with requirements; repair substrates and reapply weather barrier components.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Perform the following inspections to determine that the weather barrier materials and installation are in compliance with requirements:

1. Continuity of weather barrier system has been achieved throughout the building envelope with no gaps or holes.

2. Continuous structural support of weather barrier system has been provided.

3. Site conditions for application temperature and dryness of substrates have been maintained.

4. Maximum exposure time of materials to UV deterioration has not been exceeded.

5. Surfaces have been primed, if applicable.

6. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.

7. Termination mastic has been applied on cut edges.

8. Strips and transition strips have been firmly adhered to substrate.

9. Compatible materials have been used.

10. Transitions at changes in direction and structural support at gaps have been provided.

11. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.

12. All penetrations have been sealed.

C. Tests: Perform the following tests:

1. Qualitative Testing: Weather barrier assemblies shall be tested for evidence of air leakage according to ASTM E 1105.

2. Quantitative Air Leakage Testing: Testing not to exceed the test pressure differential, positive and negative, indicated in "Performance Requirements" Article for weather barrier assembly air leakage according to ASTM E 783.

3. Test Area: After completion of membrane weather barrier application, the Contractor will propose three (3) independent 40 square foot minimum areas, to be reviewed and accepted by the Design Consultant, of weather barrier for qualitative and quantitative testing. Test shall be performed in presence of Manufacturer's representative and Owner's representative. If testing indicates failure of weather barrier system, additional testing will be required.

D. Submit written reports of field quality control tests and inspections.

E. Remove and replace deficient weather barrier components and retest as specified above.

3.07 CLEANING AND PROTECTION

A. Protect weather barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect weather barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace weather barrier exposed for more than 30 days.

2. Protect weather barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by weather barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072720

SECTION 074113

METAL WALL PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes concealed-fastener, lap-seam metal wall panels.

B. Metal wall panel products included in this section are to match existing. If product description does not match the existing metal wall panels, verify requirements with the Design Consultant.

C. Related Sections:

1. Division 5 Section "Structural Stud Framing" for support framing, including girts, studs, and bracing.

2. Division 7 Section "Fluid-Applied Membrane Weather Barriers" for continuous weather barrier systems.

3. Division 7 Section "Insulated-Core Metal Wall Panels" for foamed-in-place, laminated and honeycomb insulated metal wall panels.

4. Division 7 Section "Composite Wall Panels" for composite wall panels.

5. Division 7 Section "Sheet Metal Flashing and Trim" for flashing and other sheet metal work that is not part of metal wall panel assemblies.

1.03 DEFINITION

A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight wall system.

1.04 PERFORMANCE REQUIREMENTS

A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design metal wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft.

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 12.0 lbf/sq. ft.

E. Water Penetration under Dynamic Pressure: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft..

1. Water Leakage: As defined according to AAMA 501.1.

2. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

F. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.

2. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/240 of the span.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory-, shop- and field-assembled work. Indicate provisions for panel drainage.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

a. Flashing and trim.

b. Anchorage systems.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Wall Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.

2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.

3. Accessories: 12-inch-long Samples for each type of accessory.

D. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:

1. Wall panels and attachments.
2. Girts.
3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
4. Penetrations of wall by pipes and utilities.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

F. Field quality-control reports.

G. Maintenance Data: For metal wall panels to include in maintenance manuals.

H. Warranties: Sample of special warranties.

I. Meeting Records: Minutes of pre-installation conference.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of metal wall panel from single source from single manufacturer.

C. Pre-Installation Conference: Conduct conference at Project site.

1. Meet with Owner' Representative, Design Consultant, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal wall panel assembly during and after installation.
8. Review wall panel observation and repair procedures after metal wall panel installation.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal wall panel for period of metal wall panel installation.

1.08 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal wall panels without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.09 COORDINATION

A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of girts, studs, , and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.

b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANEL MATERIALS

A. Metallic-Coated Steel Sheet (unless otherwise required to match existing panels): Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 coating designation; structural quality.

2. Surface: Smooth, flat finish, or as required to match existing.

3. Exposed Coil-Coated Finish:

a. 3-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

2. Joint Sealant: ASTM C 920; elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.

2.02 MISCELLANEOUS MATERIALS

A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners, if any, with heads matching color of metal wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.03 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Unless otherwise required to match existing panels, provide factory-formed metal wall panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.

B. Concealed-Fastener Metal Wall Panels:

1. Material: Zinc-coated (galvanized) steel sheet, 0.028-inch nominal thickness, unless otherwise required to match existing.

   a. Profile: To match existing.

   b. Exterior Finish: 3-coat fluoropolymer, unless otherwise required to match existing.

   c. Color: To match existing.

2. Panel Coverage: To match existing.

3. Panel Height: To match existing.

2.04 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.

2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Formed from 0.018-inch minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

2.05 FABRICATION

A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, and that will minimize noise from movements within panel assembly.

E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.06 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

3. Verify that weather-barrier has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Commence metal wall panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.

2. Shim or otherwise plumb substrates receiving metal wall panels.

3. Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.

4. Install screw fasteners in predrilled holes.

5. Locate and space fastenings in uniform vertical and horizontal alignment.

6. Install flashing and trim as metal wall panel work proceeds.

7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.

9. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

10. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners: Use stainless-steel fasteners.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.

2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

E. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal wall panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
6. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps; on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weathertight.
7. At panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

3.03 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by SEI/ASCE 7, but not less than 12.0 lbf/sq. ft.

C. Water-Spray Test: After completing the installation of 75-foot-by-2-story minimum area of metal wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Design Consultant.

D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect and test completed metal wall panel installation, including accessories.

E. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

F. Submit written reports of field quality control tests and inspections.

G. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.05 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

SECTION 074216

INSULATED-CORE METAL WALL PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes foamed-insulation-core metal wall panels, with associated trim, flashings, and support structure.

B. Related Sections:

1. Division 5 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal wall panels.
2. Division 7 Section "Metal Wall Panels" for concealed-fastener, lap-seam metal wall panels where indicated to match existing wall panels.
3. Division 7 Section "Composite Wall Panels" for metal-faced composite wall panels.
4. Division 7 Section "Metal Soffit Panels" for concealed-fastener, lap-seam metal soffit panels.
5. Division 7 Section "Joint Sealants" for sealants adjacent to metal wall panels but not installed with system.

1.03 DEFINITIONS

A. Metal Wall Panel Assembly: Insulated-core metal wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system.

1.04 PERFORMANCE REQUIREMENTS

A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design metal wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Air Infiltration: Air leakage through assembly of not more than 0.03 cfm/sq. ft. of wall area when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft.

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 10.0 lbf/sq. ft.

E. Water Penetration under Dynamic Pressure: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-

acting, wind-load design pressure of not less than 10.0 lbf/sq. ft. and not more than 12 lbf/sq. ft.

1. Water Leakage: As defined according to AAMA 501.1.
2. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

F. Structural Performance: Metal wall panel assemblies shall withstand the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:

1. Wind Loads: As indicated on Drawings.
2. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/180 of the span.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

H. Thermal Performance: Provide insulated metal wall panel assemblies with thermal-resistance value (R-value) indicated when tested according to ASTM C 518.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, head, jamb, and sill conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, weep locations, closures, and accessories; and special details. Include exterior elevations drawn to scale. Coordinate with locations of doors, windows, louvers, penetrations, and wall-mounted items, if any. Distinguish between factory-, shop-, and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

a. Flashing and trim.

b. Anchorage systems.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Samples shall be fabricated of actual specified finish and texture.

1. Metal Wall Panels: Two piece sample with each piece 12 inches long by actual panel width. Panels shall be joined and sealed to show the joint condition. Include fasteners, closures, and other metal wall panel accessories.

2. Trim and Closures: 12 inches long. Include each type of metal trim, extrusion, and other exposed accessories.

3. Accessories: 12-inch-long Samples for each type of accessory.

D. Delegated-Design Submittal: For metal wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Qualification Data: For Installer and professional engineer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product, indicating compliance of products with requirements.

G. Field quality-control reports.

H. Maintenance Data: For insulated-core metal wall panels to include in maintenance manuals.

I. Warranties: Sample of special warranties.

J. Meeting Records: Minutes of pre-installation conference.

1.06 QUALITY ASSURANCE

A. A. Installer Qualifications: Experienced Installer with minimum of 5 years experience with successfully completed projects of a similar nature and scope.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

C. Source Limitations: Obtain each type of metal wall panel from single source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics as determined by testing identical panels and system components per test method indicated below by UL

or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: Provide wall panels with flame-spread index of 25 or less and smoke-developed index of 450 or less, per ASTM E 84.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall panel as shown on Drawings; by full thickness, including insulation, supports, attachments, and accessories.

2. Mockup shall be attached to the curtainwall mockup in location indicated on the Drawings. Metal panel mockup shall be length indicated x full height of curtainwall mock-up, unless otherwise indicated on Drawings. Mockup shall show typical joints vertical and horiztontal joints where indicated. Joints shall be filled with sealant where applicable. Mock-up shall demonstrate a typical outside corner with extrusion trim.

3. Conduct water spray test of mockup of metal wall panel assembly, testing for water penetration according to AAMA 501.2.

4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Design Consultant specifically approves such deviations in writing.

5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Pre-Installation Conference: Conduct conference at Project site.

1. Meet with Owner's Representative, Design Consultant, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.

4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.

5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.

6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

7. Review temporary protection requirements for metal wall panel assembly during and after installation.

8. Review wall panel observation and repair procedures after metal wall panel installation.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal wall panels for period of metal wall panel installation.

1.08 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings. Include verification of edge of slab dimensions.

C. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal wall panels without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.09 COORDINATION

A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of subgirts, studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including rupturing, cracking, or puncturing.

b. Deterioration of metals and other materials beyond normal weathering.

c. Failure to remain watertight or to prevent water leakage.

2. Warranty Period: Five years from date of Substantial Completion.

C. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANEL MATERIALS

A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755.
   1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 coating designation; structural quality.
   2. Surface: Embossed, striated finish.
   3. Exposed Coil-Coated Finish, Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Extruded Aluminum Trim: Manufacturer's standard coil-coated extruded aluminum trim with temper as required to suit forming operations and structural performance required.
   1. Surface: Smooth finish.
   2. Exposed Coil-Coated Finishes:
      a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

C. Panel Sealants:
   1. Joint Sealant: ASTM C 920; elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer. Joint sealants for use with insulated core metal wall panels shall be compatible with joint sealants specified in Division 7 Section "Joint Sealants" at areas of contact.
   2. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape in size recommended by manufacturer for Project applications.
   3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.02 INSULATION FOR PANEL CORES

A. Polyisocyanurate Insulation: Closed cell, modified polyisocyanurate foam using a non-CFC blowing agent, foamed-in-place type, with maximum flame-spread index of 25 and smoke-developed index of 450.

2.03 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653, G90 hot-dip galvanized, or coating with equivalent corrosion resistance unless otherwise indicated.

B. Subgirts: Manufacturer's standard C- or Z-shaped sections, 0.064-inch nominal thickness.

C. Zee Clips: 0.079-inch minimum thickness.

D. Base or Sill Channels and Angles: 0.079-inch minimum thickness.

E. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.04 MISCELLANEOUS MATERIALS

A. Panel Fasteners: Self-tapping screws; bolts and nuts; self-locking rivets and bolts; end-welded studs; and other suitable fasteners designed to withstand design loads. All fasteners shall be stainless steel. Exposed fasteners are prohibited. All fasteners shall be concealed from view. Fasteners shall be designed to prevent overtightening of the fastener and to prevent crushing of the foam core during fastener installation. Provide EPDM, PVC, or neoprene sealing washers where indicated or required by manufacturer.

2.05 FOAMED-INSULATION-CORE METAL WALL PANELS

A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Panel Performance:

a. Flatwise Tensile Strength: 25 psi when tested according to ASTM C 297.

b. Humid Aging: Volume increase not greater than 6.0 percent and no delamination or metal corrosion when tested for 7 days at 140 deg F and 100 percent relative humidity according to ASTM D 2126.

c. Heat Aging: Volume increase not greater than 2.0 percent and no delamination, surface blistering, or permanent bowing when tested for 7 days at 200 deg F according to ASTM D 2126.

d. Cold Aging: Volume decrease not more than 1.0 percent and no delamination, surface blistering, or permanent bowing when tested for 7 days at minus 20 deg F according to ASTM D 2126.

e. Fatigue: No evidence of delamination, core cracking, or permanent bowing when tested to a 20-lbf/sq. ft. positive and negative wind load and with deflection of L/180 for 2 million cycles.

f. Autoclave: No delamination when exposed to 2-psi pressure at a temperature of 212 deg F for 2-1/2 hours.

2. Polyisocyanurate Insulation-Core Performance:
   a. Density: 2.6 lb/cu. ft. when tested according to ASTM D 1622.
   b. Compressive Strength: Minimum 20 psi when tested according to ASTM D 1621.
   c. Shear Strength: 20 psi when tested according to ASTM C 273.

B. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with double tongue-and-groove panel edges with factory-applied weather seal at exposed side and factory-applied vapor seal at concealed side; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners. Clips shall mechanically engage both face and liner elements and be designed to prevent overtightening of the fastener and to prevent crushing of the foam core during fastener installation.

1. Product: The product for foamed-insulation-core metal wall panels is "Versawall" manufactured by CENTRIA Architectural Systems.

2. Facings: Fabricate panel with exterior and interior facings of same material and thickness.
   a. Material: Zinc-coated G-90 (galvanized) steel sheet, 0.030 inch/22 gage minimum.
   b. Exterior Facing Finish: 3-coat fluoropolymer.
   c. Color: Bright Silver Metallic #9710.
   d. Interior Facing Finish: Standard polyester finish. Arctic Ice #5913
   e. Exterior Surface: Embossed, striated.
   f. Interior Surface: Embossed, planked.
3. Panel Width: 30 inch module.
4. Panel Thickness: 2.0 inches.
5. Panel Length: Provide lengths as indicated on Drawings.
6. Thermal-Resistance Value (R-Value): R14 minimum.

2.06 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Extruded Aluminum Trim: Manufacturer's standard extruded aluminum trim, not less than 0.063 inches (1.60 mm) wall thickness, with butyl-sealed lap strips and weeps.

Field drilled weeps are not acceptable. Locations include, but are not limited to, bases, drips, jambs, inside and outside corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, stack joints, and fillers. Finish trim with same finish system as adjacent metal wall panels.

C. Flashing: Formed from 0.018-inch-minimum thickness, zinc-coated (galvanized) steel sheet prepainted with coil coating. Provide flashing as required to seal against weather and to provide finished appearance. Finish flashing with same finish system as adjacent metal wall panels. Match material, gage, and color of metal wall panel face sheets.

2.07 FABRICATION

A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Fabricate metal wall panels in lengths as indicated on Drawings. Horizontal joints will only be allowed where indicated on Drawings.

D. Provide panel profile for full length of panel.

E. Fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

F. Factory-apply continuous ribbon of sealant to panel joint on concealed side of insulated-core metal wall panels as vapor seal; factory-apply sealant to panel joint on exposed side of panels for weather seal.

G. Extruded Aluminum Trim: Utilize extruded aluminum trim pieces, with concealed fasteners, for all panel edge conditions, including bases, drips, jambs, inside and outside corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, stack joints, and fillers. Form joints as indicated on Drawings with concealed back-up plates and sealant.

H. Sheet Metal Flashing: Fabricate flashing, including sills, to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal flashings that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric joint sealant unless otherwise recommended by sealant manufacturer for intended use.

3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

4. Conceal expansion provisions. Conceal all fasteners. Exposed fasteners are not allowed on faces of flashing exposed to view.

5. Fabricate cleats and attachment devices from same material as flashing being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.08 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

1. Examine wall framing to verify that subgirts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to metal wall panel manufacturer's written recommendations.

3.03 METAL WALL PANEL INSTALLATION, GENERAL

A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Commence metal wall panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.

2. Shim or otherwise plumb substrates receiving metal wall panels.

3. Flash and seal metal wall panels with weather closures at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until flashings that will be concealed by metal wall panels are installed.

4. Install screw fasteners in predrilled holes.

5. Locate horizontal joints only where shown on Drawings.

6. Install flashing and trim as metal wall panel work proceeds.

7. Apply elastomeric joint sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.

8. Align bottom of metal wall panels and fasten with extruded trim and concealed fasteners. Fasten extruded trim and flashings around openings and similar elements with concealed fasteners.

9. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners for Steel Wall Panels: Use stainless-steel fasteners.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.

2. Coordinate installation of joint sealants with Division 7 Section "Joint Sealants" to insure compatibility of adjacent sealant work.

3.04 INSULATED-CORE METAL WALL PANEL INSTALLATION

A. General: Panels shall have factory-applied continuous ribbon of sealant at panel joint on concealed side of insulated-core metal wall panels as vapor seal and factory-applied sealant at panel joint on exposed side of panels for weather seal.

1. Install panels as indicated on Drawings or, if not indicated, lay out panels from center marks established with principal walls, so panels at opposite edges of wall are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half panel at perimeter.

2. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line. Maintain uniform module spacing.

3. At locations where field cutting is required, cover ends with extrusions or flashing in accordance with details on Drawings. No ends shall be left exposed.

4. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.

5. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.

B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners that mechanically engage both face and liner elements and that are designed to prevent overtightening of the fastener and crushing of the foam core during fastener installation.. Fully engage tongue and groove of adjacent panels.

1. Install clips to supports with self-tapping fasteners.

3.05 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide

concealed fasteners, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install extrusions as indicated on Drawings and in accordance with manufacturer's written recommendations for installations with completely concealed fasteners. Provide concealed butyl-sealed lap strip splices for use at joints between extrusions.
2. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
3. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.06 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.07 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect and test metal wall panel installation, including accessories. Arrange for a minimum of 3 in-progress inspections by manufacturer's technical personnel to inspect wall panel installation, including one toward beginning of metal wall panel installation, one at 50% completion, one at 75% completion. Arrange for final inspection by manufacturer's technical personnel to inspect wall panel system installation on completion.

C. Water-Spray Test: After completing the installation of 75-foot-by-2-story minimum area of metal wall panel assembly, Contractor shall test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Design Consultant. Test shall be performed in presence of Manufacturer's factory-authorized technical service representative and Owner's representative.

D. Submit written reports of field quality control tests and inspections.

E. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.08 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074216

SECTION 075419

ROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Adhered TPO membrane roofing system.
2. Roof insulation.
3. TPO-coated flashing.

B. Related Sections:

1. Division 6 Section "Carpentry, General" for wood nailers, curbs, and blocking.
2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings and for fabrication of TPO-coated metal flashings and trim.
3. Division 7 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
4. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.03 DEFINITIONS

A. TPO: Thermoplastic polyolefin.

B. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.04 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.

1. Corner Uplift Pressure: As indicated on Drawings.
2. Perimeter Uplift Pressure: As indicated on Drawings.
3. Field-of-Roof Uplift Pressure: As indicated on Drawings.

D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

1. Fire/Windstorm Classification: As indicated on Drawings, but not less than Class 1A-90.

2. Hail Resistance: SH.

E. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

F. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low -slope roof products.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work. Include fabrication details for TPO flashing.

1. Base flashings and membrane terminations.

2. Tapered insulation, including slopes and thicknesses. Include basis of R-Value calculations.

3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing. Include locations of roof expansion joints.

4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

5. Walkway pad layout.

6. Include description of methods for providing temporary night seals. Include description of roof protection plan describing how the membrane roof will be protected against damage by other trades.

7. Written certification from Manufacturer indicating that project details have been reviewed and approved by Manufacturer as acceptable to provide specified warranty. Certification shall be submitted in writing prior to or concurrent with submittal of shop drawings to Design Consultant and prior to review by Design Consultant.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified, including T-shaped side and end lap seam.

2. Preformed flashings.

3. Metal termination bars, 24" lengths.

4. Six insulation fasteners of each type, length, and finish.

5. Six roof cover fasteners of each type, length, and finish.

6. Factory pre-molded inside and outside corner membrane flashing.

D. Qualification Data: For qualified Installer and manufacturer.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements:

F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

G. Field quality-control reports, including roof inspection reports.

H. Maintenance Data: For roofing system to include in maintenance manuals.

I. Warranties: Sample of special warranties.

J. Meeting Records: Minutes of pre-installation conference.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is FM Approvals approved for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Source Limitations: Obtain components including roof insulation and fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

D. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

E. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner's Representative, Design Consultant, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.

5. Review structural loading limitations of roof deck during and after roofing.

6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

F. Pre-Installation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner's Representative, Design Consultant, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions and warranty requirements.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation. Include discussion of night seals and roof protection plan.
9. Review roof observation and repair procedures after roofing installation.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.08 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.09 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, and roof walkway products, for the following warranty period:

1. Warranty Period: 2 years from date of Substantial Completion.

C. Special Warranty: Manufacturer's standard or customized Total Systems Warranty form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, roofing accessories, roof walkways and other components of membrane roofing system.

2. Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 TPO MEMBRANE ROOFING

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible fabric backed TPO sheet.

Basis-of-Design: The design for roofing Firestone, Ultra Ply Platinum TPO membrane using insulation thickness as designated.

1. . Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers:

a. Firestone, Ultra Ply Platinum TPO

2. Thickness: 80 mils, nominal.

3. Exposed Face Color: White.

2.02 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Plastic Foam Adhesives: 50 g/L.

b. Gypsum Board and Panel Adhesives: 50 g/L.

c. Multipurpose Construction Adhesives: 70 g/L.

d. Fiberglass Adhesives: 80 g/L.

e. Contact Adhesive: 80 g/L.

f. Other Adhesives: 250 g/L.

g. Single-Ply Roof Membrane Sealants: 450 g/L.

h. Nonmembrane Roof Sealants: 300 g/L.

i. Sealant Primers for Nonporous Substrates: 250 g/L.

j. Sealant Primers for Porous Substrates: 775 g/L.

B. Sheet Flashing: Manufacturer's standard reinforced thermoplastic polyolefin sheet flashing, of same type, thickness, and color as sheet membrane, unless otherwise recommended in writing by Manufacturer.

C. TPO-Coated Metal Flashing: Hot-dip galvanized steel sheet, complying with ASTM A 653, G90 coating, minimum 0.024 inches thick, factory-coated with layer of non-reinforced membrane sheet flashing, minimum 0.035 inches thick, designed to allow for welding TPO membrane directly to coated metal flashing.

1. Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof, unless otherwise indicated on Drawings.

D. Bonding Adhesive: Manufacturer's standard.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed sealant pockets, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.03 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable

for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces. Insulation shall have a minimum long term thermal resistance r-value of 6.00 per 1 inch thickness, based on ASTM C 1289.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.04 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Cover Board (Roof Board): ASTM C 1177, glass-mat, water-resistant gypsum substrate, 1/2 inch thick, factory primed. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Georgia-Pacific Corporation; Dens Deck Prime.

2. United States Gypsum Company: Securock Roof Board.

2.05 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer. Provide materials supplied by or recommended by roofing membrane manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.

2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 5 Section "Steel Deck."

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Asphalt roofing cement shall not be used and will not be acceptable for temporary night seals. Remove and discard temporary seals before beginning work on adjoining roofing.

D. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

1. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.

3.03 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.

2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten through insulation to roof deck. Maximum gap between cover board joints, nailers, and similar items shall be 1/4", unless a tighter gap is required by roofing membrane manufacturer.

1. Fasten cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.04 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
4. All "T" laps shall be overlaid with factory-fabricated T-joint cover in accordance with manufacturer's written instructions.

H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.05 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Install TPO-coated flashings in accordance with roofing system manufacturer's written instructions, including joints between adjoining sections of flashing.

D. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

E. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

F. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.06 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.07 FIELD QUALITY CONTROL

A. In-Progress Roof Inspections: Arrange for roofing system manufacturer's technical personnel to inspect roofing system installation periodically during installation. Arrange for a minimum of four (4) inspections on each major roof area, including one during insulation installation, one toward beginning of membrane installation, one at 50% completion, and one at 75% completion. There are approximately six (6) major roof areas which shall receive the four (4) in-progress roof inspections. Additional inspections shall be provided as warranted by application and as required by manufacturer for issuance of warranty.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Submit written reports of field quality control inspections.

D. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

E. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.08 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Design Consultant and Owner's Representative.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07543

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Manufactured Products:

a. Manufactured reglets and counterflashing.

2. Formed Products:

a. Formed wall sheet metal fabrications.

b. Formed roof drainage sheet metal fabrications.

c. Formed low-slope roof sheet metal fabrications (roof edge flashing).

B. Related Sections:

1. Division 5 Section "Architectural Joint Systems" for manufactured sheet metal expansion-joint covers.

2. Division 6 Section "Rough Carpentry" for wood nailers and blocking.

3. Division 7 Section “Metal Wall Panels” for sheet metal flashing and trim integral with concealed-fastener, lap-seam metal wall panels.

4. Division 7 Section "Roof Expansion Assemblies" for proprietary manufactured roof expansion-joint assemblies.

1.03 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Fabricate and install roof edge flashings capable of resisting wind forces indicated on Drawings according to recommendations in FMG Loss Prevention Data Sheet 1-49.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Accessories and Miscellaneous Materials: Full-size Sample.

D. Qualification Data: For qualified fabricator.

E. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

F. Warranty: Sample of special warranty.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Provide sheet metal flashing and trim as part of building mockups, as indicated on Drawings. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Design Consultant specifically approves such deviations in writing.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Pre-Installation Conference: Conduct conference at Project site.

1. Meet with Owner's Representative, Design Consultant, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with sheet metal flashing and trim fabrications by field measurements before fabrication.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with sheet metal flashing and trim fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

C. Provide allowance for trimming and fitting at site.

1.08 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Installer's Warranty: Provide warranty in which installer agrees to repair or replace metal flashing and trim items that fail in materials or workmanship within specified warranty period. Installer shall warrant that during the warranty period it will, at its own cost and expense, make or cause to be made such repairs to or

replacements of work as necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

1. Installer's Warranty Period: Five years from date of Substantial Completion.

C. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

1. Surface: Smooth, flat.

2. Exposed Coil-Coated Finishes, Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Color: As selected by Design Consultant from manufacturer's full range.

4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.02 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.03 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.

2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.

3. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle Coatings & Waterproofing Inc., Div. of Carlisle Companies Inc.; CCW WIP 300HT.

b. Grace Construction Products; a unit of Grace, W. R. & Co.; Ultra.

c. Henry Company; Blueskin PE200 HT.

d. Metal-Fab Manufacturing, LLC; MetShield.

e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

B. Sheet Underlayment: Refer to Division 7 roofing sections for membrane roofing and flashing used as underlayment for metal flashing and trim associated with roofing.

C. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.04 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets and Counterflashing: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Fry Reglet Corporation.

b. Heckmann Building Products Inc.

c. Hickman, W. P. Company.

d. Hohmann & Barnard, Inc.;

2. Material:

a. Stainless Steel: 0.019 inch thick, unless otherwise indicated.

b. Prefinished Aluminum: To match aluminum framing, 0.024 inch thick, under aluminum framing and elsewhere as indicated.

3. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

5. Accessories:

a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

6. Finish: 2D (dull, cold rolled).

2.05 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal. Fabricate of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

G. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

H. Do not use graphite pencils to mark metal surfaces.

2.06 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters (Not Associated with Metal Roofing): Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.

1. Gutter Style: SMACNA designation B, unless otherwise indicated.

2. Expansion Joints: Lap type.

3. Accessories: Wire ball downspout strainer.

4. Gutters with Girth up to 15 Inches: Fabricate from metallic-coated steel sheet, 0.022 inch thick.

5. Gutters with Girth 16 to 20 Inches: Fabricate from metallic-coated steel sheet, 0.028 inch thick.

6. Gutters with Girth 21 to 25 Inches: Fabricate from metallic-coated steel sheet, 0.034 inch thick.

7. Gutters with Girth 26 to 30 Inches: Fabricate from metallic-coated steel sheet, 0.040 inch thick.

B. Downspouts: Fabricate rectangular downspouts, unless otherwise indicated, complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Fabricated Hanger Style: SMACNA figure designation 1-35H, unless otherwise indicated.
2. Fabricate from metallic-coated steel sheet, 0.022 inch thick.

C. Parapet Scuppers: Refer to Division 7 Section "Thermoplastic Polyolefin (TPO) Roofing" for scuppers fabricated from TPO-coated metal.

D. Built-in Gutters: Refer to Division 7 Section "Metal Roof Panels" for built-in gutters associated with metal roofing.

2.07 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Edge Flashing (Gravel Stop): Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections.

1. Joint Style: Butt, with 12-inch-wide, concealed backup plate.
2. Fabricate from aluminum, 0.050 inch thick.

2.08 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick, unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 UNDERLAYMENT INSTALLATION

A. General: Install underlayment as indicated on Drawings, and as specified in Division 7 roofing section.

B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.03 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners,

solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by separating dissimilar metals form contact with each other or with the corrosive substrate by non-bituminous permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of underlayment and cover with a slip sheet, unless otherwise indicated on Drawings to receive roofing membrane underlayment.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.04 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored straps spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Loosely lock straps to front gutter bead and anchor to roof deck.
2. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
3. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
4. Install continuous gutter screens on gutters with noncorrosive fasteners, hinged to swing open for cleaning gutters.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
2. Provide elbows at base of downspout to direct water away from building.
3. Where indicated, connect downspouts to underground drainage system indicated.

D. Parapet Scuppers: Refer to Division 7 "Thermoplastic Polyolefin (TPO) Roofing" for installation of parapet scuppers.

3.05 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual". Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant, unless otherwise indicated on Drawings.

C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

3.06 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Refer to Division 4 Section "Unit Masonry" for through-wall flashing and installation.

C. Reglets: Installation of reglets is specified in Division 3 Section "Cast-in-Place Concrete" and Division 4 Section "Unit Masonry Assemblies".

D. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.07 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.08 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.09 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 078100

SPRAYED-ON FIREPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Concealed SFRM.
2. Exposed SFRM.

B. Related Sections include the following:

1. Division 5 Section "Structural Steel" for surface conditions required for structural steel receiving SFRM.
2. Division 7 Section "Through-Penetration Firestop Systems" for fire-resistance-rated firestopping systems.
3. Division 7 Section "Fire-Resistive Joint Systems" for fire-resistance-rated joint systems.

1.03 DEFINITIONS

A. SFRM: Sprayed fire-resistive material.

B. Concealed: Fire-resistive materials applied to surfaces that are concealed from view behind other construction when the Work is completed and have not been defined as exposed.

C. Exposed: Fire-resistive materials applied to surfaces that are exposed to view when the Work is completed**,** that are accessible through suspended ceilings, that are in elevator shafts and machine rooms, that are in mechanical rooms, that are in air-handling plenums, and that are identified as exposed on Drawings.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Structural framing plans or schedule indicating the following:

1. Locations and types of surface preparations required before applying SFRM.
2. Extent of SFRM for each construction and fire-resistance rating, including the following:
   a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
   b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
3. Treatment of SFRM after application.

C. Product Certificates: For each type of SFRM, signed by product manufacturer.

D. Qualification Data: For Installer.

E. Compatibility and Adhesion Test Reports: From SFRM manufacturer indicating the following:

1. Materials have been tested for bond with substrates.

2. Materials have been verified by SFRM manufacturer to be compatible with substrate primers and coatings.

3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed SFRM.

G. Field quality-control test and special inspection reports.

H. Warranties: Special warranties specified in this Section.

I. Meeting Records: Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by SFRM manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its SFRM to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Source Limitations:

1. Obtain cementitious SFRM through one source from a single manufacturer.

C. Compatibility and Adhesion Testing: Engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.

1. Test for bond per ASTM E 736 and requirements in UL's "Fire Resistance Directory" for coating materials. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.

2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with SFRM.

D. Fire-Test-Response Characteristics: Provide SFRM with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing SFRM with appropriate markings of applicable testing and inspecting agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" acceptable to authorities having jurisdiction, for SFRM serving as direct-applied protection tested per ASTM E 119.

2. Surface-Burning Characteristics: ASTM E 84.

E. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy".

F. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to SFRM including, but not limited to, the following:

1. Review products, exposure conditions, design ratings, restrained and unrestrained conditions, calculations, densities, thicknesses, bond strengths, and other performance requirements.
2. Review and finalize construction schedule and verify sequencing and coordination requirements.
3. Review weather predictions, ambient conditions, and proposed temporary protections for SFRM during and after installation.
4. Review surface conditions and preparations.
5. Review field quality-control testing procedures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply SFRM when ambient or substrate temperature is 40 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of SFRM. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.08 COORDINATION

A. Sequence and coordinate application of SFRM with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosure as required to confine spraying operations and protect the environment.

2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.

3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.

4. Do not apply fire-resistive material to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.

5. Do not apply fire-resistive material to metal floor deck substrates until concrete topping has been completed.

6. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.

7. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.

8. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

1.09 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace SFRMs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of SFRM from substrates.

b. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 CONCEALED SFRM

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Carboline Co., Fireproofing Products Div.; Southwwest Fireproofing Type 5 GP.

2. Grace, W. R. & Co. - Conn., Construction Products Div.; Monokote Type MK-6s.

3. Isolatek International Corp.; Cafco 300.

B. Material Composition for Concealed Cementitious SFRM: Factory-mixed, dry formulation of gypsum or portland cement binders, additives, and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

C. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: 15 lb/cu. ft. for average and individual densities, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."

2. Thickness: Minimum average thickness required for fire-resistance design indicated according to the following criteria, but not less than 0.375 inch, per ASTM E 605:

a. Where the referenced fire-resistance design lists a thickness of 1 inch or more, the minimum allowable individual thickness of SFRM is the design thickness minus 0.25 inch.

b. Where the referenced fire-resistance design lists a thickness of less than 1 inch but more than 0.375 inch, the minimum allowable individual thickness of SFRM is the greater of 0.375 inch or 75 percent of the design thickness.

c. No reduction in average thickness is permitted for those fire-resistance designs whose fire-resistance ratings were established at densities of less than 15 lb/cu. ft.

3. Bond Strength: 200 lbf/sq. ft. minimum per ASTM E 736 based on laboratory testing of 0.75-inch minimum thickness of SFRM.

4. Compressive Strength: 5.21 lbf/sq. in. minimum per ASTM E 761. Minimum thickness of SFRM tested shall be 0.75 inch and minimum dry density shall be as specified but not less than 15 lb/cu. ft..

5. Corrosion Resistance: No evidence of corrosion per ASTM E 937.

6. Deflection: No cracking, spalling, or delamination per ASTM E 759.

7. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.

8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of SFRM is 0.75 inch, maximum dry density is 15 lb/cu. ft., test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.

9. Fire-Test-Response Characteristics: Provide SFRM with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

a. Flame-Spread Index: 10 or less.

b. Smoke-Developed Index: 0.

10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

2.02 EXPOSED SFRM

A. Contractor's Option: At the Contractor's option, exposed SFRM may be provided in lieu of concealed SFRM.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Carboline Co., Fireproofing Products Div.; Southwwest Fireproofing Type 7 GP.

2. Grace, W.R. & Co. - Conn., Construction Products Div.; Monokote Type Z106.

3. Isolatek International Corp.; Cafco 400.

C. Material Composition for Exposed Cementitious SFRM: Factory-mixed, dry, cement aggregate formulation; or chloride-free formulation of gypsum or portland cement binders, additives, and inorganic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

D. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method," but with an average density of not less than 22 lb/cu. ft.

2. Bond Strength: 434 lbf/sq. ft. minimum per ASTM E 736.

3. Compressive Strength: 51 lbf/sq. in. minimum per ASTM E 761.

4. Corrosion Resistance: No evidence of corrosion per ASTM E 937.

5. Deflection: No cracking, spalling, or delamination per ASTM E 759.

6. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.

7. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. per ASTM E 859.

8. Combustion Characteristics: Passes ASTM E 136.

9. Fire-Test-Response Characteristics: Provide SFRM with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

   a. Flame-Spread Index: 10 or less.

   b. Smoke-Developed Index: 0.

10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

11. For exterior applications of SFRM, provide formulation listed and labeled by testing and inspecting agency acceptable to authorities having jurisdiction for surfaces exposed to exterior.

2.03 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with SFRM and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:

1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory" for coating materials based on a series of bond tests per ASTM E 736.

2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of SFRM per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of SFRM.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistance designs indicated and fire-resistive

material manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive SFRM.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:

1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.

2. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, incompatible encapsulants, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.

3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.

4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.

B. Verify that concrete work on steel deck has been completed.

C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work are completed.

D. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.

B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.

C. Prime substrates where recommended in writing by SFRM manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive SFRM.

D. For exposed applications, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of SFRM. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.03 APPLICATION, GENERAL

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and

spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Apply SFRM that is identical to products tested as specified and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.

C. Install metal lath, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by SFRM manufacturer. Attach accessories where indicated or required for secure attachment of lath to substrate.

D. Coat substrates with bonding adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by SFRM manufacturer for material and application indicated.

E. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by SFRM manufacturer, install body of fire-resistive covering in a single course.

F. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by SFRM manufacturer.

G. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply SFRM that differs in color from that of encapsulant over which it is applied.

H. Where sealers are used, apply products that are tinted to differentiate them from SFRM over which they are applied.

3.04 APPLICATION, CONCEALED SFRM

A. Apply concealed SFRM in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if specified in Part 2 "Concealed SFRM" Article.

B. Apply water overspray to concealed sprayed-fiber fire-resistive material as required to obtain designated fire-resistance rating and where indicated.

C. Cure concealed SFRM according to product manufacturer's written recommendations.

3.05 APPLICATION, EXPOSED SFRM

A. Apply exposed SFRM in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if indicated.

1. For steel beams and bracing, provide a thickness of not less than 1 inch.

2. For metal floor or roof decks, provide a thickness of not less than 1/2 inch.

B. Provide a uniform finish complying with description indicated for each type of material and matching Design Consultant's sample or, if none, finish approved for field-erected mockup.

C. Apply exposed cementitious SFRM to produce the following finish:

1. Spray-textured finish with no further treatment, unless otherwise indicated.
2. Even, spray-textured finish, produced by rolling flat surfaces of fire-protected members with a damp paint roller to remove drippings and excessive roughness where SFRM will be exposed to view, where SFRM will receive a painted finish, or where indicated.

D. Cure exposed SFRM according to product manufacturer's written recommendations.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a special inspector and qualified testing agency to perform tests and inspections and prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Tests and Inspections: Testing and inspecting of completed applications of SFRM shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of SFRM for the next area until test results for previously completed applications of SFRM show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design. Test intumescent mastic fire-resistive coating before topcoat is applied.

1. Thickness for Floor, Roof, and Wall Assemblies: For each 1000-sq. ft. area, or partial area, on each floor, from the average of 4 measurements from a 144-sq. in. sample area, with sample width of not less than 6 inches per ASTM E 605.
2. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
3. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
4. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 10,000-sq. ft. area, or partial area, on each floor, cohesion and adhesion from one sample of size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 736.
   a. Field test SFRM that is applied to flanges of wide-flange, structural-steel members on surfaces matching those that will exist for remainder of steel receiving fire-resistive material.
   b. If surfaces of structural steel receiving SFRM are primed or otherwise painted for coating materials, perform series of bond tests specified in UL's "Fire Resistance Directory." Provide bond strength indicated in referenced UL fire-resistance criteria, but not less than 150 lbf/sq. ft. minimum per ASTM E 736.
5. If testing finds applications of SFRM are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

C. Remove and replace applications of SFRM that do not pass tests and inspections for cohesion and adhesion, for density, or for both and retest as specified above.

D. Apply additional SFRM, per manufacturer's written instructions, where test results indicate that thickness does not comply with specified requirements, and retest as specified above.

3.07 CLEANING, PROTECTING, AND REPAIR

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect SFRM, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.

C. Coordinate application of SFRM with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect SFRM and patch any damaged or removed areas.

D. Repair or replace work that has not successfully protected steel.

END OF SECTION 078100

SECTION 078413

THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

B. Related Sections include Division 7 Section "Fire-Resistive Joint Systems".

1.03 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

a. Penetrations located outside wall cavities.

b. Penetrations located outside fire-resistance-rated shaft enclosures.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:

1. Types of penetrating items.

2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.

3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

D. Qualification Data: For Installer.

E. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.

F. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

G. Meeting Records: Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors".

B. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

D. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

E. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
   a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
   b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in its "Fire Resistance Directory".

F. Pre-Installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.08 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated on Drawings and produced by one of the following manufacturers:

1. Grace, W. R. & Co. - Conn.
2. Hilti, Inc.
3. Johns Manville.
4. Specified Technologies, Inc.
5. 3M; Fire Protection Products Division.
6. Tremco; Sealant/Weatherproofing Division.
7. USG Corporation.

2.02 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:
   a. Slag-/rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.03 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials indicated on Drawings by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

L. Smoke Seal Elastomeric Spray: Non-halogenated, latex-based, elastomeric coating designed to provide passive smoke and fire protection in construction joints. Spray shall form a flexible shield against the propagation of fire, be totally resistant to water, and contain no inorganic fibers, asbestos, or solvents.

2.04 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.03 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic

labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.05 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a special inspector and a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.06 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 07841

Prepared By	MCA
Checked By	JW

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Construction	15 Jul 08
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SECTION 078443

JOINT FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions apply to this Section.

1.02 SUMMARY

A. This Section includes fire-resistive joint systems for the following:

1. Floor-to-floor joints.
2. Floor-to-wall joints.
3. Head-of-wall joints.
4. Wall-to-wall joints.
5. Perimeter fire-resistive joint systems consisting of floor-to-wall joints between perimeter edge of fire-resistance-rated floor assemblies and fixed exterior aluminum window framing system.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for non-fire-resistive joint sealants.

1.03 PERFORMANCE REQUIREMENTS

A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.

B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities indicated as determined by UL 2079.

1. Load-bearing capabilities as determined by evaluation during the time of test.

C. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated below, as determined by UL 2079 or CW-S-2062.

1. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.

D. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

D. Qualification Data: For Installer.

E. Research/Evaluation Reports: For each type of fire-resistive joint system indicating compliance with applicable codes and standards indicated on Drawings.

F. Meeting Records: Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors".

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

C. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.

2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:

a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.

b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

E. Pre-Installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.08 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, fire-resistive joint systems that may be incorporated into the Work include, but are not limited to, those systems indicated on Drawings and produced by one of the following manufacturers:

1. Hilti, Inc.
2. RectorSeal.
3. Specified Technologies, Inc.
4. 3M; Fire Protection Products Division.
5. Thermafiber.
6. Nelson.

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2.02 FIRE-RESISTIVE JOINT SYSTEMS

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.

2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.03 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.

2. Apply fill materials so they contact and adhere to substrates formed by joints.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a special inspector and a qualified independent inspecting agency to inspect fire-resistive joint systems and prepare inspection reports.

B. Testing Services: Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.

1. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.

C. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.

D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

3.05 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 078443

SECTION 079200

JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Preformed joint sealants.
5. Acoustical joint sealants.

B. Related Sections:

1. Division 4 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 7 Section "Architectural Joint Systems" for building expansion joints.
3. Division 7 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
4. Division 8 Section "Glazing" for glazing sealants.
5. Division 9 Section "Ceramic Tile" for sealing tile joints.

1.03 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant

products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.04 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Where colors have not been indicated in Finish Listing, submit manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.

2. Joint-sealant manufacturer and product name.

3. Joint-sealant formulation.

4. Joint-sealant color.

E. Qualification Data: For qualified Installer.

F. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

G. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

H. Field-Adhesion Test Reports: For each sealant application tested.

I. Warranties: Sample of special warranties.

J. Meeting Records: Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Firms with a minimum of seven years successful experience on projects of similar type and size, using specified products. Installers shall be acceptable to manufacturer and familiar with proper application procedures to ensure maximum joint sealant expansion and contraction capabilities.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

D. Pre-Installation Conference: Conduct conference at Project site.

1.06 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.07 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Installer's Warranty: Warranty in which Installer and General Contractor agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period for Silicone Sealants: Twenty years from date of Substantial Completion.

2. Warranty Period for Other Exterior Sealants: Five years from date of Substantial Completion.

3. Warranty Period for Interior Sealants: Two years from date of Substantial Completion.

D. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.

2. Disintegration of joint substrates from natural causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience. Sealants shall be nonstaining to exposed-to-view porous substrates.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.

2. Sealant Primers for Nonporous Substrates: 250 g/L.

3. Sealant Primers for Porous Substrates: 775 g/L.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors of Exposed Joint Sealants: As selected by Design Consultant from manufacturer's full range.

2.02 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 790.

b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.

c. Pecora Corporation; 301 NS.

d. Sika Corporation, Construction Products Division; SikaSil-C990.

e. Tremco Incorporated; Spectrem 1.

B. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Omniplus.

b. Dow Corning Corporation; 786 Mildew Resistant.

c. GE Advanced Materials - Silicones; Sanitary SCS1700.

d. Tremco Incorporated; Tremsil 200 Sanitary.

2.03 URETHANE JOINT SEALANTS

A. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic NP 2.

b. Pecora Corporation; Dynatred.

c. Sika Corporation, Construction Products Division; Sikaflex - 2c NS.

d. Tremco Incorporated; Vulkem 227.

B. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 12.5, for Use T.

1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; Dynaflex.

C. Single-Component, Pourable, Traffic-Grade, Self-Leveling, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic SL 1.

b. Pecora Corporation; Urexpan NR-200.

c. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.

d. Tremco Incorporated; Vulkem 45.

D. Single-Component, Pourable, Traffic-Grade, Semi-Self Leveling Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic SL-2 Slope Grade.

b. Pecora Corporation; DynaTrol II-SG.

c. Sika Corporation. Construction Products Division; Sikaflex – 2CNS.

d. Tremco Incorporated; Vulkem 45 SSL.

E. Single-component, nonsag, neutral-curing, medium to high modulus, silicone sealant; Class 25, Use NT (nontraffic), and Use M (masonry).

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Sika Corporation, Inc.; Sikaflex - 1a.

b. Sonneborn, Division of ChemRex; NP 1.

c. Tremco, Sealant/Waterproofing Division; Vulkem 116.

2.04 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolac.

b. Pecora Corporation; AC-20+.

c. Tremco Incorporated; Tremflex 834.

2.05 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. EMSEAL Joint Systems, Ltd.; Emseal 25V.

b. Willseal USA, LLC; Willseal 150.

c. MM Systems Corp., Expanding Impregnated Foam System (EIF).

2.06 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; AC-20 FTR.

b. USG Corporation; SHEETROCK Acoustical Sealant.

2.07 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.08 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

   a. Concrete.

   b. Masonry.

   c. Unglazed surfaces of ceramic tile.

   d. Stone.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

   a. Metal.

   b. Glass.

   c. Porcelain enamel.

d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.

5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

H. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.04 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.

    b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.

    b. Whether sealant dimensions and configurations comply with specified requirements.

    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.05 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.06 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.07 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation and contraction joints in cast-in-place concrete slabs.

b. Other joints as indicated.

2. Urethane Joint Sealant: Single-Component, Pourable, Self-Leveling, traffic grade, Class 25.

3. Joint-Sealant Color: As selected by Design Consultant from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in sloped horizontal traffic surfaces.

1. Joint Locations:

a. Isolation and contraction joints in cast-in-place concrete slabs.

b. Other joints as indicated.

2. Urethane Joint Sealant: Single-Component, Pourable, Semi-Self-Leveling, traffic grade, Class 25.

3. Joint-Sealant Color: As selected by Design Consultant from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Construction joints in cast-in-place concrete.

b. Joints between plant-precast architectural concrete units.

c. Control and expansion joints in unit masonry.

d. Joints between metal panels.

e. Perimeter joints of exterior openings.

f. Joints between different materials listed above.

g. Perimeter joints between materials listed above and frames of doors, windows, and louvers.

h. Control and expansion joints in ceilings and other overhead surfaces.

i. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.

3. Joint-Sealant Color: As selected by Design Consultant from manufacturer's full range of colors.

D. Joint-Sealant Application: Exterior joints in vertical surfaces.

1. Joint Locations:

a. Joints in stone cladding system.

b. Joints in dimension stone cladding.

c. Joints between different materials listed above.

d. Perimeter joints between materials listed above and other materials.

e. Other joints as indicated.

2. Urethane Joint Sealant: Single-component, nonsag, neutral-curing, medium to high modulus, silicone sealant; Class 25.

3. Joint-Sealant Color: As selected by Design Consultant from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs of the Connector Tunnel.

b. Other joints as indicated.

2. Urethane Joint Sealant: Single-component, pourable, traffic grade, Class 25.

3. Joint-Sealant Color: As selected by Design Consultant from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior joints in horizontal traffic surfaces not indicated above.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.

b. Control and expansion joints in tile flooring.

c. Other joints as indicated.

2. Urethane Joint Sealant: Multicomponent, nonsag, traffic grade, Class 25.

3. Joint-Sealant Color: As selected by Design Consultant from manufacturer's full range of colors.

G. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.

b. Perimeter joints of exterior openings where indicated.

c. Tile control and expansion joints.

d. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls, and partitions.

e. Joints on underside of plant-precast structural concrete beams.

f. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.

g. Other joints as indicated.

2. Joint Sealant: Latex.

3. Joint-Sealant Color: As selected by Design Consultant from manufacturer's full range of colors. Where used in tile, sealant color shall match grout color.

H. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.

b. Tile control and expansion joints in rooms containing floor drains and elsewhere as indicated.

c. Joints within fiberglass planters, between fiberglass planters, and between fiberglass planters and adjacent construction.

d. Joints within countertops and between countertops and adjacent construction.

e. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, mildew resistant, acid curing.

3. Joint-Sealant Color: As selected by Design Consultant from manufacturer's full range of colors. Where used in tile, sealant color shall match grout color.

I. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:

a. Acoustical joints where indicated.

b. Other joints as indicated.

2. Joint Sealant: Acoustical.

3. Joint-Sealant Color: As selected by Design Consultant from manufacturer's full range.

J. Joint-Sealant Application: Interior vandal-resistant joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location: As indicated on Drawings.
2. Urethane Joint Sealant: Multicomponent, Nonsag, Urethane Joint Sealant.
3. Joint-Sealant Color: As selected by Design Consultant from manufacturer's full range.

K. Joint-Sealant Application: Preformed joint sealants.

1. Joint Location: As indicated on Drawings.
2. Preformed Joint Sealant: Preformed Foam Joint Sealant.
3. Joint-Sealant Color: As selected by Design Consultant from manufacturer's full range.

END OF SECTION 079200

SECTION 081113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes standard hollow metal doors and frames.

B. Related Sections

1. Division 4 Section "Unit Masonry Assemblies" for embedding anchors for hollow metal work into masonry construction.
2. Division 8 Section "Door Hardware" for door hardware for hollow metal doors.
3. Division 8 Section “Glazing” for glass view panels in steel doors and frames.
4. Division 9 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
5. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.03 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.

9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

E. Meeting Records: Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252or UL 10B.

1. Temperature-Rise Limit: Where indicated or at vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

D. Pre-Installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating hollow metal doors and frames without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.08 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amweld Building Products, LLC.
2. Curries Company; an Assa Abloy Group company.
3. Kewanee Corporation (The).
4. Steelcraft; an Ingersoll-Rand company.

2.02 MATERIALS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B; with minimum A40 metallic coating.

E. Frame Anchors: ASTM A 591, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153, Class B.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

G. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143.

I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

J. Glazing: Comply with requirements in Division 8 Section "Glazing".

K. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.03 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel.

2. Core Construction: Manufacturer's standard kraft-paper honeycomb core for interior doors and polystyrene core for exterior doors, unless another type of core is required to meet thermal-rated or fire-rated requirements,

a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

1) Locations: Exterior doors and interior doors where indicated.

3. Vertical Edges for Single-Acting Doors: Beveled edge, unless otherwise indicated, 1/8 inch in 2 inches.

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.

5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick, end closures or channels of same material as face sheets.

6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames".

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.04 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped corners.

2. Fabricate frames as full profile welded unless otherwise indicated.

3. Frames for Level 3 Steel Doors: 0.053-inch-thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet**,** unless metallic-coated sheet is indicated.

1. Fabricate frames as full profile welded unless otherwise indicated.

2. Frames for Level 2 Steel Doors: 0.053-inch-thick steel sheet.

3. Frames for Wood Doors: 0.053-inch-thick steel sheet.

4. Frames for Borrowed Lights: Same as adjacent door frame.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.05 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.

2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and clip-type anchors, with two holes to receive fasteners.

2.06 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high where indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed, unless otherwise indicated.

2.07 LOUVERS

A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

2. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

2.08 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.09 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

2. Glazed Lites: Factory cut openings in doors.

3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

6. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb from 60 to 90 inches high.

b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Four anchors per jamb from 60 to 90 inches high.

c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Unless otherwise indicated, fabricate steel frames for installation in stud partitions with throat dimension as required to wrap the final finished surface of the wall, including applied wall finishes.

G. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware".

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.

2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.

3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

H. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.

2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.

3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

4. Provide loose stops and moldings on inside of hollow metal work.

5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. At fire-protection-rated openings, install frames according to NFPA 80.

b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.

c. Install frames with removable glazing stops located on secure side of opening.

d. Install door silencers in frames before grouting.

e. Remove temporary braces necessary for installation only after frames have been properly set and secured.

f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.

4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.

6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

7. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.

b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.

c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 083113

ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes access doors and frames for walls and ceilings.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for blocking out openings for access doors and frames in concrete.

2. Division 4 Section "Unit Masonry" for anchoring and grouting access door frames set in masonry construction.

3. Division 8 Section "Door Hardware" for mortise or rim cylinder locks and master keying.

4. Division 23 and 24 Section "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.03 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each door face material requiring a color finish, submit samples at least 3 by 5 inches in size, in specified finish.

D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access door and frame through one source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for vertical access doors and frames.

2. ASTM E 119 or UL 263 for horizontal access doors and frames.

C. Size Variations: Obtain Design Consultant's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.05 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article. Do not install access doors and frames until schedule has been approved by Design Consultant.

1. Provide access panels where indicated and for the following items where inaccessible due to concealing permanent construction. Provide sizes needed for operation or maintenance of concealed items. Items located above lay-in acoustical ceilings are considered accessible.

a. Pipe valves.

b. HVAC dampers.

c. Overhead door operators and spring adjusters.

d. Other inaccessible equipment for which maintenance access is needed or recommended by equipment manufacturer.

2. Because locations of valves, dampers, and other mechanical and electrical devices for which maintenance access is required are shown diagrammatically on Drawings, it is not possible to show all access panels on the Drawings.

3. Actual installed configurations of equipment may affect the number and size of access panels required.

PART 2 - PRODUCTS

2.01 STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

1. ASTM A 123, for galvanizing steel and iron products.

2. ASTM A 153, for galvanizing steel and iron hardware.

C. Steel Sheet: Uncoated cold-rolled steel sheet substrate complying with ASTM A 1008, Commercial Steel (CS), exposed.

D. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS) with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924.

E. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning", to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel,

complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning", or SSPC-SP 8, "Pickling".

2. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

   a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

3. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

F. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.02 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Babcock-Davis; A Cierra Products Co.
2. J. L. Industries, Inc.
3. Larsen's Manufacturing Company.
4. Nystrom, Inc.
5. Milcor Inc.

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

1. Locations: Masonry and concrete wall surfaces.
2. Door: Minimum 0.060-inch-thick sheet metal, set flush with exposed face flange of frame.
3. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
4. Hinges: Spring-loaded, concealed-pin type.
5. Latch: Cam latch operated by screwdriver with interior release.
6. Lock: Cylinder where indicated on Drawings.

   a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 08 Section "Door Hardware".

C. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Gypsum board wall and ceiling surfaces.
2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead flange.
4. Hinges: Spring-loaded, concealed-pin type.

5. Latch: Cam latch operated by screwdriver with interior release.
6. Lock: Cylinder, where indicated on Drawings.
   a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 08 Section "Door Hardware".

D. Exterior/Insulated Flush Access Doors and Frames with Exposed Trim: Weatherproof with extruded door gasket. Fabricated from metallic-coated steel sheet.
1. Locations: Exterior masonry, concrete, and gypsum board wall and ceiling surfaces and interior masonry, concrete, and gypsum board wall and ceiling surfaces where insulated access door is indicated.
2. Door: Minimum 0.040-inch-thick metallic-coated steel sheet; flush panel construction with manufacturer's standard 2-inch-thick fiberglass insulation.
3. Frame: Minimum 0.060-inch-thick metallic-coated steel sheet.
4. Hinges: Continuous piano, zinc plated.
5. Lock: Dual-action handles with key lock.

E. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
1. Locations: Fire-rated masonry and concrete wall surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
6. Hinges: Spring-loaded, concealed-pin type.
7. Latch: Self-latching device operated by ring turn with interior release.
8. Lock: Self-latching device with cylinder lock, where indicated on Drawings.
   a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 08 Section "Door Hardware".

F. Fire-Rated, Insulated, Flush Access Doors and Trimless Frames: Fabricated from steel sheet.
1. Locations: Fire-rated gypsum board wall and ceiling surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch-thick sheet metal with drywallbead.
6. Hinges: Spring-loaded, concealed-pin type.
7. Latch: Self-latching device operated by ring turn with interior release.

8. Lock: Self-latching device with cylinder lock, where indicated on Drawings.
   a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 08 Section "Door Hardware".

2.03 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
   1. For trimless frames with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
   2. Provide mounting holes in frames for attachment of units to metal framing.
   3. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors**.**

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
   1. For cylinder lock, furnish two keys per lock and key all locks alike.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.02 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 084413

GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions apply to this Section.

1.02 SUMMARY

A. Section includes conventionally glazed aluminum curtain walls, unitized curtain walls, and ribbon windows.

B. Section includes aluminum exterior sun-shading devices, as indicated on Drawings.

C. Related Sections:

1. Division 7 Section "Building Insulation" for insulation materials field installed with aluminum-framed systems.
2. Division 7 Section "Insulated-Core Metal Wall Panels" for metal panels associated with aluminum-framed systems.
3. Division 7 Section "Composite Wall Panels" for metal panels associated with aluminum-framed systems.
4. Division 7 Section "Fire-Resistive Joint Systems" for perimeter fire-containment systems field installed with glazed aluminum curtain-wall systems.
5. Division 7 Section "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain-wall systems and for sealants to the extent not specified in this Section.
6. Division 8 Section "Aluminum Entrances and Storefronts" for entrance and storefront systems installed with glazed aluminum curtain-wall systems.
7. Division 8 Section "Automatic Entrance Doors" for automatic entrances.
8. Division 8 Section "Glazing" for insulating-glass requirements.

1.03 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.

d. Loosening or weakening of fasteners, attachments, and other components.

e. Failure of operating units.

f. Water leakage.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads: As indicated on Structural Drawings.

2. Periodic Maintenance Equipment Loads: As indicated on Drawings.

D. Structural-Test Performance: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

F. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. Component Importance Factor shall be as indicated on Structural Drawings.

G. Story Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.

2. Test Performance: Meeting criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

H. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.

I. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.

1. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.

J. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Test Interior Ambient-Air Temperature: 75 deg F.
3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

K. Energy Performance:

1. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the U-factor shall not be more than 0.57.
2. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft.
3. Condensation Resistance: When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 55 (composite).

1.04 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Provide glazed aluminum curtain walls that comply with test-performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies by a qualified testing agency.

1.05 SUBMITTALS

A. Prior to submitting any documents required for approval, provide an itemized list of specification requirements and architectural drawing requirements which are not embodied in the contract, or intended contract, for work of this section. Identify the specification page and paragraph, or the architectural drawing sheet, elevation, plan, section, or detail for each item. Deviations not specifically identified in this manner shall not be deemed valid in submittal review, and shall be cause for disapproval at the reviewers' discretion. In the event that there are no deviations, provide a written statement of full compliance with architectural drawings and specifications. Failure to provide an itemized list of deviations in the required form or a statement of full compliance shall, at the reviewer's discretion, be cause for return of any and all submittals for approval without review, with the Contractor bearing full responsibility for any resultant delay.

B. Prior to or simultaneous with first submittal of structural calculations for approval, provide dimensioned die drawings for all aluminum extrusions. In the event that extrusion profiles are not finalized, provide die drawings for the profiles contemplated at that time. If profiles are revised, provide revised die drawings with the first calculation or shop drawing submittal which follows the revision. Die drawings shall show all profile dimensions, metal thickness, alloy, and temper.

C. Prior to building construction, provide glass manufacturer's wind and thermal stress analysis, and center deflection calculations showing that specified maximum probabilities of breakage are not exceeded.

D. Prior to building construction, provide sealant manufacturer's test reports confirming adhesion of sealant to all relevant substrates. Provide samples of production materials to sealant manufacturer for adhesion tests. Adhesion shall be evaluated, and is required to be acceptable, after initial cure and after water immersion for seven days. Evaluate adhesion of immersed samples immediately after removal from water. Provide stain test reports on any applicable, porous substrates. Provide written certification from the sealant manufacturer that sealant selected is compatible with all adjacent materials and finishes. Provide print review from sealant manufacturer.

E. Prior to building construction, provide glass manufacturer's written statement that any insulated, heat treated, reflective, spandrel or laminated glass is suitable for such application. Submit letter stating manufacturer has reviewed the curtain wall shop drawings and has approved the glazing details shown therein.

F. Provide the following submittals for acceptance. First submittals and resubmittals shall be complete and in the required form. Shop Drawings shall be reviewed and approved in writing by the manufacturer prior to submission to the Design Consultant. Resubmittals shall include requested corrections and shall respond to previous comments. Each sheet that is revised shall bear a revision date and number. Revisions shall be flagged with a conspicuous revision symbol and number and revised detail clouded. Failure of a submittal to be complete, in the proper form, responsive to comments or identifying revisions shall, at the reviewers' discretion, be cause for disapproval and return of documents without review, with the Contractor bearing full

responsibility for any resultant delay. Failure to review comments or to note a noncompliance with plans and specifications shall not relieve the Contractor from its obligation to comply. Failure to review comments or to note a noncompliance on a given submittal shall not preclude a directive to comply on future submittals. Allow sufficient time for preparation and processing of submittals and resubmittals to avoid conflicts with schedules.

1. Provide shop drawings showing materials in place on the building including coordination of related and adjoining work, insert drawings and erection diagrams. Show relative layout for all adjacent walls, beams, columns, slabs, ceilings, etc. Drawings shall include elevations, floor plans, sections, and full size details. Details shall be full size and fully drawn, not outlined. Provide isometric details of any conditions, as requested by the Design Consultant. Drawings shall include the following information:

    a. Joinery and internal weather seals.

    b. Glass and metal thicknesses, including tolerances.

    c. Metal alloy, temper, and finish.

    d. Glass manufacturer's information for strength, thickness, tint, coating, opacifier or ceramic frit, safety backing, and rating of insulated units.

    e. Fastener manufacturer's information for material alloy, plating, diameter, length, spacing, embedment, and edge distances.

    f. Glazing materials identification.

    g. Sealants identification by product name and manufacturer, including cleaning and priming requirements.

    h. Relative layout of walls, beams, columns, and slabs with dimensions noted. Dimension all tolerances required or which can be accommodated.

    i. Field connections, weld sizes, anchorages, and fasteners, embedment length, and edge distances.

    j. Dimensioned position of glass edge relative to metal daylight.

    k. Reglazing and glazing procedures.

    l. Dimension limits of movements for all moving joints and provisions for expansion and contraction.

    m. Spotting plans for preset inserts in structure or in adjacent construction.

    n. Perimeter sealant joint sizes, including tolerances and minimum/maximum joint sizes required.

    o. Seal and signature of qualified professional engineer. This shall be the same engineer who signs the calculations.

2. Provide structural calculations, sealed by a qualified professional engineer, prepared in compliance with referenced documents and these specifications. Where specifications and code differ the more severe requirements shall govern. Test reports are not an acceptable substitute for calculations. Calculations shall include the following information:

    a. Analysis for all applicable loads on framing members.

b. Analysis for all applicable loads on anchors, including anchors embedded in concrete.

c. Section property computations for framing members.

d. Seal and signature of qualified professional engineer on drawings and calculations.

3. Submit samples of all materials to be encompassed in the Work in the size and quantity as required by the project documents. These will include but not be limited to, samples of:

a. Extrusions, flat sheet, or formed shapes showing finish. Show any variations in color or texture, if any, by providing range samples.

b. Design Consultant reserves right to require submittal of fabrication samples, showing prime members, joinery, anchorage, expansion provisions, glazing, sealant details and similar details, profiles and intersection.

c. Glass samples, 12" square, of all types specified.

d. Technical data on all proposed sealants, along with color chart, and cured samples.

e. 12" x 12" samples of insulation with technical data.

f. 12" length of fire safing with technical data.

g. All extrusion die drawings and 12" long samples of the production run on all extrusion shapes involving a snap fit. Snap fits shall be designed using 1/2 standard tolerances.

h. Glass setting blocks, side spacers, gaskets and shims.

i. Samples of fire knock-out decals or markings, if required.

j. Samples of gaskets, rods, tapes, glazing accessories. Gasket test reports, sealant test reports, and technical data on all glazing accessories.

4. Submit manufacturer's product data and specifications for any materials or fabrication techniques used in the curtain wall work. Include instructions and recommendations for installation and maintenance. Include certified test reports showing compliance with requirements where test methods are indicated.

G. Preconstruction Mockup Submittals:

1. Preconstruction Test Reports: Provide glazed aluminum curtain walls that comply with test performance requirements indicated, as evidenced by reports of tests performed on manufacturer’s standard assemblies by a qualified testing agency. If test reports on standard assemblies are not available, provide test reports on mockups prepared by a qualified preconstruction testing agency for each mockup test.

H. Seismic Qualification Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.

I. Welding certificates.

J. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.

K. Field quality-control reports.

L. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

M. Warranties: Sample of special warranties.

N. Meeting Records: Minutes of pre-installation conference.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed energy performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of that are similar to those indicated for this Project in material, design, and extent.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel".

2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum".

E. Energy Performance Standards: Comply with AAMA 507 for minimum standards of energy performance, materials, components, accessories, and fabrication.

F. Mockups:

1. Contractor shall furnish, build, and test a mock-up containing the glazed curtain wall. Scope of mock-up is as shown on mock-up scope drawings. Contractor shall be responsible for scheduling and coordination of mock-up at an independent testing facility. Mock-up shall accurately represent job conditions including joints, sealants, glass, glazing, anchors, insulation, and finishes per mock-up drawings. Delay installation of thermal insulation until completion of initial air, water, and structural tests.

2. Provide at least one extra light of glass for each type and size on the mock-up. Glass which breaks during testing shall be replaced with new glass and the test continued. Repeated glass breakage at design pressures shall constitute failure.

3. Prepare and submit complete mock-up drawings and structural calculations stamped by a qualified professional engineer. Construct mock-ups in strict accordance with approved mock-up shop drawings. Any deviation from or additions to details shown on drawings are subject to approval from Design Consultant. Do not use excessive amounts of sealant, nor other special measures or techniques, which are not representative of those to be used on the building.

4. Tests specified below shall be performed on the mock-up and paid for by the Contractor. Any additional or retesting costs, including any costs or expenses incurred by the Construction Manager, Design Consultant, or their consultants, shall be paid for by the Contractor.

5. Tests shall be conducted at an independent testing laboratory, as approved by the Construction Manager and Design Consultant. The testing laboratory shall be responsible for conducting and reporting the tests, shall state in the report whether or not the test specimen conforms to all requirements of the Contract Documents, and shall specifically note any deviations therefrom. Laboratories or test facilities are subject to approval. Submit detailed information on facilities and test equipment for test site. Manufacturer's laboratories are not acceptable test facilities.

6. The testing laboratory shall not act as consultant to a Contractor for this project, modify contract document requirements, modify mock-up configuration, or dismantle mock-ups until notified that no further testing is required. At the direction of the Design Consultant, deliver mock-up or selected portions of the mock-up, boxed to the job site, contractor's plant, or dispose of mock-up properly.

7. Mock-ups are subject to observation by Construction Manager, Design Consultant, and their Consultants throughout their construction and testing. Provide minimum three weeks notice before beginning construction of mock-up. Provide materials and personnel for prompt continuous construction of mock-ups. Delays in mock-up construction due to lack of materials or personnel could result in the Contractor being charged for fees and travel expenses of observers. Contractor shall

coordinate chamber availability, shipping schedules and mock-up construction schedules directly with the laboratory.

8. If failures occur, revise and retest mock-up. Modifications must be realistic in terms of job conditions, must maintain standards of quality and durability, and are subject to approval by Design Consultant.

9. In general, performance requirements specified for test mock-ups and samples also apply to the actual building, and vice versa. Variations in criteria over the surface of the building, such as wind pressure, shall be taken into account in testing of mock-ups and samples. Where certain performance is required for specific test conditions of mock-ups and samples, that same performance is also required of the actual building, for natural conditions equivalent to or less severe than the test conditions.

10. Contractor shall submit laboratory's proposed test procedure for Design Consultant's approval four weeks prior to erection. Erection at testing laboratory shall not commence prior to review of laboratory's proposed test procedure by Design Consultant.

11. Laboratory test report must be accompanied by "as built" mock-up drawing showing any revisions or corrective measures taken during testing. Any modifications on mock-up must be done on job unless Design Consultant specifically approves otherwise. Mock-up must be supervised by and installed by same workmen that will do actual job.

12. Prior to mock-up installation or fabrication, provide to sealant manufacturer samples of all relevant substrates, including finished aluminum, coated glass, gaskets, backers and any other substrates which will required sealant contact. Samples shall be labeled and identified for this project. Sealant manufacturer shall perform tests to verify adhesion, staining and chemical compatibility. Use sealants and substrates only in combinations for which favorable adhesion and compatibility results have been obtained. Submit, for record, sealant manufacturer's written test reports and recommendations regarding cleaning and priming required to obtain acceptable adhesion.

13. Mock-up test specimen shall be tested in the following order:

    a. Preload specimen at 50% of inward (positive) design pressure.

    b. Air leakage per ASTM A 283 using a pressure of 6.24 psf (50 mph wind). Air leakage not to exceed 0.06 cfm per square foot of projected gross wall area. Individual components shall not exceed 0.06 cfm per square foot of component. Verify air flow through each component of the specimen.

    c. Static water penetration per ASTM E 331 using a pressure of 10 psf. No uncontrolled water penetration allowed.

    d. Dynamic water penetration per AAMA 501.1 using a pressure of 10 psf. No uncontrolled water penetration allowed.

    e. Structural performance per ASTM E 330 using positive and negative design load pressures indicated on Drawings. Deflections to be measured and recorded.

    f. Repeat the static water penetration test per ASTM E 331 using a pressure of 10 psf. No uncontrolled water penetration allowed.

g. Structural overload test per ASTM E 30 using 1.5 times the design load pressure. Deflections to be measured and recorded. No permanent set of more than L/1000 is allowed. No permanent set in anchors of more than 1/16 is allowed.

14. Where the test sequence or test failures require successive water infiltration tests, the only means used to drain water from internal cavities shall be gravity drainage through the weep system for a minimum of 15 minutes. Air pressure, removal of parts, or other means of draining water shall not be used.

G. Pre-Installation Conference: Conduct conference at Project site.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating glazed aluminum curtain wall without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.08 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain walls that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

2. Structural failures including, but not limited to, excessive deflection.

a. Noise or vibration created by wind and thermal and structural movements.

b. Deterioration of metals**,** metal finishes, and other materials beyond normal weathering.

c. Water penetration through fixed glazing and framing areas.

d. Failure of operating components.

3. Warranty Period: 5 years from date of manufacture.

C. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of manufacture.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: The design for glazed aluminum curtain-wall systems is based Oldcastle,the 'Reliance' reinforced aluminum curtain wall system.

1. Oldcastle,the 'Reliance'

2.02 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Welding Rods and Bare Electrodes: AWS A5.10.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36.
2. Cold-Rolled Sheet and Strip: ASTM A 1008.
3. Hot-Rolled Sheet and Strip: ASTM A 1011.

C. Sun Control Accessories: Provide exterior sun-shading devices fabricated by manufacturer of same aluminum materials as framing systems. Provide size and configuration as indicated on Drawings.

2.03 FRAMING

A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally improved.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

3. All fasteners shall be concealed to the greatest extent possible. All exposed fasteners, bolts, clips, and similar items shall be stainless steel. All flush fasteners, bolts, clips, and similar items shall be finished to match adjacent finished surface.

4. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

D. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

E. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.

F. Framing Sealants: Manufacturer's standard sealants.

2.04 GLAZING

A. Glazing: Comply with Division 8 Section "Glazing".

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: Comply with Division 8 Section "Glazing".

2.05 OPERABLE UNITS

A. Doors: Comply with Division 8 Section "Aluminum-Framed Entrances and Storefronts".

2.06 ACCESSORY MATERIALS

A. Perimeter Fire-Containment Systems: Specified in Division 7 Section "Fire-Resistive Joint Systems".

B. Insulating Materials: Specified in Division 7 Section "Building Insulation".

C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.07 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.

3. Physical and thermal isolation of glazing from framing members.

4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

5. Provisions for field replacement of glazing from exterior or interior, as indicated on Drawings.

6. Fasteners, anchors, and connection devices that are concealed from view. Where absolutely unavoidable, exposed fasteners, bolts, clips, and similar items shall be stainless steel and exposed flush fasteners, bolts, clips, and similar items shall be finished to match adjacent finished surface.

D. Fabricate components that, when assembled, have the following characteristics:

1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

E. Curtain-Wall Framing: Manufacturer's standard system.

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.08 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Exterior Finish: PPG UC70214F Duranar Sunstorm "Gray Velvet", unless noted otherwise.

2. Interior Finish: PPG UC55026 Duranar "Bright White", unless noted otherwise.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.

2. Do not install damaged components.

3. Fit joints to produce hairline joints free of burrs and distortion.

4. Rigidly secure nonmovement joints.

5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

7. Seal joints watertight unless otherwise indicated.

8. Careful coordination and sequencing is required with adjoining work, in particular with the composite aluminum work. The details require that these areas of work interface in a manner which will not enable one area of work to be completed independently of the other.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Division 8 Section "Glazing".

F. Install sealants as specified in Division 7 Section "Joint Sealants".

G. Install insulation materials as specified in Division 7 Section "Building Insulation".

H. Install perimeter fire-containment systems as specified in Division 7 Section "Fire-Resistive Joint Systems".

3.03 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.

2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.

3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.

b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.

c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of representative areas of glazed aluminum curtain walls shall take place as installation proceeds to determine compliance of installed assemblies with specified requirements.

1. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of 10 lbf/sq. ft., and shall not evidence water penetration.

   a. Area, quantity, and time of tests shall be as agreed to by Contractor and Design Consultant.

2. Water Spray Test: Before installation of interior finishes has begun, areas designated by Design Consultant shall be tested according to AAMA 501.2 and shall not evidence water penetration.

   a. Area and time of tests shall be as agreed to by Contractor and Design Consultant. Tests shall be conducted per AAMA 501.2. Water penetration is as defined previously herein. Contractor shall provide powered scaffold, hose, water supply, communication system and manpower to perform tests. Test wall at 10%, 20%, 40%, 60%, and 90% completion. Schedule any work necessary, such as out of sequence sealant work, so that wall can be tested as specified.

3. Test Conditions: Surrounding interior finishes, including gypsum board, whall not be installed at test area locations until after completion of testing and acceptance of materials, so as to ensure test observations from the interior are not masked by such materials.

4. Depending upon the prevalence or absence of leakage in initial water penetration test, and upon measures adopted by Contractor to eliminate source of leakage, Design Consultant will determine necessity for, and scope of, additional tests and test methods. Remedial measures shall maintain standards of quality and durability and are subject to approval. In no case, will total of tested area amount to less than 1.0% nor more than 10.0% of the exterior wall area except as subsequently authorized by the Owner's Representative.

C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. All costs of additional tests, including fees and cost incurred by the Owner, Design Consultant, and their Consultants shall be paid for by the Contractor.

F. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION 084413

SECTION 085113

INTERIOR GLAZED ALUMINUM PARTITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Aluminum framing for interior storefront.
2. Aluminum framing for interior structural silicone glazed window wall.
3. Interior manual-swing doors in aluminum framing.
4. Interior sliding doors in aluminum framing.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for installation of joint sealants installed with glazed aluminum framing systems and for sealants to the extent not specified in this Section.
2. Division 8 Section "Door Hardware" for hardware in manual swinging doors and sliding doors not specified in this Section.
3. Division 8 Section "Glazing" for glazing in aluminum framing and doors.
4. Division 8 Section "Glazed Aluminum Curtain Walls" for exterior curtain-wall systems.

1.03 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities".

1.04 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

a. Deflection exceeding specified limits.
b. Framing members transferring stresses, including those caused by structural movements to glazing.
c. Glazing-to-glazing contact.

d. Loosening or weakening of fasteners, attachments, and other components.

e. Sealant failure.

f. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Seismic Loads: As indicated on Structural Drawings.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

E. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by aluminum-framed systems without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.

2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

F. Structural-Sealant Joints: Designed to produce tensile or shear stress of less than 20 psi.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

3. Shop Drawings shall be reviewed and approved in writing by the manufacturer prior to submission to the Design Consultant.

C. Installation Instructions: Submit manufacturer's written installation guide.

D. Samples for Initial Selection: For glazing sealant.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.

G. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

H. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of aluminum-framed systems.
2. Include design calculations.

I. Qualification Data: For qualified Installer and testing agency.

J. Seismic Qualification Certificates: For aluminum-framed systems**,** accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

K. Preconstruction Test Reports: For sealant.

L. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

M. Quality-Control Program for Structural-Sealant-Glazed System: Include reports.

N. Field quality-control reports.

O. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

P. Warranties: Sample of special warranties.

Q. Meeting Records: Minutes of pre-installation conference.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Quality-Control Program for Structural-Sealant-Glazed System: Develop quality control program specifically for Project. Document quality-control procedures and verify results for aluminum-framed systems. Comply with ASTM C 1401 recommendations including, but not limited to, system material-qualification procedures, preconstruction sealant-testing program, procedures for system fabrication and installation, and intervals of reviews and checks.

E. Preconstruction Sealant Testing: For structural-sealant-glazed systems, perform sealant manufacturer's standard tests for compatibility with and adhesion of each material that will come in contact with sealants and each condition required by aluminum-framed systems.

1. Test a minimum five samples each of metal, glazing, and other material.

2. Prepare samples using techniques and primers required for installed systems.

3. For materials that fail tests, determine corrective measures necessary to prepare each material to ensure compatibility with and adhesion of sealants including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

F. Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

G. Source Limitations for Aluminum-Framed Systems: Obtain aluminum framing system and swinging doors from single source from single manufacturer. Provide sliding doors from same source and same manufacturer, if possible. If not possible, obtain from sliding door manufacturer acceptable to and approved by aluminum framing system manufacturer.

H. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.

I. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

J. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.

2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Design Consultant specifically approves such deviations in writing.

4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

K. Pre-Installation Conference: Conduct conference at Project site.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.08 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.

b. Noise or vibration caused by thermal movements.

c. Deterioration of metals**,** metal finishes, and other materials beyond normal weathering.

d. Adhesive or cohesive sealant failures.

e. Failure of operating components.

2. Warranty Period: 10 years from date of Substantial Completion.

C. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sliding aluminum-framed glass doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.

b. Structural failures including excessive deflection.

c. Faulty operation of movable sash and hardware.

2. Warranty Period: Sliding Door: Five years from date of Substantial Completion.

D. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

1.09 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer.

Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

B. Structural-Sealant-Glazed Systems:

1. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of structural-sealant-glazed system Installer. Include monthly preventive maintenance, repair or replacement to ensure long-term performance and durability of structural-sealant-glazed system as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original system.

2. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Interior Storefront Framing System

1. Description: 1-3/4" x 4-1/2" center set, flush glazed framing system for monolithic glass infill panels.

2. Basis-of-Design Product (Interior Storefront Framing): The design for interior storefront framing is based on "YKK AP Series YES 45 FS Aluminum Storefront System" as manufactured by YKK AP America Inc. Subject to compliance with requirements, other manufacturers offering products that may be incorporated in the Work include, but are not necessarily limited to, the following:

a. Kawneer North America; an Alcoa company.

b. Gardner Metal Systems.

c. United States Aluminum.

d. Vistawall Architectural Products.

B. Interior Window Wall Framing System

1. Description: 2" x 4-15/16", vertical structural silicone glazed ribbon system designed to accept glazing as indicated.

2. Basis-of-Design Product (Interior Window Wall Framing): The design for interior structural silicone glazed window wall system is based on "YKK AP Series YSG 50 Window Wall System" as manufactured by YKK AP America Inc. Subject to compliance with requirements, other manufacturers offering products that may be incorporated in the Work include, but are not necessarily limited to, the following:

a. Kawneer North America; an Alcoa company.

b. Gardner Metal Systems.

c. United States Aluminum.

d. Vistawall Architectural Products.

2.02 MATERIALS

A. Recycled Content of Aluminum Products: Provide products with an average recycled content of aluminum products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 40 percent.

B. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

C. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.

2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.

3. Extruded Structural Pipe and Tubes: ASTM B 429.

4. Structural Profiles: ASTM B 308.

D. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36.

2. Cold-Rolled Sheet and Strip: ASTM A 1008.

3. Hot-Rolled Sheet and Strip: ASTM A 1011.

2.03 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction:

a. Interior Storefront: Non-thermal.

b. Interior Structural Silicone Glazed Window Wall: Structurally glazed.

2. Glazing System:

a. Interior Storefront: Retained mechanically with gaskets on four sides.

b. Interior Structural Silicone Glazed Window Wall: Retained by structural sealant at vertical edges and mechanically with gaskets at horizontal edges.

3. Glazing Plane:

a. Interior Storefront: Center.

b. Interior Structural Silicone Glazed Window Wall: Front.

B. Glazing Channel Fillers: Manufacturer's standard aluminum glazing channel fillers for unglazed openings to match aluminum systems.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

2. Reinforce members as required to receive fastener threads.

E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123 or ASTM A 153.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

1. Provide sealants for use interior of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.04 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing".

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:

1. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.

a. Provide sealants for use inside of the weatherproofing system that have a VOC content of 100 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

b. Color: As selected by Design Consultant from manufacturer's full range of colors.

2.05 SWINGING ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2-inch overall thickness, with minimum 0.188-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

2. Door Design: Wide stile; 5-inch nominal width.

a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane. All doors shall be accessible.

3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware:

1. Hardware shall be as specified in Division 8 Section "Door Hardware".

2.06 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants".

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.07 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.

3. Physical and thermal isolation of glazing from framing members.

4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. Storefront Framing: Fabricate components for assembly using shear-block system.

G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.08 ALUMINUM FINISHES

A. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Interior Finish: PPG UC55026 Duranar "Bright White", unless noted otherwise.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.

2. Do not install damaged components.

3. Fit joints to produce hairline joints free of burrs and distortion.

4. Rigidly secure nonmovement joints.

5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with primer or applying sealant or tape as recommended by manufacturer for this purpose.

C. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

D. Install glazing as specified in Division 8 Section "Glazing".

1. Structural-Sealant Glazing: Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

E. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

F. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants".

3.03 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.

2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.

b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive phases as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C 1401.

a. Destructive Test Method A, "Hand Pull Tab (Destructive)," in ASTM C 1401, Appendix X2, shall be used.

1) A minimum of two areas on each building face shall be tested.

2) Repair installation areas damaged by testing.

2. Structural-Sealant Glazing Inspection: After installation of aluminum-framed systems is complete, structural-sealant glazing shall be inspected and evaluated according to recommendations in ASTM C 1401.

C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.05 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

END OF SECTION 085113

SECTION 0880O0

GLAZING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions apply to this Section.

1.02 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Glazed curtain walls.
4. Interior glazed aluminum partitions.
5. Interior borrowed lites.

B. Section includes the request for alternate pricing on the following:

1. Provide an alternate price to use silicone setting blocks and silicone edge blocks at insulated glass units.

1.03 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.04 PERFORMANCE REQUIREMENTS

A. General:

1. Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
2. Installed security glazing shall withstand security-related loads and forces without damage to the glazing beyond that allowed by referenced standards.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures (Exterior Glass and Interior Airlock Glass): As indicated on Structural Drawings.

2. Vertical Glazing (Exterior and Interior): For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.

3. Probability of Breakage for Sloped Glazing (Exterior and Interior): For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.

4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements (Exterior Glass and Interior Airlock Glass): Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Sound Transmission: At exterior airside-facing areas of glazing, provide glass having the following sound-transmission characteristics:

1. Sound Transmission Class (STC [Outdoor-Indoor Transmission Class (OITC)]: For glass areas requiring sound transmission control, provide minimum 42 STC (30 OITC) when tested for laboratory sound transmission loss according to ASTM E 413 (OITC ASTM E 90 and determined by ASTM E 1332).

E. Security Glazing: Design security glazing, including comprehensive engineering analysis by a qualified professional engineer.

1. Design Procedure for Glass: Design according to ASTM E 1300.

1.05 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.

4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.06 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of the following products; 12 inches square.

1. Insulating glass for each designation indicated.

C. Glazing Accessory Samples: For sealants, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Qualification Data: For professional engineer and installers and manufacturers of insulating-glass units with sputter-coated, low-e coatings.

G. Product Certificates: For glass and glazing products, from manufacturer. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer. Manufacturer shall provide written acknowledgement that manufacturer has reviewed the details, agrees that manufacturer's products are appropriate for the intended use as shown in those details, and that the product is warrantable as detailed, including glass bite, setting block size and materials, weep hole requirements, thermal stress in the specified glass type, effects of partial shading, and other details relative to the warranty.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, coated glass, insulating glass, glazing sealants, and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

I. Preconstruction adhesion and compatibility test report.

J. Warranties: Sample of special warranties.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations that are similar to those indicated for this Project in material, design, and extent.

D. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

E. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

F. Source Limitations for Glass: Obtain clear float glass, tinted float glass, coated float glass, laminated glass, laminated glass, and insulating glass from single source from single manufacturer for each glass type.

G. Source Limitations for Glazing Accessories and Sealants: Obtain from single source from single manufacturer for each product and installation method.

H. Source Limitations for Glazing Sealants: Obtain from single source from single manufacturer for all glazing sealants.

I. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."

2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."

3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."

4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

J. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

K. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

L. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

M. Mockups: If required by Owner, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install glazing in mockups in locations and of the sizes indicated on Drawings, or, if not indicated on the Drawings, in locations and of the sizes as directed by the Design Consultant.

2. Notify Design Consultant seven days in advance of dates and times when mockups will be constructed.

3. Obtain Design Consultant's approval of mockups before starting fabrication.

4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

N. Preinstallation Conference: Conduct conference at Project site.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions for delivery, storage, and handling. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.10 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of manufacture.

C. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 5 years from date of manufacture.

D. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of manufacture.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Quantities and types of extra materials shall be coordinated with the Owner's representative.

PART 2 - PRODUCTS

2.01 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is actual thickness, unless a greater thickness is required to meet performance or code requirements. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.

2. For laminated-glass lites, properties are based on products of construction indicated.

3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.

5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.02 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2. For uncoated glass, comply with requirements for Condition A.

3. For coated vision glass, comply with requirements for Condition C (other coated glass).

C. Uncoated Tinted Float Glass: Class 2, complying with other requirements specified.

D. Ceramic-Coated Vision Glass: Heat-treated float glass, Condition C; with ceramic enamel applied by silk-screened process; complying with Specification No. 95-1-31 in GANA's Tempering Division's "Engineering Standards Manual" and with other requirements specified.

E. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.

2.03 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.

2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.

3. Interlayer Color: As indicated.

2.04 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.

2. Spacer: Manufacturer's standard spacer material and construction, with bent or soldered corners.

3. Desiccant: Molecular sieve or silica gel, or blend of both.

2.05 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

B. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, clear float glass; with intumescent interlayers; complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. InterEdge, Inc., a subsidiary of AFG Industries, Inc.; Pyrobel.

b. Pilkington Group Limited (distributed by Technical Glass Products); PyroStop.

c. Vetrotech Saint-Gobain; \SGG Contraflam N2 or SGG Swissflam N2.

C. Gel-Filled, Double Glazing Units: Double glazing units made from two lites of uncoated, clear, fully tempered float glass; with a perimeter metal spacer separating lites and dual-edge seal enclosing a cavity filled with clear, fully transparent, heat-absorbing gel; complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Safti First; SuperLite II.

2.06 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.

4. Colors of Exposed Glazing Sealants: As selected by Design Consultant from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dow Corning Corporation; 791 and 795.

    b. GE Advanced Materials - Silicones; SilPruf NB SCS9000 and UltraPruf II SCS2900.

    c. Tremco Incorporated; Spectrem 2 and Spectrem 3.

2. Applications: Structural and non-structural glazing of glass and metal.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dow Corning Corporation; 799.

    b. GE Advanced Materials - Silicones; UltraGlaze SSG4000 and UltraGlaze SSG4000AC.

    c. Tremco Incorporated; Proglaze SSG and Tremsil 600.

2. Applications: Structural and non-structural glazing of glass and metal.

D. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.07 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.08 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5. Provide an alternate price for silicone setting blocks.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking). Provide an alternate price for silicone edge blocks.

F. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

G. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

H. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from **one of** the following:

1. EPDM complying with ASTM C 864.

2. Silicone complying with ASTM C 1115.

3. Thermoplastic polyolefin rubber complying with ASTM C 1115.

2.09 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.10 GLASS UNITS

A. Glass Type GL-01: Blue Tinted Tempered Insulated Laminated Glass Unit with Low-E Coating:

1. Basis-of-Design Product: "Solarscreen Radiant Low-E (VRE) Insulating Glass VRE 5-38" as manufactured by Viracon or a comparable product by one of the following:

   a. AFG Industries, Inc.

   b. PPG Industries, Inc.

2. Overall Unit Thickness: 1 3/16 inch (29.5 mm).

3. Outdoor Lite: 1/4 inch (6 mm) blue tempered float glass.

4. Radiant Low-E Coating: Sputtered on second surface.

5. Interspace: 1/2 inch (12 mm)

   a. Content: Air.

6. Indoor Lite:

   a. 3/16 inch (4.5 mm) clear heat strengthened float glass.

   b. 0.060 inch clear polyvinyl butyral interlayer.

   c. 3/16 inch (4.5 mm) clear heat strengthened float glass.

7. Properties:

   a. Transmittance:

      1) Visible Light: 22%.

      2) Solar Energy: 10%

      3) Ultra-Violet: <1%

   b. Reflectance:

      1) Visible Light - Exterior: 20%

      2) Visible Light – Interior: 19%

      3) Solar Energy: 18%

   c. ASHRAE U-Value:

      1) Winter Nighttime: 0.29 Btu/(hr x swft x deg F)

      2) Summer Daytime: 0.26 Btu/(hr x swft x deg F)

   d. Shading Coefficient: 0.21

   e. Relative Heat Gain: 45 Btu/hr x sqft

   f. Solar Factor (SHGC): 0.18

B. Glass Type GL-2: Blue Insulated Laminated Glass Unit with Low-E Coating and 50% Frit Pattern:

1. Basis-of-Design Product: "Solarscreen Radiant Low-E (VRE) Insulating Glass (50% Silk-Screen Coverage V-175) VRE 5-38" as manufactured by Viracon or a comparable product by one of the following:
   a. AFG Industries, Inc.
   b. PPG Industries, Inc.
2. Overall Unit Thickness: 1-3/16 inch (29.5 mm).
3. Outdoor Lite: 1/4 inch (6 mm) blue heat strengthened float glass.
4. Radiant Low-E Coating: Sputtered on second surface.
5. Ceramic Frit Coating: Silk-screen partial coverage #5960 with V-175 white ceramic frit on second surface.
6. Interspace: 1/2 inch (12 mm)
   a. Content: Air.
7. Indoor Lite:
   a. 3/16 inch (4.5 mm) clear heat strengthened float glass.
   b. 0.060 inch clear polyvinyl butyral interlayer.
   c. 3/16 inch (4.5 mm) clear heat strengthened float glass.
8. Properties:
   a. Transmittance:
      1) Visible Light: 14%.
      2) Solar Energy: 7%
      3) Ultra-Violet: <1%
   b. Reflectance:
      1) Visible Light - Exterior: 20%
      2) Visible Light – Interior: 19%
      3) Solar Energy: 18%
   c. ASHRAE U-Value:
      1) Winter Nighttime: 0.29 Btu/(hr x swft x deg F)
      2) Summer Daytime: 0.26 Btu/(hr x swft x deg F)
   d. Shading Coefficient: 0.16
   e. Relative Heat Gain: 36 Btu/hr x sqft
   f. Solar Factor (SHGC): 0.14

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.03 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Film Coating: Adhesively apply film coating to glass unit prior to installation in framing system. Adhere film in accordance with manufacturer's written instructions.

3.04 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.

H. Center security glazing in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.05 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.06 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for

buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 089000

LOUVERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Fixed, extruded aluminum louvers.

B. Related Sections:

1. Division 8 Section "Steel Doors and Frames" for louvers in hollow-metal doors.

1.03 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

D. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.04 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. Design earthquake spectral response acceleration, short period (Sds) for Project as indicated on Drawings.

2. Component Importance Factor as indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

2. Show mullion profiles and locations.

C. Samples for Verification: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.06 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to AWS D1.2/D1.2M, "Structural Welding Code - Aluminum.".

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

D. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating louvers without field

measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T-6.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head tamper-resistant screws for exposed fasteners unless otherwise indicated.

2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.

3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Hardware: For hinged louver units provide manufacturer's continuous stainless steel piano hinge and factory-welded lockable hasp.

2.02 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern.

C. Maintain equal louver blade spacing to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel, unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.

1. Fully Recessed Mullions: Provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.

G. Provide subsills made of same material as louvers for recessed louvers.

H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

I. Fabricate hinged louver units to match adjacent louver units in material, appearance, performance, and finish.

2.03 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Continuous-Blade, Drainable-Blade Louver:

1. Basis-of-Design Product: Design is based on "Model #CB6774", as manufactured by The Airolite Company, LLC. Subject to compliance with requirements, provide either the named product or comparable product by one of the following:

a. Cesco Products; a division of Mestek, Inc.

b. Nystrom Building Products.

c. Reliable Products, Inc.

d. Ruskin Company; Tomkins PLC.

e. United Enertech Corp.

f. Construction Specialties, Inc.

g. Greenheck Fan Corporation.

2. Louver Depth: 4 inches, unless otherwise indicated.

3. Frame and Blade Nominal Thickness: Not less than 0.080 inch for blades and 0.080 inch for frames.

4. Mullion Type: Fully recessed.

5. Louver Performance Ratings:

a. Free Area: Not less than 8.35 sf for 48-inch wide by 48-inch high louver (52% free area).

b. Point of Beginning Water Penetration: Not less than 961 fpm.

c. Air Performance: Not more than 0.12-inch wg static pressure drop at 961-fpm free-area velocity.

6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

B. Horizontal Storm-Resistant Louver

1. Basis-of-Design Product: Design is based on "Model #RS-7315", as manufactured by Construction Specialties, Inc. Subject to compliance with requirements, provide either the named product or comparable product by one of the following:

a. Airolite Company, LLC (The).

b. Cesco Products; a division of Mestek, Inc.

c. Greenheck Fan Corporation.

d. Nystrom Building Products.

e. Reliable Products, Inc.

f. Ruskin Company; Tomkins PLC.

g. United Enertech Corp.

2. Louver Depth: 7 inches, unless otherwise indicated.

3. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.060 inch for frames.

4. Mullion Type: Fully recessed.

5. Louver Performance Ratings:

a. Free Area: Not less than 8.09 sf for 48-inch wide by 48-inch high louver (50% free area).

b. Air Performance: Not more than 0.259-inch wg static pressure drop at 900-fpm free-area exhaust and intake velocity.

c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 3 inches per hour and a wind speed of 29 mph at a core-area intake velocity of 400 fpm.

6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.04 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.

2. Screening Type: Insect screening.

B. Secure screen frames to louver frames with machine screws with heads finished to match louver, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.

2. Finish: Mill finish unless otherwise indicated.

3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:

1. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.

2.05 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.06 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Design Consultant from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.03 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

3.04 ADJUSTING AND CLEANING

A. Clean exposed surfaces of louvers that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Design Consultant, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089000

SECTION 092216

NON-LOAD-BEARING STEEL FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).

2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

B. Related Sections include the following:

1. Division 5 Section "Structural Metal Studs" for exterior non-load-bearing.

2. Division 6 Section "Carpentry, General" for wood blocking and hanging strips to be used in lieu of backing plates and hanging strips, if backing plates cannot be used.

3. Division 7 Section "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide interior non-load-bearing steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings, including, but not limited to, dead loads of interior finish materials.

2. Deflection Limits:

a. Design interior non-load-bearing framing systems to withstand design loads without horizontal deflections greater than 1/240 of the wall height, unless otherwise indicated.

3. Design interior non-load-bearing framing systems to provide for movement of framing members without damage or overstressing, failure of interior finish materials, connection failure, undue strain on fasteners and anchors, or other detrimental effects.

4. Design interior non-load-bearing framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure of 1/2 inch (upward and downward movement).

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Show layout, spacings, sizes, thicknesses, and types of steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work. Indicate compliance with manufacturer's standard load tables to meet performance requirements.

C. Load Tables: Manufacturer's standard load tables used for sizing steel framing minimum base-metal thickness.

D. Welding certificates.

E. Meeting Records: Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering steel framing that may be incorporated into the Work include, but are not limited to, the following:

1. AllSteel Products, Inc.
2. Clark Steel Framing.
3. Craco Metals Manufacturing, LLC.
4. Dietrich Metal Framing; a Worthington Industries Company.
5. Formetal Co. Inc. (The).
6. MarinoWare; a division of Ware Industries.
7. Southeastern Stud & Components, Inc.
8. Steel Construction Systems.
9. United Metal Products, Inc.

2.02 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 50 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.

2. Protective Coating: ASTM A 653, G40, hot-dip galvanized, unless otherwise indicated.

2.03 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

2. Type: Cast-in-place anchor, designed for attachment to concrete forms or postinstalled, expansion anchor.

3. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.

1. Depth: 2-1/2 inches, unless otherwise indicated.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.

2. Steel Studs: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0179 inch, unless otherwise indicated.

b. Depth: As indicated on Drawings.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base Metal Thickness: 0.0179 inch, unless otherwise indicated.

4. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped.

F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.

b. Chicago Metallic Corporation; 640-C or 660-C.

c. USG Corporation; Drywall Suspension System.

2.04 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0179 inch or as required to comply with manufacturer's standard load tables for unsupported span, deflection limits, and loads, unless otherwise indicated.

2. Minimum Base-Metal Thickness for Studs Supporting Diamond Mesh: 0.043 inch minimum, or as required to comply with manufacturer's standard load tables for unsupported span, deflection limits, and loads, unless otherwise indicated.

3. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, provide the following:

1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0179 inch, unless otherwise indicated.

2. Depth: 7/8 inch, unless otherwise indicated.

D. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

E. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

F. Backing Plate and Hanging Strips: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0598 inch, unless otherwise indicated.

2.05 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.03 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.04 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support

standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Do not attach hangers to steel roof deck.

5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.05 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:

a. Single-Layer Application: 16 inches o.c., unless otherwise indicated.

b. Multilayer Application: 16 inches o.c., unless otherwise indicated.

c. Tile backing panels: 16 inches o.c., unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb, unless otherwise indicated.

b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

6. Curved Partitions:

a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.

b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

D. Direct Furring: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

F. Install backing plates and hanging strips as required to support millwork, fixtures, specialty items, and trim, unless otherwise indicated. Provide wood blocking in lieu of backing plates and hanging strips where required, in accordance with Division 6 Section " Carpentry, General".

END OF SECTION 092116

SECTION 092713

GLASS-REINFORCED GYPSUM FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes factory-molded, glass-reinforced gypsum (GRG) fabrications for interior applications including column covers.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for supports of column covers.
2. Division 5 Section “Metal Column Covers” for metal column covers.
3. Division 6 Section "Rough Carpentry" for blocking, nailers, shims, and carpentry supporting GRG fabrications.
4. Division 6 Section "Interior Architectural Woodwork" for stainless steel base.
5. Division 9 Section "Non-Load-Bearing Steel Framing" for steel framing, blocking, and bracing supporting GRG fabrications.
6. Division 9 painting and coating sections for paint and coatings to be applied to GRG fabrications.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Column covers, including anchors and connections, shall withstand the effects of gravity loads without exceeding the allowable design working stress of materials involved and without exhibiting permanent deformation in any components.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, weights, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show profiles, thicknesses, embedded supports, and anchorage details for fabrications. Indicate requirements for joint treatment, clearances, control joints and attachment to supports.

1. Indicate maximum loads imposed on building structure at points of support.

C. Samples: For each exposed product in each profile and size required, and as follows:

1. Column Cover: 24-inch-long section of full-size unit, with finished joint.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing column covers similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Installer Qualifications: Fabricator of products.

C. Source Limitations: Obtain column covers from single source.

D. Mockups: Build mockups of full-size column cover with required finishes applied to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. requirements specified in other Division 9 Sections.

2. Finish mockups with metal cladding to match final finish scheduled or indicated.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Design Consultant specifically approves such deviations in writing.

4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Pre-Installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C 1467.

B. All materials shall be protected during fabrication, shipment, site storage and erection to prevent damage to the finished work from other trades. Store materials inside a well-ventilated area, away from uncured concrete and masonry, and protected from weather moisture, soiling, abrasion, and extreme temperatures.

1.07 PROJECT CONDITIONS

A. Environmental Conditions:

1. Comply with requirements in ASTM C 1467.

2. Do not deliver or install GRG fabrications until building is enclosed, wet work is complete, and HVAC system is operating and continuously maintaining temperature and relative humidity at levels intended for building occupants.

B. Conditioning: Acclimatize GRG fabrications to ambient temperature and humidity of spaces in which they will be installed. Remove packaging and move units into installation spaces not less than 48 hours before installing them.

C. Field Measurements: Where GRG fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.08 COORDINATION

A. Coordinate layout and installation of GRG fabrications with support components specified in other Sections.

B. Coordinate installation of column covers with adjacent construction to ensure that wall assemblies are protected against damage.

PART 2 - PRODUCTS

2.01 GRG FABRICATIONS

A. Fabrications: Molded, glass-reinforced gypsum units complying with ASTM C 1381.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Casting Designs, Inc.

b. DEC Associates.

c. Formglas Inc.

d. Plastrglas, Incorporated.

e. Pittcon Industries

B. Embedments: As standard with GRG fabrication manufacturer and as required for reinforcement and for anchorage to substrates and framing.

2.02 AUXILIARY MATERIALS

A. Adhesives: To connect GRG to GRG as recommended in GRG fabrication manufacturer's written instructions.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Steel Drill Screws: Of sufficient length and size to securely fasten GRG fabrications to framing members, and as follows:

1. Screws complying with ASTM C 1002 for fastening GRG fabrications to steel members less than 0.033 inch thick.

2. Screws complying with ASTM C 954 for fastening GRG fabrications to steel members from 0.033 to 0.112 inch thick.

C. Joint-Treatment Materials: ASTM C 475.

D. Control Joints: ASTM C 1047, one-piece control joint with V-shaped slot and removable strip covering the slot opening.

1. Material: Steel sheet zinc-coated by hot-dip process.

E. Provide cut-outs for column-mounted items, as indicated on Drawings.

2.03 FABRICATION

A. Shop Assembly: Preassemble column covers in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Fabricate GRG units to comply with ASTM C 1381, with smooth-finished surfaces; repair hollows, voids, scratches, and other surface imperfections. Fabricate units in lengths and sizes that will minimize number of joints between abutting units.

C. Coordinate dimensions and attachment methods of column covers with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

D. Form column covers to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends..

E. Embedments: Incorporate embedments into units to develop the full strength of GRG fabrications. Cover embedments with not less than 3/16-inch thickness of GRG composite.

F. Increase thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.

1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.

G. Connection Hardware: Designed and fabricated to support and connect GRG fabrications to hangers, support framing, and substrates.

H. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce column covers as needed to attach and support other construction.

I. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install metal column covers. See Division 5 Section "Metal Fabrications" and Division 9 Section "Non-Load-Bearing Steel Framing" for supports of GRG column covers.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine support framing, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach support framing to surfaces indicated to receive sprayed fire-resistive materials.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of support framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. If required, replace fire-resistive materials to thickness required. Protect adjacent fire-resistive materials from damage.

3.03 GRG INSTALLATION

A. Comply with requirements in ASTM C 1467.

B. Install GRG fabrications level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment.

C. Attach GRG fabrications to framing and substrates with steel drill screws, unless otherwise indicated. Do not use pneumatic staple guns. Countersink screw heads below adjoining finished surface.

1. Predrill fastener holes in units. Clean fastener holes to remove dirt and oil.
2. Locate fasteners not less than 5/16 inch from edges or ends of units.

D. Where GRG fabrications are joined to form composite units, join fabrications with adhesive. Band or brace units together until adhesive cures.

E. Install control joints between GRG fabrications where indicated by manufacturer.

F. Use joint-treatment materials to finish GRG fabrications to produce surfaces ready to receive primers and paint finishes specified in other Division 9 Sections. Comply with ASTM C 840 and provide Level 5 finish.

1. Finish joints between units, other than control joints, and countersunk fastener heads to comply with ASTM C 840 for Level 5 and to match surface texture of units.
2. Repair hollows, voids, scratches, and other surface imperfections on units to provide Level 5 finish.

END OF SECTION 092713

SECTION 092900

GYPSUM DRYWALL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.

B. Related Sections include the following:

1. Division 5 Section "Structural Metal Studs Framing" for load-bearing steel framing that supports gypsum board.
2. Division 6 Section "Sheathing" for gypsum sheathing.
3. Division 7 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board.
4. Division 9 Section "Non-Load-Bearing Steel Framing" for non-structural framing and suspension systems that support gypsum board.
5. Division 9 painting Sections for primers applied to gypsum board surfaces.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For trim Accessories. Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.04 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.05 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.01 PANELS, GENERAL

A. Recycled Content: Provide gypsum panel products with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 30 percent by weight for recycled core material and 100% by weight for recycled paper facings.

B. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.02 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 1629 or ASTM C 1396, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum Co.

b. G-P Gypsum.

c. National Gypsum Company.

d. USG Corporation.

B. Regular Type:

1. Thickness: 5/8 inch, unless otherwise indicated.

2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

3. Location: Vertical surfaces, unless otherwise indicated.

C. Type X:

1. Thickness: 5/8 inch.

2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

3. Location: Where required for fire-resistance-rated assembly.

D. Flexible Type: Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. National Gypsum Company; 1/4" High Flex Gypsum Wallboard.

b. United States Gypsum Co.; SHEETROCK Brand Flexible Gypsum Panels.

2. Thickness: 1/4 inch, unless otherwise indicated.

3. Long Edges: Tapered.

4. Location: Curved surfaces, unless otherwise indicated.

E. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum Co.; Interior Ceiling Board.

b. National Gypsum Company; 1/2" High Strength Ceiling Board.

c. United States Gypsum Co.; SHEETROCK Brand Sag-Resistant Interior Gypsum Ceiling Board.

2. Thickness: 1/2 inch, unless otherwise indicated.

3. Long Edges: Tapered.

4. Location: Ceiling surfaces, unless otherwise indicated.

F. High-Impact Type: Manufactured with Type X core, plastic film laminated to back side for greater resistance to through-penetration (impact resistance).

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. National Gypsum Company; Hi-Impact XP Wall Board.

b. United States Gypsum Co.; SHEETROCK Brand Abuse-Resistant Gypsum Board.

2. Core: 5/8 inch, regular type or 5/8 inch, Type X, as required.

3. Long Edges: Tapered.

4. Location: As indicated on drawings.

G. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. G-P Gypsum Corp.; DensArmor Plus Paperless Interior Panel.

b. National Gypsum Company; XP Wallboard.

c. United States Gypsum Co.; SHEETROCK Brand Humitek Gypsum Board Panels.

2. Core: 5/8 inch, Type X where required.

3. Long Edges: Tapered.

4. Location: Interior areas subject to outdoor air exposure and high humidity, toilet room walls not receiving tile, and inside face of exterior walls, unless otherwise indicated.

2.03 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

2. Shapes:

a. Cornerbead.

b. LC-Bead: J-shaped; exposed long flange receives joint compound.

c. Expansion (control) joint.

d. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Basis-of-Design Products: The design is based on the products listed. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers:

a. Fry Reglet Corp.

b. Gordon, Inc.

c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.

3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

4. TR-07: Trim Reveals.

   a. Basis-of-Design Product: STR-075-050 by Pittcom Industries.

   b. Material: Aluminum.

5. TR-08: J-Molding.

   a. Basis-of-Design Product: JDM-625 by Fry Reglet Corp.

   b. Material: Aluminum.

6. TR-09: T-Piece.

   a. Basis-of-Design Product: FCP-T Piece by Fry Reglet Corp.

   b. Material: Aluminum.

7. TR-12: Reveal Channel.

   a. Basis-of-Design Product: DCS-625-75 by Fry Reglet Corp.

   b. Material: Aluminum.

2.04 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints**,** rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.

4. Finish Coat: For third coat, use drying-type, all-purpose compound.

5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.05 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Sound Attenuation Blankets: As specified in Division 7 Section "Building Insulation".

E. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants".

F. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

3.03 APPLYING INTERIOR GYPSUM BOARD

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

C. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.

2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.04 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.

B. Areas Not Subject to Wetting: Install regular-type gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

INSTALLING TRIM ACCESSORIES

D. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

E. Control Joints: Install control joints at locations indicated on Drawings or according to ASTM C 840 and in specific locations approved by Design Consultant for visual effect.

F. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.

2. LC-Bead: Use at exposed panel edges.

3. Curved-Edge Cornerbead: Use at curved openings.

G. Aluminum Trim: Install in locations indicated on Drawings.

3.05 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

2. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.

3. Level 5: Where indicated on Drawings and where required by finish manufacturer, including areas to receive multi-colored interior coatings, special interior Venetian plaster coating, and special textured acrylic coating.

3.06 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09290

SECTION 0951215

ACOUSTICAL CEILING SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes acoustical panels and exposed suspension systems for ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.03 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension system members.

2. Method of attaching hangers to building structure.

a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.

3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

4. Minimum Drawing Scale: 1/8 inch = 1 foot.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of full-size Samples of each type, color, pattern, and texture.

2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch-long Samples of each type, finish, and color.

D. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.

E. Maintenance Data: For finishes to include in maintenance manuals.

F. Meeting Records: Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

C. Seismic Standard: If required by seismic loads indicated on Structural Drawings, provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:

1. International Building Code.

2. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

D. Pre-Installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.08 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.

2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.01 ACOUSTICAL PANELS, GENERAL

A. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum percentage by weight as indicated.

B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.02 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

A. Acoustical Panel (ACT-01 And ACT-02

1. Panels complying with ASTM E 1264 for type, form, and pattern as follows:

a. Basis-of-Design: Provide ceilings panels matching adjacent ceiling system in sizes, patterns, color, NRC, CAC and Light Reflectance.

2.03 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

a. Type: Postinstalled, chemical anchor.

b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.

2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

I. Hold-Down Clips: Where indicated and where required to secure panels, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

2.04 METAL SUSPENSION SYSTEMS

A. SUSPENSION SYSTEM.

1. Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653, not less than G30 coating designation, with prefinished metal caps on flanges.

a. System: The design for steel suspension system shall match the existing in style, face width and color.

b. Structural Classification: Intermediate-duty system.

c. End Condition of Cross Runners: Override type.

d. Face Design: Flat, flush.

e. Cap Material: Steel cold-rolled sheet.

f. Cap Finish: Painted in color as selected from manufacturer's full range.

2.05 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

1. Metal Edge Molding for APC-1, APC-2, APC-3, APC-4, APC-5, and APC-7: Unless otherwise indicated, provide the following edge trim:

a. Basis-of-Design: The design for metal edge molding is based on "Angle Molding #7800" manufactured by Armstrong World Industries, Inc. Subject to

compliance with requirements, provide either the named product or a comparable product by one of the following manufacturer:

1) BPB USA (CertainTeed Corporation).

2) USG Interiors, Inc.

2. Metal Edge Molding for APC-6: Unless otherwise indicated, provide the following edge trim:

a. Basis-of-Design: The design for metal edge molding is based on "Shadow Molding #7871" manufactured by Armstrong World Industries, Inc. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturer:

1) BPB USA (CertainTeed Corporation).

2) USG Interiors, Inc.

3. Metal Edge Trim System for Suspended Ceiling Cloud: Where ceiling tile is suspended without connection to adjacent wall, provide the following edge trim as indicated on Drawings:

a. Basis-of-Design: The design for extruded aluminum edge trim for suspended ceiling cloud is based on "Axiom Classic 4 inches" manufactured by Armstrong World Industries, Inc. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturer:

1) BPB USA (CertainTeed Corporation).

2) USG Interiors, Inc.

4. Metal Edge Trim for Exposed Metal Tee: Where the edge metal tee would be exposed without trim or molding on suspended ceiling cloud, as indicated on the Drawings, provide the following edge trim:

a. Basis-of-Design: The design for exposed metal tee for suspended ceiling cloud is based on "360° Painted" manufactured by Armstrong World Industries, Inc. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturer:

1) BPB USA (CertainTeed Corporation).

2) USG Interiors, Inc.

b. Width of metal caps on flanges to match adjacent grid system.

c. Cap finish to match adjacent grid system.

2.06 ACOUSTICAL SEALANT

A. Provide acoustical sealants that comply with requirements in Division 7 Section "Joint Sealants".

1. VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.03 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

6. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and where required to secure panels. Space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.04 SLOPED CEILING INSTALLATION

A. Install sloped ceiling panels and grid in accordance with manufacturer's written instructions. Comply with the following unless otherwise directed by manufacturer:

1. Install a main runner along the top peak.

2. Install main runners parallel to the slope (perpendicular to main runner placed at the peak). Use an angle bracket and pop-rivets to connect to the main runner at the peak. If beams, joists, trusses, or other structural members are running up the slope and do not have purlins between them, bridge the beams, joists, or trusses with a material capable of supporting ceiling system and attach hanger wires. Do not install main runners perpendicular to the slope.

3. Hanger wires shall be installed plumb.

4. The wall angle at the bottom of the slope shall either be blocked out or re-bent to the correct angle.

5. Use shims as required at the lowest edge to center panels and prevent gaps.

6. Use hold down clips to secure ceiling tile on sloped installation.

3.05 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095125

SECTION 095133

ACOUSTICAL METAL PAN CEILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. Section includes acoustical metal pans and suspension systems for ceilings.

B. Related Sections:

1. Division 9 Section "Acoustical Panel Ceilings" for ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension systems.

1.03 DEFINITIONS

A. CAC: Ceiling Attenuation Class.

B. LR: Light Reflectance coefficient.

C. NRC: Noise Reduction Coefficient.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Exterior snap-in metal pan ceilings shall withstand exterior exposure and the effects of gravity loads and the following loads and stresses without showing permanent deformation of ceiling system components including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of ceiling units; or permanent damage to fasteners and anchors.

1. Wind Load: Uniform pressure as indicated on Structural Drawings, acting inward or outward.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:

1. Metal Pans: Set of full size Samples of each type, finish, color, pattern, and texture. Show pan edge profile.

2. Sound Absorber: Match size of Sample metal pan.

C. Performance Data: For installed products indicated to comply with design loads and other criteria, include structural analysis and other analytical data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension members.
2. Method of attaching hangers to building structure.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
4. Ceiling perimeter and penetrations through the ceiling; and trim and moldings.
5. Minimum Drawing Scale: 1/8 inch = 1 foot.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical metal pan ceiling.

F. Maintenance Data: For finishes to include in maintenance manuals.

G. Meeting Records: Minutes of pre-installation conference.

1.06 QUALITY ASSURANCE

A. Source Limitations:

1. Acoustical Ceiling Pans: Obtain each type from single source from single manufacturer.
2. Suspension Systems: Obtain each type from Acoustical Ceiling Pans manufacturer.

B. Surface-Burning Characteristics: Complying with ASTM E 1264 for Class A materials as determined by testing identical products according to ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Seismic Standard: If required by seismic loads indicated on Structural Drawings, provide acoustical metal pan ceilings designed and installed to withstand the effects of earthquake motions according to the following:

1. International Building Code.
2. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

D. Pre-Installation Conference: Conduct conference at Project site.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical metal pans, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Handle acoustical metal pans, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical metal pan ceilings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above

ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.09 COORDINATION

A. Coordinate layout and installation of acoustical metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Metal Pans: Full-size units equal to 144 sq.ft. of quantity installed (to the nearest full container).

PART 2 - PRODUCTS

2.01 ACOUSTICAL METAL CEILING PANS

A. Acoustical Metal Pan Standard: Provide manufacturer's standard acoustical metal pans of configuration indicated that comply with ASTM E 1264 classifications as designated by types, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Sheet Metal Characteristics: For metal components exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.

1. Steel Sheet: Commercial-quality, cold-rolled, carbon-steel sheet; stretcher leveled; with protective coating complying with ASTM C 635.

a. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

b. Painted Finishes: Electrolytic zinc-coated steel complying with ASTM A 591/A 591M, 40Z coating, surface treatment as recommended by finish manufacturer for type of use and finish indicated.

2. Aluminum Sheet: Roll-formed aluminum sheet, complying with ASTM B 209; alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

a. Recycled Content: Provide products made from aluminum sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 50 percent.

3. Unwrapped, Glass-Fiber Insulation: Black coated, unfaced, complying with ASTM C 553, Type I, II, or III; not less than 1-lb/cu. ft. density; treated to be nondusting; and as follows:

a. Thickness: 1 inch.

2.02 METAL PANS FOR ACOUSTICAL METAL PAN CEILING

A. Metal Ceiling Pan System MC-01:

1. Basis-of-Design: The design is based on "Illusions" by Ceilings Plus matching the existing metal ceiling, no substitution.:

2. Classification: Units complying with ASTM E 1264 for Type XX, Pattern C, perforated steel facing (pan). Pattern shall match the existing.

3. Pan Fabrication: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated and finished to comply with requirements indicated.

   a. Hook-on Pans: Designed for hook-on, secure engagement with concealed suspension system. Metal ceiling pans shall be removable without the use of a special tool.

4. Pan Thickness: Not less than 0.021-inch nominal thickness for steel pans and not less than 0.04-inch nominal thickness for aluminum pans.

5. Pan Edge Detail: Square.

6. Pan Joint Detail: Match the existing.

7. Pan Size: As indicated.

8. Pan Face Finish: Manufacturer's standard factory applied powder coating (post-coated).

9. Color: Match the existing

10. LR: Not less than 0.77.

11. NRC: Not less than 0.65.

2.03 METAL SUSPENSION SYSTEMS - GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors for Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

   a. Type: Postinstalled, chemical anchor.

   b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.

2. Size: Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C 635, Table 1, Direct Hung will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

D. Hanger Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A 653, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

F. Compression Struts: Manufacturer's standard compression struts designed to accommodate seismic and/or wind load forces. At curved (faceted) instllation, provide manufacturer’s standard compression struts designed to resist tendency of the grid system to flatten out.

G. Seismic Clips: If required by seismic loads indicated on Structural Drawings, manufacturer's standard seismic clips designed and spaced to secure acoustical metal pans in place.

H. Hold-Down/Security Clips: Manufacturer's standard hold-down clips spaced to secure acoustical metal pans in place.

1. Locations: At exterior metal pan ceilings and as indicated on Drawings.

I. Exposed Metal Edge Moldings and Trim: Provide exposed members as indicated or as required to comply with seismic requirements of authorities having jurisdiction, to conceal edges of and penetrations through ceiling, to conceal edges of pans and runners, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching acoustical metal pan ceiling units, unless otherwise indicated.

1. For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.

2.04 METAL SUSPENSION SYSTEM

A. ACOUSTICAL METAL PAN CEILING MC-01.

1. Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, hot-dip galvanized according to ASTM A 653, not less than G30 coating designation, with prefinished 15/16-inch-wide metal caps on flanges.

a. Basis-of-Design: The design for steel suspension system is based on existing suspension system.

b. Structural Classification: Intermediate-duty system.

c. End Condition of Cross Runners: Override type.

d. Face Design: Flat, flush.

e. Cap Material: Steel cold-rolled sheet.

f. Finish: 2.0 mil powder-coated or baked polyester painted finish in color as selected from manufacturer's full range.

2.05 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant**,** with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.06 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.07 ALUMINUM FINISHES

A. Finish for MC-01: Anodized aluminum.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical metal pan ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical metal pan ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Measure each ceiling area and establish layout of acoustical metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width pans at borders, and comply with layout shown on reflected ceiling plans and Coordination Drawings.

3.03 INSTALLATION

A. Install acoustical metal pan ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved.

6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

8. For exterior units, install compression struts and associated materials as recommended by manufacturer to resist wind and seismic loads.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical metal pans.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Cut acoustical metal pan units for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.

F. Install acoustical metal pans in coordination with suspension system and exposed moldings and trim.

1. For clip-in and hung-on pans, position pans according to manufacturer's written instructions.

2. For snap-in pans, fit adjoining units to form flush, tight joints.

3. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.

4. Fit adjoining units to form flush, tight joints.

5. Install directionally patterned or textured metal pans in directions indicated.

6. Install sound-absorbent pads in perforated metal pans.

7. Install hold-down clips where required to secure panels and where indicated on Drawings. Hold-down clips shall be provided for all ceilings in public and family restrooms.

G. Installation of Faceted Curve System: In addition to general installation requirements and manufacturer's instructions, metal pan ceilings used as part of the faceted curve system shall comply with the following:

1. Unless otherwise indicated, main beams shall be suspended 2 feet on center, with cross tees installed every 2 feet along the length of the main beams.

2. Every second row of main beams shall be held in position by compression struts extending from the main beam to the structure above. Struts shall be spaced as required to overcome the grid system's tendency to flatten out, but not more than 12 feet apart along the length of the mains. Struts shall be attached as recommended by the manufacturer and as required to maintain curve of system.

3. Install hold down clips as required by manufacturer to maintain panels in place.

4. Position panels so that all kerfed edges engage cross tees.

5. Treat perimeter conditions as recommended by manufacturer and as indicated on Drawings. Molding shall be bent to match the angle of the ceiling where it contacts with adjacent walls at straight sides, and cut to align with panel segments on faceted sides.

3.04 CLEANING

A. Clean exposed surfaces of acoustical metal pan ceilings, including trim and edge moldings after removing strippable, temporary protective covering, if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION 09514

Prepared By	MCA
Checked By	JW

Issue History

Construction	12 Nov 09
Revision 1	10 Sept 10
Revision 2	12 Nov 10

SECTION 096340

STONE FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General s, apply to this Section.

1.02 SUMMARY

A. Section includes the following applications of dimension stone:

1. Interior flooring.

2. Stair treads and risers.

B. Related Sections:

1. Division 7 Section "Joint Sealants" for sealing control and expansion joints in stonework with elastomeric sealants.

1.03 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.5.

2. Step Treads: Minimum 0.5.

1.04 SUBMITTALS

A. Product Data:

1. For each variety of stone. Include data on physical properties required by referenced ASTM standards.

2. For stone accessories and other manufactured products.

B. Shop Drawings: Include plans, sections, details, and attachments to other work. Show locations of each type of stone and stone pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in stone substrates and finished stone surfaces.

C. Samples for Initial Selection: Where color is not designated, provide samples for initial selection. Include samples of abrasive inserts for stair treads.

D. Samples for Verification:

1. For each stone type indicated, in sets of Samples not less than 12 inches square. Include three or more Samples in each set and show the full range of variations in appearance characteristics expected in completed Work. Samples will establish the standard by which stone will be judged.

2. For each color of grout required.

E. Qualification Data: For Fabricator and Installer.

F. Static Coefficient of Friction Certificates: For each type of product, signed by product manufacturer.

G. Warranties: Special warranties specified in this Section. A preliminary sample copy of the warranty shall be submitted with the shop drawing submittal, prior to installation. The final signed warranty shall be submitted upon completion of the Work.

H. Maintenance Data: For stone flooring to include in maintenance manuals. Include Product Data for stone-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

I. Meeting Records: Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate interior stone flooring similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Installer Qualifications: An installer who employs experienced stone setters who are skilled in installing interior flooring similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

C. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single quarry**,** whether specified in this Section or in other Sections of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.

1. For stone types that include same list of varieties and sources, provide same variety from same source for each.

D. Source Limitations for Other Materials: Obtain each type of mortar, grout, setting compound, stone accessory, waterproof membrane, and other material from single source, acceptable to manufacturer providing total system warranty.

E. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical interior floor area as shown on Drawings.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Design Consultant specifically approves such deviations in writing.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Pre-Installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.

B. Store stone on pallets with nonstaining separators and nonstaining, waterproof covers. Ventilate under covers to prevent condensation.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.07 PROJECT CONDITIONS

A. Cold-Weather Requirements for Interior Stone Flooring:

1. Do not set stone when air or material temperature is below 50 deg F.

2. Maintain temperature at 50 deg F or above in installation areas during installation and for 7 days after completion unless higher temperatures are required by fabricator's or supplier's instructions.

B. Field Measurements: Verify dimensions of construction to receive stone flooring by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabrication without field measurements. Coordinate construction, including wall and other contiguous construction, to ensure that actual dimensions correspond to established dimensions.

1.08 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Total System Warranty: Provide total system warranty in which setting material's manufacturer agrees to repair or replace components of complete flooring system that do not comply with requirements, that fail in material or workmanship, that fail to remain watertight, or that exhibit cracking, deterioration, or other defects within specified warranty period.

1. Warranty repair shall include all repairs necessary to correct cracks or leaks, including the cost of materials and labor required to make the repairs. Warranty shall include removal and subsequent replacement of all stone and other finish materials and accessories covering the setting materials, including the cost of materials and labor.

2. Warranty Period: Fifteen (15) years from date of Substantial Completion.

1.09 EXTRA MATERIALS

A. Furnish extra materials that match and are from same source as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. <u>Flooring Units</u>: Furnish quantity of full-size units installed for each type, composition, color, pattern, and size indicated:

a. Stone Tile:

1) Luna Pearl – 500 sq.ft.

2) Santa Cecilia – 500 sq.ft.

3) All other accent stones, equally distributed – 100 sq.ft.

2. Stair Units (Treads and Risers): Furnish 54 sq.ft. of full-size units for amount installed for each type, composition, color, pattern, and size indicated.
3. Interior Stone Face Units: Furnish 100 sq.ft. of full size and trim units for amount installed for each type, composition, color pattern and size indicated.
4. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PART 2 - PRODUCTS

2.01 GRANITE (FLOOR)

A. Stone Tile: Type ST-01

1. Stone Type: Granite, complying with ASTM C 615.
2. Color: As indicated on "Finish Legend".
3. Cut: Vein cut.
4. Finish: As indicated on "Finish Legend".
5. Edges: Eased.
6. Actual Tile Size: 17-29/32" x 17-29/32".
7. Nominal Tile Thickness: 1/2".
8. Joint Width: 3/32".

2.02 GRANITE (STAIR TREADS (STT-01) AND RISERS (STR-01)

A. Granite: Comply with ASTM C 615.

B. Description: Color, finish, and other stone characteristics as indicated on Finish Legend.

C. Nominal Thickness Stair Treads: 3 cm, unless otherwise indicated.

D. Nominal Thickness Stair Risers: 1/2 inches, unless otherwise indicated.

E. Size of Stair Treads: Depth of tread by full width of tread.

F. Size of Stair Risers: Height of riser by full width of riser.

G. Abrasive Inserts for Stair Treads: Abrasive strips consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder, fabricated for installing in routed grooves of stair treads to provide slip resistance. Provide epoxy-resin installation adhesive compatible with inserts.

1. Width: 1/4 inch.
2. Depth: 1/2 inch.
3. Length: 4 inches less than stair width.
4. Color: As selected by Design Consultant from manufacturer's full range.

2.03 MORTAR MATERIALS

A. Thin-Set Mortar:

1. Latex-Portland Cement Mortar: ANSI A118.4, consisting of the following:

a. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.

2. Basis-of-Design Product: The design for latex-portland cement mortar is based on "Sure Set" manufactured by Laticrete International, Inc. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Boiardi Products Corporation.

b. Bonsal American; an Oldcastle Company.

c. Bostik, Inc.

d. Custom Building Products.

e. MAPEI Corporation.

f. Mer-Kote Products, Inc.

g. Summitville Tiles, Inc.

h. TEC Specialty Construction Brands; H. B. Fuller Company.

3. Performance Properties: Provide mortar with the following minimum performance requirements:

a. Shear Strength (28-Day Cure Porcelain Tile): >250 psi, when tested in accordance with ANSI A118.4.

b. Shear Bond (Porcelain Tile Water Immersion): >185 psi, when tested in accordance with ANSI A118.4.

c. Shear Bond (28-Day Cure Quarry Tile to Plywood): >210 psi, when tested in accordance with ANSI A118.11.

d. Performance Rating: Product shall comply with "Extra Heavy" rating based on results from testing in accordance with ASTM C 627, "Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson Type Floor Tester".

e. Working Properties: Provide mortar with the following minimum working properties:

1) Open Time: 30 minutes.

2) Pot Life: 2 to 4 hours.

3) Time to Heavy Traffic: 24 hours maximum.

4) Wet Density: 87 lbs/c.f.

B. Water: Potable.

2.04 FLEXIBLE SETTING COMPOUND

A. High-Bond Adhesive: White, flexible, trowelable, three-component adhesive, complying with ISO 13007 R2.

1. Basis-of-Design Product: The design for high-bond adhesive is based on "Latapoxy 300" manufactured by Laticrete International, Inc. Subject to

compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Bonsal American; an Oldcastle Company.

b. Bostik, Inc.

c. Custom Building Products.

d. MAPEI Corporation.

e. Mer-Kote Products, Inc.

f. Summitville Tiles, Inc.

g. TEC Specialty Construction Brands; H. B. Fuller Company.

2. Performance Requirements: Provide adhesive with the following minimum performance requirements:

a. Shear Bond Strength: 1,250 psi minimum, when tested in accordance with ANSI A118.3.

b. Tensile Strength: 1,400 psi minimum, when tested in accordance with ANSI A118.3.

c. Compressive Strength: 5,000 psi minimum, when tested in accordance with ANSI A118.3.

d. Thermal Shock Resistance: 600 psi minimum, when tested in accordance with ANSI A118.3.

e. Shrinkage: 0.25% maximum, when tested in accordance with ANSI A118.3.

f. Sag Resistance: No shape change, when tested in accordance with ANSI A118.3.

2.05 GROUT

A. Grout Colors: As indicated on Finish Listing.

B. Water-Cleanable Epoxy Grout: ANSI A118.3.

1. Basis-of-Design Product: The design for water-cleanable epoxy grout is based on "SpectraLOCK PRO Grout" manufactured by Laticrete International, Inc. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Boiardi Products Corporation.

b. Bonsal American; an Oldcastle Company.

c. Bostik, Inc..

d. Custom Building Products.

e. MAPEI Corporation.

f. Mer-Kote Products, Inc.

g. Summitville Tiles, Inc.

h. TEC Specialty Construction Brands; H. B. Fuller Company.

2. Performance Properties: Provide grout with the following performance requirements:
   a. Compressive Strength (7 days): 3,500 psi minimum.
   b. Tensile Strength (7 days): 1,100 psi minimum.
   c. Shrinkage: 0.25% maximum.
   d. Water Absorption: 0.50% maximum.
3. Working Properties: Provide grout with the following minimum working properties:
   a. Working Time: 80 minutes minimum at 70 degrees F.
   b. Time to Dirt and Stain Resistance: 7 days maximum.
   c. Time to Heavy Foot Traffic: 24 hours maximum.
   d. Time to Full Cure: 14 days maximum.

2.06 CRACK ISOLATION WATERPROOF MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.10 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
1. Basis-of-Design Product: The design for fluid-applied membrane is based on "Hydro Ban" manufactured by Laticrete International, Inc. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Boiardi Products Corporation.
   b. Bonsal American; an Oldcastle Company.
   c. Bostik, Inc.
   d. Custom Building Products.
   e. MAPEI Corporation.
   f. Mer-Kote Products, Inc.
   g. Summitville Tiles, Inc.
   h. TEC; a subsidiary of H. B. Fuller Company.
2. Performance Properties: Provide membrane with the following minimum performance requirements:
   a. Shear Strength (28-Day): 200 psi minimum, when tested in accordance with ANSI A118.10.
   b. Tensile Strength (7-Day): 250 psi minimum, when tested in accordance with ANSI A118.10.
   c. Water Immersion (7-Day): 95 psi minimum, when tested in accordance with ANSI A118.10.
   d. Shear Bond (7-Day): 200 psi minimum, when tested in accordance with ANSI A118.10.

e. Hydrostatic Test (7-Day): Pass, when tested in accordance with ANSI A118.10.

f. System Crack Resistance Test: Pass, when tested in accordance with ANSI A118.12.5-4.

g. Water Vapor Transmission: 0.515 grains/h*ft^2, when tested in accordance with ASTM 96, Procedure B.

h. Water Vapor Performance: 1.247 perms, when tested in accordance with ASTM 96, Procedure B.

i. Performance Rating: Product shall comply with "Extra Heavy" rating based on results from testing in accordance with ASTM C 627, "Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson Type Floor Tester".

2.07 ACCESSORIES

A. Temporary Spacers: Resilient plastic, nonstaining to stone, sized to suit joint thickness.

B. Metal Edge Strips: Provide accessories of profiles and dimensions indicated on Drawings. The design is based on the products listed on Finish Listing. Subject to compliance with requirements, provide either the named product or a comparable product by another approved manufacturer.

C. Cleaner: Stone cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer and, if a sealer is specified, by sealer manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

D. Floor Sealer: Colorless, slip- and stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Bostik Findley Inc.

b. Custom Building Products.

c. Hillyard, Inc.

d. HMK Stone Care System.

e. Miracle Sealants Company.

f. Stonecare International.

g. Summitville Tiles, Inc.

E. Movement Control Joints: Provide control joints fabricated of perforated polyvinyl chloride (PVC) anchoring legs and chlorinated polyethylene (CPE) movement zone. Visible movement zone profile shall be 3/16" wide. The design for the floor control joints is based on "DILEX-BWS 125 PG" manufactured by Schluter. Subject to compliance with requirements, provide either the named product or a comparable product by another approved manufacturer.

2.08 MORTAR AND GROUT MIXES

A. Mortar: Comply with referenced standards and with manufacturers' written instructions for mixing requirements needed to produce mortar of uniform quality and with optimum performance characteristics.

B. Joint Grout: Comply with mixing requirements in referenced ANSI standards and with manufacturer's written instructions.

2.09 STONE FABRICATION

A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.

B. Fabricate stone to comply with requirements indicated and with the following references:

1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."

C. Cut stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and Shop Drawings.

1. Dress joints straight and at right angle to face, unless otherwise indicated.

2. Provide smooth, accurate curves where stone is cut at column covers and similar radiused terminations.

D. Fabrication Tolerances:

1. Variation in Thickness: Do not vary thickness more than 1/32 inch.

2. Variation in Width: Do not vary width (both sides) more than 1/32 inch.

3. Size and Squareness: Plus or minus 1/32 inch of required size, with a squareness tolerance of plus or minus 1/32 inch, unless tolerances are otherwise indicated.

E. Finish exposed faces and edges of stone to comply with requirements indicated for finish of each type of stone required and to match approved Samples and mockups.

F. Pattern Arrangement: Fabricate and arrange stone units with veining and other natural markings to comply with the following requirements:

1. Cut stone from one block or contiguous, matched blocks in which natural markings occur.

2. Arrange units with veining quarter turned from tile to tile, unless otherwise indicated on Drawings.

G. Fabricate stone thresholds in sizes and profiles as indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges of thresholds at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

H. Fabricate stone stair treads in sizes and profiles indicated. Rout grooves into treads to receive abrasive strips and install strips to comply with manufacturer's written directions.

I. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units. Clean sawed backs of stones to remove rust stains and iron particles.

1. Grade and select stone for overall uniform appearance when assembled in place.
2. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved Samples and mockups.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces indicated to receive stone, with Installer present, for compliance with requirements and other conditions affecting performance.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone flooring.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Vacuum clean concrete substrates to remove dirt, dust, debris, and loose particles.

B. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

C. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.03 STONE FLOORING FIELD LAYOUT

A. Joints: 3/32-inch-wide grouted joints.

B. Pattern Arrangement: Fabricate and arrange panels with veining and other natural markings as indicated on Drawings and with veining quarter turned from tile to tile.

3.04 INSTALLATION, GENERAL

A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods and apply to types of setting and grouting materials used. Follow procedures in the ANSI A108 Series of tile installation standards for providing 100 percent mortar coverage:

B. Do necessary field cutting as stone is set. Cut lines straight and true and finish field-cut edges to match shop-cut edges.

1. Use power saws with diamond blades to cut stone.

C. Set stone to comply with Drawings and Shop Drawings. Match stone for color and pattern as indicated on Shop Drawings.

D. Scribe and field-cut stone as necessary to fit at obstructions. Produce neat joints of size to match grout joints.

E. Expansion- and Control-Joint Installation: Locate and install according to general guidelines indicated on Drawings to coordinate with joint patterns and according to approved Shop Drawings.

1. Locate interior joints no greater than 25 feet apart in each direction, except locate interior joints subject to direct sunlight no greater than 12 feet apart in each direction.
2. Where expansion joints occur in concrete substrates, locate joints in stone surfaces directly above them.
3. Unless otherwise indicated, provide expansion- and control-joints as part of the stone flooring pattern. Do not cut stone tile to form expansion- and control-joints.

3.05 INSTALLATION TOLERANCES

A. Variation in Line: For positions shown in plan for edges of paving, flooring, ramps, steps, changes in color or finish, and continuous joint lines, do not exceed 1/8 inch in 96 inches, 1/4 inch in 20 feet, or 3/8 inch maximum.

B. Variation in Joint Width: Do not vary joint thickness more than 1/16 inch or 1/4 of nominal joint width, whichever is less. In addition to stone to stone joints this criteria shall apply to joints between stone and other materials.

C. Variation in Surface Plane: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum from level or slope indicated.

D. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/32-inch difference between planes of adjacent units.

3.06 CRACK ISOLATION WATERPROOF MEMBRANE INSTALLATION

A. Place crack isolation waterproof membrane over substrates indicated to receive stone.

B. Install crack isolation waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

C. Do not install tile or setting materials over crack isolation waterproof membrane until membrane has cured.

3.07 INSTALLATION OF STONE OVER CRACK ISOLATION WATERPROOF MEMBRANE

A. Place mortar bed over crack isolation waterproof membrane. Spread with 1/2 inch by 1/2 inch tile trowel, tamp, and screed to level surface at elevations required for setting stone to finished elevations indicated.

B. Mix and place only that amount of mortar bed that can be covered with stone before initial set. Cut back, bevel edge, and discard material that has reached initial set before stone can be placed.

C. Where stone flooring terminates at temporary partitions, install a steel angle to contain edge of mortar bed.

D. Place stone before initial set of mortar occurs. Immediately before placing stone on setting bed, apply uniform 1/16-inch-thick bond coat to bed or to back of each stone unit, providing 100 percent coverage.

E. Tamp and beat stone with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each unit in a single operation before initial set of mortar; do not return to areas already set and disturb stone for purposes of realigning finished surfaces or adjusting joints.

F. Rake out joints to depth required to receive grout as units are set.

3.08 STONE THRESHOLD INSTALLATION

A. At locations adjacent to stone flooring, install stone thresholds in same type of setting bed as abutting stone flooring unless otherwise indicated.

1. Set thresholds in thin-set, latex-portland cement mortar to comply with ANSI A108.5 at locations where mortar bed would otherwise be exposed above other adjacent paving and flooring.

B. At locations not adjacent to stone flooring, install stone thresholds in thin-set, latex-portland cement mortar to comply with ANSI A108.5.

3.09 STONE STAIR TREAD AND RISER INSTALLATION

A. Install stone stair treads and risers in flexible setting compound over crack isolation membrane to comply with ANSI A108.4 and ANSI A108.6 and manufacturer's written instructions.

3.10 GROUTING

A. Grout stone joints with water-cleanable epoxy grout to comply with ANSI A108.10 and with manufacturer's written instructions.

1. Do not use sanded grout for polished stone.

2. Grout joints as soon as possible after initial set of setting bed. Force grout into joints, taking care not to smear grout on adjoining stone and other surfaces. After initial set of grout, finish joints by tooling to produce a slightly concave polished joint, free of drying cracks.

3. Cure grout as recommended by manufacturer.

3.11 ADJUSTING AND CLEANING

A. Remove and replace stonework of the following description:

1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Design Consultant.

2. Defective joints.

3. Stone paving, flooring, and joints not matching approved Samples and mockups.

4. Stonework not complying with other requirements indicated.

B. Replace in a manner that results in stonework matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stonework as work progresses. Remove mortar fins and smears before tooling joints.

D. Clean stonework after setting and grouting are complete. Use procedures recommended by stone fabricator for types of application.

E. Apply sealer to cleaned stonework according to sealer manufacturer's written instructions.

3.12 PROTECTION

A. Allow stone installation to cure for a minimum of 7 days and prohibit traffic from installed stone during curing period.

B. After curing period, protect installed stonework during construction with nonstaining kraft paper. Where adjoining areas require construction work access, cover stonework with a minimum of 3/4-inch untreated plywood or oriented strand board over nonstaining kraft paper.

3.13 STONE FLOOR INSTALLATION SCHEDULE

A. Interior Concrete Subfloor; TCNA F115.

1. Tile Type: As indicated on "Finish Listing".
2. Membrane: Crack isolation waterproof membrane.
3. Thin Set Mortar: Latex-portland cement mortar, 1/4” thick.
4. Grout: Water cleanable epoxy grout.

B. Interior Metal Stair Subfloor; TCNA F115.

1. Tile Type: As indicated on "Finish Listing".
2. Membrane: Crack isolation waterproof membrane.
3. Thin Set Mortar: High-bond adhesive, flexible setting bed, 1/16 to 1/8 thick, nominal.
4. Grout: Water cleanable epoxy grout.

C. Interior Plywood Subfloor at Elevator; TCNA F115.

1. Tile Type: As indicated on "Finish Listing".
2. Membrane: Crack isolation waterproof membrane.
3. Thin Set Mortar: High-bond adhesive, flexible setting bed, 1/16 to 1/8 thick, nominal.
4. Grout: Water cleanable epoxy grout.

END OF SECTION 096340

SECTION 096513

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes:

1. Resilient base.

2. Resilient molding accessories.

B. Related Sections include:

1. Division 9 Section "Carpeting" for carpet floor tile.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

C. Product Schedule: For resilient products. Use same designations indicated on Drawings**.**

1.04 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.06 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.

2. During installation.

3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.07 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 800 linear feet, of each type, color, pattern, and size of resilient product installed (to the nearest full standard length)..

PART 2 - PRODUCTS

2.01 RESILIENT BASE

A. Basis-of-Design: The design is based on "Traditional Rubber Wall Base" manufactured by Johnsonite, Inc. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers.

1. Armstrong World Industries, Inc.
2. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
3. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
4. Roppe Corporation, USA.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TS (rubber, vulcanized thermoset).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Cove (base with toe).

C. Minimum Thickness: 0.125 inch.

D. Height: 6 inches, unless otherwise indicated.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Preformed.

H. Colors and Patterns: As indicated on Finish Listing.

2.02 RESILIENT MOLDING ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
2. Flexco, Inc.
3. Johnsonite.
4. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
5. R.C.A. Rubber Company (The).
6. Roppe Corporation, USA.

B. Descriptions: Carpet tile to sealed concrete, static-control resilient flooring to sealed concrete, rubber tile to sealed concrete, carpet to linoleum flooring, linoleum flooring to sealed concrete, and walk-off carpet to sealed concrete.

C. Material: Rubber.

D. Profiles and Dimensions: Similar to type DPT-XX-B by Johnsonite, unless otherwise indicated on Drawings.

E. Colors and Patterns: As indicated Sheet I0.0.2.

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Cove Base Adhesives: Not more than 50 g/L.

b. Rubber Floor Adhesives: Not more than 60 g/L.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances by the manufacturer and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.

4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.03 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.04 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

C. Resilient Stair Accessories:

1. Use filler recommended by resilient stair accessory manufacturer to fill nosing substrates that do not conform to tread contours.

2. Tightly adhere to substrates throughout length of each piece.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 096800

CARPETING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes modular, tufted carpet tile.

B. Related Sections include the following:

1. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.03 PRE-SELECTION SUBMITTALS

A. Testing Samples: Submit five (5) samples of each type of carpet tile, except for CP-07, complying with specification requirements and being offered for consideration for use on the project. Samples shall represent same construction type as those to be used for the project, meeting all product specifications and performance characteristics, but do not need to be the exact pattern or color selected. Samples will be tested for compliance with specifications. Failure of any test will result in the product being dropped from consideration. Testing will include, but is not necessarily limited to, the following:

1. Cleaning and Dirt Retention.
2. Darkening and color and pattern retention.
3. Delamination.
4. Dimensional Stability.
5. Zippering, Fraying, and Edge Raveling.
6. Wear.
7. Matting, Crushing, and Watermarking.
8. Tuft Bind.

B. Color and Pattern Development Samples and Submittals (for all carpets except CP-07):

1. The Contractor shall be required to work with the Owner's Representative and Design Consultant in developing unique pattern and color samples for consideration.
2. Based on color and pattern guidelines in the product specifications and working in conjunction with the Design Consultant, Contractor shall prepare samples, strikeoffs, digital images, computer-generated room scenes, and other sample information as required to determine final colors and patterns to be used in the Project.
3. Copyright ownership of any pattern or design developed for the Project shall be transferred by the manufacturer and/or Contractor, to the Owner of the project.

1.04 CONSTRUCTION SUBMITALLS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.

2. Carpet tile type, color, and dye lot.

3. Type of subfloor.

4. Type of installation.

5. Pattern of installation.

6. Pattern type, location, and direction.

7. Pile direction.

8. Type, color, and location of insets and borders.

9. Type, color, and location of edge, transition, and other accessory strips.

10. Transition details to other flooring materials.

C. Verification Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.

2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch-long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

E. Qualification Data: For Installer. Include specified certifications.

F. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.

2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

G. Warranty: Special warranty specified in this Section.

H. Meeting Records: Minutes of pre-installation conference.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements. Installer shall have not less than 5 consecutive years of successful experience similar to work of this Section and shall be recommended, trained, and approved by the carpet manufacturer. Submit letter from carpet manufacturer stating certification qualifications and acceptance.

B. Manufacturer's Qualifications: Firm with not less than 5 consecutive years of production experience with carpet similar to type specified in this section, whose published product literature clearly indicates compliance of products with requirements of this section.

C. Fire-Test-Response Characteristics: Provide products with the fire test response characteristics indicated in Part 2, as determined by testing identical products by an independent NVLAP acceptable to authorities having jurisdiction.

D. Mockups: Before installing carpet tile, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Mockup is not required for CP-07.

1. Construct a minimum size mock-up of 40 square yards in an area designated by the Design Consultant, with an expansion joint, tile transition, base condition, and column cover interface of both hard backed carpet tile and cushion backed carpet tile.

2. In installation of mock-up, include transition from carpet level to level of adjacent stone tile, using leveling and patching compound transitioning from featheredge to required height.

3. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

E. Pre-Installation Conference: Conduct conference at Project site. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

1. Review delivery, storage, and handling procedures.

2. Review ambient conditions and ventilation procedures.

F. Measurement Verification:

1. Dimensions shown on Drawings are approximate. It is the Contractor's responsibility to verify all dimensions and job site conditions and to order sufficient yardage to fully carpet areas as indicated and in the patterns and colors selected. No substitutions will be permitted to make up for any shortage of material in carpet to be installed or in attic stock.

2. Contractor shall be totally responsible for the accuracy of measurements for total yardage, individual floor yardage, dye lot yardage requirements, extra yardage for pattern match, and yardage required for attic stock. No additional compensation will be allowed for shortage of materials.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling".

1.07 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation".

B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.08 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. High traffic levels experienced at the airport does not constitute "unusual traffic" for warranty purposes.

2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, floor compatibility, color and color pattern loss, reduction of antimicrobial protection, loss of fire-resistance characteristics, moisture resistance, and delamination.

3. Warranty shall cover all costs incidental to corrective actions as may be necessary to correct the defect, including demolition for access, removal, disassembly, transportation, reinstallation, reconstruction, retesting, and reinspection. Warranty shall cover demonstrating that the previously defective work conforms to the requirements of the contract.

4. Warranty Period: 10 years from date of Substantial Completion, except carpet tile shall have a Lifetime Warranty applying to wear, edge ravel, zippering, staining and soiling, color and color pattern loss, tuft bind, floor compatibility, static discharge, anti-microbial protection, cushion resiliency, dimensional stability, floor release, moisture resistance, and backing delamination.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. <u>Carpet Tile: One (1) pallet of full-size units of each batch run by the mill, including a key plan indicating placement location of each mill run.</u>

PART 2 - PRODUCTS

2.01 CARPET TILE

A. Basis-of-Design: Refer to section "Finish Legend" for types, colors, patterns and manufacturers. Carpet must match existing carpet tile in specifications and performance.

2.02 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer. Compound shall be capable of providing thickness from featheredge up to 1.5 inches, as indicated on Drawings.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

2.03 MAINTENANCE SUPPLIES

A. Provide introductory kit that includes the manufacturer's recommended maintenance products and supplies for the selected carpet. Kit shall be provided with carpet delivery.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.

2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.

3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

C. Use trowelable leveling and patching compounds for featheredges at flooring transitions as indicated on Drawings.

D. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using

solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

E. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

F. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.03 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules", and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.04 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.

2. Remove yarns that protrude from carpet tile surface.

3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

3.05 DEMONSTRATION AND TRAINING

A. Instruct Owner's personnel on cleaning and maintaining the carpet tile once installed. Comply with requirements of Section 01770 "Closeout Procedures".

END OF SECTION 096800

SECTION 099113

EXTERIOR PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Steel, except where high-performance coating is indicated.

B. Related Sections include the following:

1. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.

2. Division 9 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.

2. Step coats on Samples to show each coat required for system.

3. Label each coat of each Sample.

4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system, color definitions, and locations of application areas. Use same designations indicated on Drawings and in schedules.

2. Provide an additional copy of product list for inclusion in maintenance manuals.

1.04 QUALITY ASSURANCE

A. MPI Standards:

1. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Design Consultant will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.

b. Other Items: Design Consultant will designate items or areas required.

2. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Design Consultant at no added cost to Owner.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.06 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.07 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Provide coating manufacturer's adhesion/corrosion, color and gloss retention warranty for labor and materials. Warranty period shall be 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Products: The design is based on the products listed. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers:

1. Benjamin Moore & Co.

2. PPG Architectural Finishes, Inc.

3. Sherwin-Williams Company (The).

2.02 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As indicated in the Finish Listing.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.

2. Masonry (Clay and CMU): 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.04 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner may engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.

2. Testing agency will perform tests for compliance of paint materials with product requirements.

3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Design Consultant, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 EXTERIOR PAINTING SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

1. Semigloss Acrylic-Enamel Finish:

a. Primer: Pittsburgh® Paints; 90-712 Series Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel (123 g/L VOC compliant as anti-corrosive product). Apply at a dry film thickness of not less than 2.0 mils.

b. Intermediate: Pittsburgh® Paints; 6-900 Series SpeedHide® Exterior House and Trim Semi-gloss Acrylic Latex (131 g/L VOC). Apply at a dry film thickness of not less than 0.9 mils.

c. Finish Coat: Pittsburgh® Paints; 6-900 Series SpeedHide® Exterior House and Trim Semi-gloss Acrylic Latex (131 g/L VOC). Apply at a dry film thickness of not less than 0.9 mils.

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces, except for structural steel under canopies:

1. Semigloss Acrylic-Enamel Finish:

a. Primer: Pittsburgh® Paints; 90-712 Series Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel (123 g/L VOC compliant as anti-corrosive product). Apply at a dry film thickness of not less than 2.0 mils.

b. Intermediate: Pittsburgh® Paints; 6-900 Series SpeedHide® Exterior House and Trim Semi-gloss Acrylic Latex (131 g/L VOC). Apply at a dry film thickness of not less than 0.9 mils.

c. Finish Coat: Pittsburgh® Paints; 6-900 Series SpeedHide® Exterior House and Trim Semi-gloss Acrylic Latex (131 g/L VOC). Apply at a dry film thickness of not less than 0.9 mils.

END OF SECTION 099113

SECTION 099123

INTERIOR PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Concrete masonry units (CMU).
3. Steel.
4. Galvanized metal.
5. Gypsum board.

B. Related Sections include the following:

1. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.
2. Division 9 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.03 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For sealed floor surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system, color definitions, and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Provide an additional copy of product list for inclusion in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Design Consultant will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.

b. Other Items: Design Consultant will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.

3. Final approval of color selections will be based on benchmark samples.

4. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Design Consultant at no added cost to Owner.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.07 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.08 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish one (1) additional 5 gallon bucket of each material and color applied.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Products: The design is based on the products listed. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers:

1. Benjamin Moore & Co.

2. PPG Architectural Finishes, Inc.

3. Porter Paints.

4. Sherwin-Williams Company (The).

5. Scuffmaster
6. ICI Paints.
7. Master Coatings Technology

2.02 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.

C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:
3. Acrolein.
   a. Acrylonitrile.
   b. Antimony.
   c. Benzene.
   d. Butyl benzyl phthalate.
   e. Cadmium.
   f. Di (2-ethylhexyl) phthalate.
   g. Di-n-butyl phthalate.
   h. Di-n-octyl phthalate.
   i. 1,2-dichlorobenzene.
   j. Diethyl phthalate.

k. Dimethyl phthalate.

l. Ethylbenzene.

m. Formaldehyde.

n. Hexavalent chromium.

o. Isophorone.

p. Lead.

q. Mercury.

r. Methyl ethyl ketone.

s. Methyl isobutyl ketone.

t. Methylene chloride.

u. Naphthalene.

v. Toluene (methylbenzene).

w. 1,1,1-trichloroethane.

x. Vinyl chloride.

D. Colors: As indicated on Finish Listing, or if not indicated, as selected by Design Consultant from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.

2. Masonry (Clay and CMU): 12 percent.

3. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.

b. Uninsulated plastic piping.

c. Pipe hangers and supports.

d. Tanks that do not have factory-applied final finishes.

e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.

f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

a. Switchgear.

b. Panelboards.

c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

F. Paint exposed surfaces, except where Drawings or these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. Refer to Finish Listing for specific paint colors. If a color of finish is not indicated, Design Consultant will select from full range of standard colors and finishes available.

G. Painting shall include identification of fire and smoke partitions. All smokestop partitions and fire-rated walls or partitions required to have protected openings shall be effectively and permanently identified with signs or stenciling in a manner acceptable to the authority having jurisdiction. Such identification shall be above any decorative ceiling and in concealed spaces. Unless otherwise directed by authority having jurisdiction, wording shall read "Fire and Smoke Barrier - Protect all Openings".

H. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels, unless otherwise indicated.

1. Prefinished items include the following factory-finished components:

a. Toilet enclosures.

b. Elevator entrance doors and frames.

c. Elevator equipment.

d. Finished mechanical and electrical equipment, except paint exposed equipment in ceiling areas of exposed structure.

e. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Furred areas.

b. Ceiling plenums.

c. Utility tunnels.

d. Pipe spaces.

e. Duct shafts.

f. Elevator shafts.

3. Finished metal surfaces include the following:

a. Anodized aluminum.

b. Stainless steel.

c. Chromium plate.

d. Copper and copper alloys.

e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.

b. Linkages.

c. Sensing devices.

d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

3.04 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner's Representative deems necessary during the period when paints are being applied:

1. Owner may engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.

2. Testing agency will perform tests for compliance with product requirements.

3. Owner's Representative may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Design Consultant, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 INTERIOR PAINTING SCHEDULE

A. Concrete (Other Than Concrete Unit Masonry and Floor Surfaces): Provide the following paint systems over interior concrete and brick masonry substrates

1. Semigloss Acrylic-Enamel Finish:

a. Primer: Pittsburgh® Paints; 4-603 Perma-Crete® Int/Ext Alkali Resistant Primer (99 g/L VOC). Apply at a dry film thickness of not less than 1.2 mils.

b. Intermediate: Pittsburgh® Paints; 6-500 Series SpeedHide® Interior Semi-gloss Acrylic Latex (90 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils.

c. Finish Coat: Pittsburgh® Paints; 6-500 Series SpeedHide® Interior Semi-gloss Acrylic Latex (90 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils

B. Concrete Masonry Unit: Provide the following finish systems over interior concrete masonry:

1. Satin Acrylic Enamel Finish:

a. Primer: Pittsburgh® Paints; 6-7 SpeedHide® Int/Ext Masonry Block Filler Latex (14.00 g/L VOC). Apply at a dry film thickness of not less than 5.1 mils.

b. Intermediate: Pittsburgh® Paints; 6-3511 Series SpeedHide® Interior Satin Acrylic Latex (46 g/L VOC). Apply at a dry film thickness of not less than 1.3 mils.

c. Finish Coat: Pittsburgh® Paints; 6-3511 Series SpeedHide® Interior Satin Acrylic Latex (46 g/L VOC). Apply at a dry film thickness of not less than 1.3 mils.

2. Semi-Gloss Acrylic-Enamel Finish:

a. Primer: Pittsburgh® Paints; 6-7 SpeedHide® Int/Ext Masonry Block Filler Latex (14.00 g/L VOC). Apply at a dry film thickness of not less than 5.1 mils.

b. Intermediate: Pittsburgh® Paints; 6-500 Series SpeedHide® Interior Semi-gloss Acrylic Latex (90 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils.

c. Finish Coat: Pittsburgh® Paints; 6-500 Series SpeedHide® Interior Semi-gloss Acrylic Latex (90 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils

3. Scrub-Resistant Finish where Paint PW-07 is Scheduled: Provide the following finish systems over interior concrete masonry units:

   a. Primer: 100% latex acrylic block filler acceptable to manufacturer of Finish Coats.

   b. Intermediate and Finish Coat: Master Coating Technologies; Scuffmaster ScrubTough Performance Panint with Microban. Apply two coats at the rate recommended by manufacturer to achieve a uniform finish. Apply subsequent coats perpendicular to previous coat.

C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Satin Acrylic Enamel Finish (PW-01 and PW-17):

   a. Primer: Pittsburgh® Paints; 6-2 SPEEDHIDE® Interior Latex Sealer Quick-Drying (98.00 g/L VOC). Apply at a dry film thickness of not less than 1.0 mil.

   b. Intermediate: Pittsburgh® Paints; 6-3511 Series SpeedHide® Interior Satin Acrylic Latex (46 g/L VOC). Apply at a dry film thickness of not less than 1.3 mils.

   c. Finish Coat: Pittsburgh® Paints; 6-3511 Series SpeedHide® Interior Satin Acrylic Latex (46 g/L VOC). Apply at a dry film thickness of not less than 5.1 mils.

2. Semi-Gloss Acrylic-Enamel Finish (PW-05):

   a. Primer: Pittsburgh® Paints; 6-2 SpeedHide® Interior Latex Sealer Quick-Drying (98.00 g/L VOC). Apply at a dry film thickness of not less than 1.0 mil.

   b. Intermediate: Pittsburgh® Paints; 6-500 Series SpeedHide® Interior Semi-gloss Acrylic Latex (90 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils.

   c. Finish Coat: Pittsburgh® Paints; 6-500 Series SpeedHide® Interior Semi-gloss Acrylic Latex (90 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils

3. Flat Acrylic Latex Finish (PW-02, PW-03, and PW-15):

   a. Primer: Pittsburgh Paints; 9-900 Pure Performance Interior Latex Primer (0.0 g/L VOC). Apply at a dry film thickness of not less than 1.4 mils.

   b. Intermediate: Pittsburgh Paints; 9-100 Series Pure Performance Flat Interior Latex (0.0 g/L VOC). Apply at a dry film thickness of not less than 1.6 mils.

   c. Finish Coat: Pittsburgh Paints; 9-100 Series Pure Performance Flat Interior Latex (0.0 g/L VOC). Apply at a dry film thickness of not less than 1.6 mils.

4. Eggshell Acrylic Latex Finish (PW-06, PW-08, PW-10, PW-11, PW-12, PW-13, and PW-14):

   a. Primer: Pittsburgh Paints; 9-900 Pure Performance Interior Latex Primer (0.0 g/L VOC). Apply at a dry film thickness of not less than 1.4 mils.

b. Intermediate: Pittsburgh Paints; 9-300 Series Pure Performance Eggshell Interior Latex (0.0 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils.

c. Finish Coat: Pittsburgh Paints; 9-300 Series Pure Performance Eggshell Interior Latex (0.0 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils.

5. Semi-Gloss Acrylic Epoxy Finish (EP-03):

a. Primer: Pittsburgh® Paints; 6-2 SpeedHide® Interior Latex Sealer Quick-Drying (98.00 g/L VOC). Apply at a dry film thickness of not less than 1.0 mil.

b. Intermediate: Pittsburgh Paints: 16-551 / 16-599 Series Pitt-Glaze WB Water Borne Acrylic Epoxy (148 g/L VOC); Apply at a dry film thickness of not less than 2.0 mils.

c. Finish Coat: Pittsburgh Paints: 16-551 / 16-599 Series Pitt-Glaze WB Water Borne Acrylic Epoxy (148 g/L VOC); Apply at a dry film thickness of not less than 2.0 mils.

6. Scrub-Resistant Finish where Paint PW-07 is Scheduled: Provide the following finish systems over interior gypsum board.

a. Primer: Master Coating Technologies; Scuffmaster Primemaster Primer/Sealer.

b. Intermediate and Finish Coats: Master Coating Technologies; Scuffmaster ScrubTough Performance Paint with Microban. Apply two coats at the rate recommended by manufacturer to achieve a uniform finish. Apply subsequent coats perpendicular to previous coat.

7. Eggshell Epoxy Non-Waterborne Finish (EP-04):

a. Primer: Pittsburgh Paints 17-921 Seal Grip 100% Acrylic Universal Primer Sealer.

b. Intermediate Coat: Amerlock 2 VOC Epoxy. Apply at a dry film thickness of 4.0 to 8.0 mils.

c. Finish Coat: Amerlock 2 VOC Epoxy. Apply at a dry film thickness of 4.0 to 8.0 mils.

D. Ferrous Metal (PM-01 and PM-02): Provide the following finish systems over ferrous metal:

1. Semigloss Acrylic-Enamel Finish:

a. Primer: Pittsburgh® Paints; 90-712 Series Pitt-Tech Int/Ext Industrial DTM PrimerlFinish Enamel (123 g/L VOC compliant as anticorrosive product). Apply at a dry film thickness of not less than 2.0 mils.

b. Intermediate: Pittsburgh® Paints; 6-500 Series SpeedHide® Interior Semi-gloss Acrylic Latex (90 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils.

c. Finish Coat: Pittsburgh® Paints; 6-500 Series SpeedHide® Interior Semigloss Acrylic Latex (90 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils.

2. Water-Base Metallic Finish Polyurethane where Paint PM-04 is Scheduled:

   a. Primer: Master Coating Technologies; Scuffmaster Primer/Sealer, or other product recommended by manufacturer for substrate and finish system.

   b. Intermediate and Finish Coats: Master Coating Technologies; Solid Metal Paint. Apply two coats at the rate recommended by manufacturer to achieve a uniform finish. Apply subsequent coats perpendicular to previous coat.

E. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:

1. Semigloss Acrylic-Enamel Finish:

   a. Primer: Pittsburgh® Paints; 90-712 Series Pitt-Tech Int/Ext Industrial DTM PrimerlFinish Enamel (123 g/L VOC compliant as anticorrosive product). Apply at a dry film thickness of not less than 2.0 mils.

   b. Intermediate: Pittsburgh® Paints; 6-500 Series SpeedHide® Interior Semi-gloss Acrylic Latex (90 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils.

   c. Finish Coat: Pittsburgh® Paints; 6-500 Series SpeedHide® Interior Semi-gloss Acrylic Latex (90 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils.

F. Concrete Floor Surfaces (SC-01): Provide the following finish systems over properly cured concrete where indicated:

1. First Coat: Sherwin-Williams; H&C Concrete Etching Solution. Apply at rate recommended by manufacturer for concrete substrate.

2. Finish Coats: Sherwin-Williams; H&C Silicone Acrylic Concrete Sealer. Apply a minimum of two coats at the rate recommended by manufacturer to achieve a uniform finish. Apply subsequent coats perpendicular to previous coat.

G. Wood: Provide the following finish system over interior wood to receive opaque finish:

1. Eggshell Acrylic Latex Finish:

   a. Primer: Pittsburgh Paints; 9-900 Pure Performance Interior Latex Primer (0.0 g/L VOC). Apply at a dry film thickness of not less than 1.4 mils.

   b. Intermediate: Pittsburgh Paints; 9-300 Series Pure Performance Eggshell Interior Latex (0.0 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils.

   c. Finish Coat: Pittsburgh Paints; 9-300 Series Pure Performance Eggshell Interior Latex (0.0 g/L VOC). Apply at a dry film thickness of not less than 1.5 mils.

END OF SECTION 099123

SECTION 101400

SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior custom fabricated architectural signage and graphics.

1.2 SUBMITTALS: The following outlines submittal requirements unique to this section of the work, especially shop drawing content and samples

A. After award of contract, but prior to the beginning of detailed shop drawings, submit drawings showing typical details of connections. The Contractor shall arrange to meet with Architect and Architect 's representative approximately one (1) week after submittal to review drawings and coordinate comments. The typical details as accepted shall be used to control detail design, shop drawing preparation and approval.

B. Shop drawings:

1. Submit complete shop drawings for manufactured and fabricated items. Indicate materials, layouts, sizes, methods, finishes, footings and anchorage devices, connections and other details of construction, as well as the relation to supporting and adjacent work where applicable. Exact identification of the paint or ink shall be noted on the shop drawings along with method of application. Create and confirm layout conditions not shown on the contract documents.
   a. Identify all pre-fabricated products proposed for use.
   b. Indicate manufacturer, brand name, quality and type paint for each surface to be finished.
   c. Submit complete shop drawings and erection drawings conforming to all current applicable industry standards and local codes. Preparation of shop drawings shall not be sublet without the written permission of Architect.

C. Details shown are for concept purposes only; the sign contractor shall submit drawings of sign connection details; drawings shall be stamped and computations shall be prepared by a registered professional engineer in the state of Georgia and shall cover all members, connections (welds, bolts, etc.) indicating such meets the design specifications for sign structures stress requirements and wind load deflection tolerances.

D. Samples: Submit two samples of each of the following, unless otherwise specified:

1. Aluminum extrusions, 12" long minimum, in sizes, profiles and finishes to be utilized in the assembly of sign units.
2. Finishes:
   a. Submit 4" x 4" samples of each finish specified. Submit five (5) of each finish.
   b. Surface-applied graphics shall be on actual substrate upon which they will appear.
   c. Hardware items: Submit samples of each type of anchor, insert or other fastener as requested by Architect.

E. Submit for review, approval and demonstration of representative craftsmanship ONE (1) complete sign unit of the each sign type.

Sign types shall be an actual sign unit which may be installed on the project site after approval or correction. One unit will be retained as a control sample.

F. Maintenance data: Submit maintenance recommendations and instructions for each material used as part of contract close-out. Include recommendations for cleaning procedures, intervals and touch-ups.

G. Scheduling: Submit the final schedule for construction of work and installation within ten (10) days of sample approvals. Indicate dates of completion for prototypical units for approval, dates of partial deliveries and total completion. Dates given shall be consistent with the time requirements submitted with the bid.

1.3 DELIVERY, STORAGE AND HANDLING

A. Maintain neat, clean conditions in all building areas; remove trash, rags and waste materials at end of each day's work. Protect the floor and wall surfaces of this space against damage or defacement.

B. Close any open containers at end of day's work. Leave no materials open.

C. Acrylic and other glazing materials or finish materials with or requiring protective wrapping shall only have this protection removed as required during fabrication and installation and once the area is clear of work or activities which might cause damage to the installed work. Care shall be taken in handling surfaces and products to prevent scratching, chipping, or cracking.

D. Store materials a minimum of 4" above ground on framework or blocking and cover with protective waterproof covering. Provide air circulation and ventilation. Store in dry, conditioned space.

1.4 QUALITY CRITERIA

A. Fabricators shall meet the following criteria:

1. Sign contractors and/or subcontractors shall have been regularly engaged in the manufacture, fabrication and installation of sign systems of comparable scope and quality for a minimum of five (5) years.
2. Sign contractors and/or subcontractors shall submit a minimum of five (5) references listing project type, scope of work, Architect and date of completion, Owner's address and telephone number.

1.5 JOB CONDITIONS

A. Environmental requirements:

1. Comply with manufacturer's recommendation regarding environmental conditions under which materials may be applied.
2. Apply no adhesive or coating materials in spaces where dust is being generated.

B. Coordination: Coordinate work with the work of other sections of the specifications to ensure that surfaces to receive signs are properly completed, inspected, and approved prior to commencement of work. Commencement of work in any space shall constitute acceptance by the Contractor of surfaces to receive identifying devices.

1.6 WARRANTIES

A. Warrant the joints in plastic constructions for a period of five (5) years from Date of Substantial Completion against failure or delamination.

B. Warrant vinyl film for a period of five (5) years from Date of Material Completion against delamination from the substrate.

C. Warrant raised letters for a period of five (5) years from Date of Material Completion against delamination from the substrate.

D. Paints or inks and finishes shall be guaranteed not to cause discoloration, deterioration, or delamination of any materials used in fabrication. Warrant paint finishes on metal and plastic materials for a period of five years from the date of Material completion.

E. Warranty Provisions: During the warranty period, restore defective work to the standard of the contract documents without cost to the Using Agency, including all labor, materials, refinishing and all costs incidental to the work.

F. Warrant all electrical components and signs for a period of at least one year, parts and labor, or greater if stipulated elsewhere in the specification section for electrical work.

1.7 GRAPHICS, ARTWORK AND ELECTRONIC FILES:

A. The Architect or their consultants shall only furnish artwork in an electronic form if it already exists or was created in that form during the course of designing the project. Formats for graphic designs shall be in that of its original creation and may be manual or photo-mechanical or electronic/digital, and if digital, are likely to have been prepared in graphic design industry standard computer software on Macintosh™ platform computer hardware. Contract document drawings or layouts for the work shall not be transferred or transmitted to the contractor.

PART 2 - PRODUCTS

2.1 CUSTOM SIGNAGE

A. Provide architectural quality custom signage fabricated per design intent drawings AG201-AG202. Signs shall reflect a high level of finish and be fabricated with sufficient internal structure to prevent "oil-canning" of surfaces.

2.3 ACCESSORIES:

A. Anchors and fasteners:

1. Anchors, inserts or fasteners shall be compatible with sign materials, shall not result in galvanic action or chemical interaction of adhesives and shall have demonstrable and sufficient strength for intended use.
2. Anchors and fastenings for aluminum shall be stainless steel, zinc or cadmium coated steel. Anchors and fasteners shall be concealed where possible. Indicate locations on shop drawings.
3. Anchors and fastenings for exterior use shall be galvanized steel in accordance with ASTM A153-82.
4. Wherever possible, anchors to concrete and masonry shall be cast-in-place. Use expansion shields where anchors cannot be located before concrete is poured.
5. Fasteners to solid masonry and concrete shall be one of the following:
   a. flat-head drop-in expansion bolts.
   b. Powder-actuated fasteners; appropriate size drive pin for concrete and for masonry.
   c. Fasteners to cells of hollow masonry shall be drive pins of the appropriate size.
   d. Fasteners to roll or formed steel members shall be powder-actuated fasteners of the appropriate size.
   e. Fasteners to metal deck shall be self-drilling, self-tapping screws.
   f. Expansion shields shall be machine bolt type, tubular type, or self-drilling tubular type.
6. Anchor bolts for wood blocking to concrete and masonry shall be the appropriate size steel for masonry, unless otherwise noted, and installed with washer and nut at both ends.
7. Anchor bolts for wood blocking to steel members shall be appropriate size steel and installed with washer and nut.
8. Install using miscellaneous anchors and fasteners as required to secure work in place.

2.4 COATINGS (PAINTS):

A. Refer to manufacturers standards for paint finishes and preparation.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspection of substrates:

1. Surfaces to receive identifying devices shall be free from defects and imperfections that would prevent an acceptable installation.
2. Commencing of work in any space shall constitute acceptance by the Contractor of surfaces to receive identifying devices as being in a satisfactory condition to permit an acceptable installation. If the Contractor's inspection of such surfaces discloses unsatisfactory conditions, he shall notify the Architect in writing and await further instruction; otherwise, no claims will be considered for unsatisfactory work due to real or alleged faulty surfaces.

3.2 PREPARATION AND PROTECTION:

A. Protect the work and adjacent work and materials against damage during progress of work until completion. Drop cloths of paper or plastic shall be used around all areas where paint is being applied and appropriate precautions shall be taken to prevent overspray, hazardous conditions or damage to adjacent work.

3.3 INSTALLATION, APPLICATION:

A. Installation of sign panels and graphic units:

1. Erect, mount or install all panels and units to be level, plumb and true.
2. Use sufficient concealed fasteners and anchors to hold sign panels and graphic units in place. Use only concealed shims. Visible fasteners may only be used where approved in shop drawings or as part of an intentional design detail.
3. Make Architect aware of conflicts in sign locations as shown in the drawings.
4. Mount all room identification sign panels at 60" AFF to centerline of sign and 2" from latch-side door jamb.

3.4 ADJUSTING, CLEANING AND PROTECTION:

A. Remove and replace damaged identifying devices with new identifying devices free of defects.

B. Clean exposed surfaces promptly after completion of installation in accordance with recommendations of manufacturer.

C. Clean exposed metal work with cleanser recommended by manufacturer of materials and rinse with clean water. Do not use harsh chemicals or abrasive. Surfaces with stains which cannot be removed by cleaning shall be refined or replaced to the satisfaction of Architect at no extra cost to Using Agency.

D. Signs shall be free of tape, packing paper, dirt, smudges, and other foreign material.

E. Spatters, drippings, smears, and / or spray shall be completely removed.

F. Plastic surfaces shall be cleaned upon completion in accordance with manufacturer's instructions. Supply one pint of manufacturer's recommended cleaner for Using Agency's use.

G. Touch up work after installation shall be performed by the sign manufacturer and approved by Architect.

H. Protection:

1. Work in progress shall be protected at all times from staining, scratching, chipping or other damage until acceptance by the Architect.
2. Provide final protection in a manner acceptable to the fabricator and installer until Date of Substantial Completion.

3.5 SIGN QUANTITIES AND UNIT PRICING

A. Provide ITEMIZED bid including sign unit prices, shipping, delivery, installation, etc.

B. Provide unit costs good for up to 1 year in the event or additions or re-orders:

3.6 SIGN LOCATIONS AND MESSAGES:

A. Refer to sheets AG100 – AG102 for Sign Location Plans. Corresponding sign messages are listed on the plans and typical layouts are provided in the drawings.

B. Refer to sheets AG201-AG202 for typical sign face layouts, materials, fabrication notes and installation conditions.

SECTION 102800

TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Toilet And Bath accessories.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.
2. Identify products using designations indicated on Drawings.

D. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Design Consultant.

1.05 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.06 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Steel Sheet: ASTM A 1008, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.

C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

D. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

E. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

F. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.02 TOILET AND BATH ACCESSORIES

A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. American Specialties, Inc.

2. Bobrick Washroom Equipment, Inc.

3. Bradley Corporation.

4. General Accessory Manufacturing Co. (GAMCO).

B. <u>Paper Towel Dispenser</u>

1. Owner-supplied dispenser unit in Contractor-provided custom fabricated stainless steel enclosure.

a. Refer to Drawings and Division 6 Section "Premium-Grade Airport Millwork" for enclosure details and specifications.

b. Provide tamper-proof latch and continuous piano hinge on enclosure.

c. Door shall have heavy-duty cam locks. Refer to Division 8 Section "Door Hardware".

2. Contractor shall install dispenser unit and coordinate location and stainless steel enclosure.

C. Waste Receptacle

1. Basis-of-Design Product: Model B-3644 by Bobrick.
2. Mounting: Recessed.
3. Size: 29-5/8" H x 17-3/16" W x 8-1/8" D.
4. Capacity: 12 gallon.
5. Material and Finish: Stainless steel, No. 4 finish (satin).
6. Liner: Reusable vinyl liner.
7. Lockset: Tumbler type for waste-receptacle.

D. Grab Bar

1. Basis-of-Design Product: Model B-6806.99 by Bobrick.
2. Mounting: Flanges with concealed fasteners.
3. Material and Finish: Stainless steel, 0.05 inches thick, with smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.
4. Size: Provide length as indicated on Drawing.

E. Coat Hook

1. Basis-of-Design Product: Model B-2116 by Bobrick.
2. Finish: Satin chrome.

F. Surface-Mounted Toilet Tissue Dispenser: Basis of Design Product Model B-2888

G. Mirror Unit:

1. Basis-of-Design Product: Model B-165 by Bobrick, with roll-formed channel frame.
2. Mirror: 1/4" thick float/plate glass, No. 1 mirror quality.
3. Dimensions: Sizes and locations as indicated on the Drawings.
4. Frame Finish: Type 430 stainless steel with bright polished finish, mitered corners.
5. Backing: Mirror back protected by 3/16" thick water-resistant, polyethylene padding. Galvanized steel back shall be attached to frame with concealed screws.
6. Mounting: secure mirror to concealed wall hanger with theft-resistant locking device.
7. Size: As indicated on Drawings.

H. Shower Curtain Rod:

1. Basis-of-Design Product: B-6107 by Bobrick.
2. Description: 1-inch OD; fabricated from nominal 0.0394-inch-thick (1 mm) stainless steel.
3. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
4. Finish: No. 4 (satin) stainless steel.

I. Shower Curtain Hooks:

1. Basis-of-Design Product: 204-1 by Bobrick.

2. Description: Type 304 stainless-steel, 0.09" diameter, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

J. Shower Curtain:

1. Basis-of-Design Product: 204 by Bobrick.
2. Size: Minimum 6 inches wider than opening by height indicated on drawings.
3. Material: Nylon-reinforced vinyl, minimum 10-oz. or 0.008-inch- thick vinyl, with integral antibacterial and flame-retardant agents, hemmed bottom and sides.
4. Color: White.
5. Grommets: Corrosion resistant at minimum 6 inches (152 mm) o.c. through top hem.

K. Surface-Mounted Soap Dispenser:

1. Basis-of-Design Product: B-4112 by Bobrick.
2. Description: Designed for dispensing commercially marketed all-purpose hand soaps.
3. Mounting: Horizontally oriented, surface mounted.
4. Capacity: 40 fluid ounces.
5. Materials: 18-8 S, type 304, 20 gauge (1.0 mm) stainless steel body with satin finish. Provide 22 gauge (0.8 mm) stainless steel back plate with 20 gauge (1.0 mm) stainless steel mounting bracket. Valve shall be black molded plastic push button, with head holding mushroom valve and stainless steel spring. Reservoir shall be antibacterial-soap-resistant plastic cylinder.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

L. Towel Pin: Basis of Design Product: B-677 by Bobrick.

M. Folding Shower Seat

1. Basis-of-Design Product: Model B-5181 by Bobrick.
2. Configuration: L-shaped seat, designed for wheelchair access.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction.
4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).

2.03 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Toilet Accessories attached to toilet partitions shall be through-bolted.

C. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.02 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10801

Prepared By	MCA
Checked By	JW

Issue History

Construction	18 Aug 08
Revision 1	12 Nov 09
Revision 2	10 Sept 10

SECTION 104413

FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes fire extinguisher cabinets for the following:

1. Portable fire extinguishers.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets, and for each type of extinguisher indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

1.04 QUALITY ASSURANCE

A. Pre-Installation Conference: Conduct conference at Project site. Review methods and procedures related to fire protection cabinets including, but not limited to, schedules and coordination requirements.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers".

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction

D. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.05 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hose valves indicated are accommodated.

C. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.06 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.

b. Faulty operation of valves or release levers.

C. Warranty Period: Six years from date of Substantial Completion

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B.

B. Stainless-Steel Sheet: ASTM A 666, Type 304.

C. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.02 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. J. L. Industries, Inc.; a division of Activar Construction Products Group.

b. Larsen's Manufacturing Company.

c. Potter Roemer LLC.

2. Valves: Manufacturer's standard.

3. Handles and Levers: Manufacturer's standard.

4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4A-80B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.03 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Design Consultant.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface. Orientation: Vertical.

2.04 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher or fire extinguisher and hose valve, as indicated on Drawings. Unless otherwise indicated, cabinets containing fire extinguisher and fire valve shall have the valve located above the extinguisher.

B. Basis-of-Design Product: The design for fire protection cabinets is based on "Architectural Series" by Larsen's Manufacturing Company. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following:

1. JL Industries, Inc.

2. Potter Roemer; Div. of Smith Industries, Inc.

C. Cabinet Construction: Nonrated or fire-rated, as indicated on Drawings.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.

2. Rating of cabinet shall match rating of adjacent wall construction.

D. Cabinet Material: Steel sheet, except stainless steel for exterior of cabinet exposed to view.

1. Shelf: Same metal and finish as cabinet.

E. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.

1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

F. Cabinet Trim Material: Stainless-steel sheet.

G. Door Material: Stainless-steel sheet.

H. Door Style: Vertical duo panel with frame.

I. Door Glazing: Tempered float glass (clear).

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting lever handle with cam-action latch.

2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

K. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
   a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER".
      1) Location: Applied to cabinet glazing.
      2) Application Process: Decals.
      3) Lettering Color: Red.
      4) Orientation: Vertical.
4. Alarm: Manufacturer's standard alarm that actuates when fire protection cabinet door is opened and that is powered by low voltage, complete with transformer.

L. Finishes:
1. Manufacturer's standard baked-enamel paint for the interior of cabinet and exterior of recessed cabinets.
2. Stainless Steel for exterior trim and door. Stainless steel for exterior of surface-mounted cabinets.

2.05 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.06 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.07 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning". After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Color and Gloss: White, full gloss, unless otherwise indicated.

2.08 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.

2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.

B. Examine roughing-in for hose valves and cabinets to verify actual locations of piping connections before cabinet installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare recesses for recessed and semirecessed fire protection cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets. If wall thickness is not adequate for either recessed or semirecessed cabinets, provide surface mounted cabinets.

2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

C. Fire-Rated Hose Valve Cabinets:

1. Install cabinet with not more than 1/16-inch tolerance between pipe OD and knockout OD. Center pipe within knockout.

2. Seal through penetrations with firestopping sealant as specified in Division 7 Section "Through-Penetration Firestop Systems”.

D. Identification: Apply decals at locations indicated.

3.04 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 113100

RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Microwave ovens.
2. Refrigerator/freezers.

B. Related Sections include the following:

1. Division 6 Section "Interior Architectural Woodwork" for custom-made cabinets and plastic-laminate tops that receive residential appliances.
2. Division 22 Sections for water distribution piping connections, drainage and vent piping, and plumbing fixtures associated with residential appliances.
3. Division 26 Sections for services and connections to residential appliances.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include operating characteristics, dimensions of individual appliances, and finishes for each appliance.

B. Appliance Schedule: For appliances; use same designations indicated on Drawings.

C. Manufacturer Certificates: Signed by manufacturers certifying that products comply with requirements.

D. Maintenance Data: For each product to include in maintenance manuals.

E. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain residential appliances through one source from a single manufacturer.

1. Provide products from same manufacturer for each type of appliance required.

2. To the greatest extent possible, provide appliances by a single manufacturer for entire Project.

B. Regulatory Requirements: Comply with provisions of the following product certifications:

1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

2. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.

3. NAECA: Provide residential appliances that comply with NAECA standards.

C. Regulatory Requirements, Accessibility: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1. Operable Parts: Provide controls with forward reach no higher than 48 inches above the floor, horizontal front reach no more than 25 inches, horizontal side reach no more than 24 inches, and that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

2. Refrigerator/Freezer: Provide 50 percent of freezer space within 54 inches of the floor.

D. AHAM Standards: Provide appliances that comply with the following AHAM standards:

1. Household Refrigerators: AHAM HRF-1.

E. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the FTC Appliance Labeling Rule.

1. Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

1.05 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranties: Manufacturer's standard form in which manufacturer of each appliance specified agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.

1. Microwave Oven: Five-year limited warranty for defects in the magnetron tube.

2. Refrigerator/Freezer: Five-year limited warranty for in-home service on the sealed refrigeration system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: The design for each residential appliance is based on the product named. Subject to compliance with requirements, provide either the named product or an approved comparable product by another manufacturer, including, but not necessarily limited to, the following:

1. Amana; a division of Whirlpool Corporation.

2. BOSCH Home Appliances.

3. General Electric Company (GE).

4. KitchenAid; a division of Whirlpool Corporation.

5. Maytag; a division of Whirlpool Corporation.

6. Whirlpool Corporation,

2.02 COOKING APPLIANCES

A. Microwave Oven:

1. Basis-of-Design: General Electric Company (GE) 1.3 Cu. Ft. Countertop Microwave Oven; Model #JES1344SK.

2.03 REFRIGERATION APPLIANCES

A. Refrigerators:

1. Basis-of-Design: Frigidaire 18 Cu. Ft., Top Mount Refrigerator, Model #FGHT1844K F/R, without icemaker.

2.04 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Stainless-Steel Finish: Provide appliances with manufacturer's standard finish complying with manufacturer's written instructions for surface preparation including ground and polished stainless-steel surfaces for uniform, directionally textured finish.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Utilities: Refer to Divisions15 and 16 for plumbing and electrical requirements.

3.03 CLEANING AND PROTECTION

A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.

B. Verify that accessories required have been furnished and installed.

C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 113100

SECTION 135600

AIRCRAFT DOCKING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This system is comprised of aircraft guidance components, emergency stop pushbutton and aircraft docking system selector switch, motion control pushbutton assembly, guidance head selector switch assembly, and flexible cord that interconnects the emergency stop pushbutton to the motion control pushbutton. The flexible cord shall be stored on a retractable reel. All must be procured from one manufacturer by the equipment purchaser to provide a complete system. The system shall be commissioned by the Owner's Commissioning Agent.

1.02 DESCRIPTION

A. The aircraft docking system (ADS) shall be a simple-to-operate, fail-safe device used to control ramp positioning during aircraft parking. The system shall utilize both human and mechanical components to accomplish its function.

B. The ADS shall allow automatic alignment and a fail-safe to stop the aircraft in case of emergency. The system shall allow the ramp agent to control the parking of the aircraft while observing critical ramp operations. The system shall allow the ramp agent to alert the pilot immediately of an emergency that requires the aircraft to come to a stop.

C. The ADS shall allow for multiple parking capability, as long as the aircraft are parked on the same centerline. Two ADS may be required on specific gate depending on aircraft mix and parking positions.

D. The ADS is designed to operate at 120 volts AC and require a maximum of one point six (1.6) amperes.

E. Power for the ADS system shall be from the ADS disconnect mounted on the face of the terminal underneath the PBB opening, or other suitable location. The Contractor will also provide the conduit from this ADS disconnect to the ADS junction Box mounted at the face of the building underneath the PBB opening, and from the ADS junction Box to the ADS footing. The Contractor shall furnish and install all necessary wire required to make this system operational.

1.03 OPERATION

A. The ADS consists of a fixed display mounted on or near the terminal face. This display contains the azimuth and three (3) lights similar to a conventional traffic signal, and a hand held pushbutton station controller along with emergency stop pushbutton. The hand held controller will be stored in a retractable device on the wheel bogey of the PBB.

B. The LED azimuth alignment unit shall be illuminated only when an aircraft is approaching. Alignment shall be accomplished by the pilot's line of view to the red and green azimuth indicators. Mounting location shall be such that "on line" alignment is 21" to the left of the aircraft centerline as viewed from inside the cockpit of the aircraft.

C. The approach signal shall only be activated when aircraft parking is in progress otherwise it shall be in the off mode and not illuminated.

D. The ramp agent shall use a hand-held controller to activate the approach signal. This hand-held controller shall be located at the cab end of the passenger loading bridge and is to be attached to a cable reel.

E. As the aircraft approaches the gate, the ramp agent signals the pilot to proceed by illuminating the green approach signal.

F. As the aircraft approaches the final chock position, the ramp agent signals the pilot to slow by turning off the green approach signal and illuminating the yellow caution approach signal.

G. When the aircraft reaches the chock position, the ramp agent signals the pilot to stop by turning off the yellow caution signal and illuminating the red stop signal.

H. There shall be a fail-safe mechanism in the hand-held controller operation such that if during use, no signal is purposely activated, the signal shall default to red (stop).

I. An emergency stop pushbutton shall be furnished and installed near the wheel bogies of the PBB. Its function shall be to force the illumination of the stop signal in the event that the handheld controller becomes non-functional (physically damaged).

1.04 MAINTENANCE PROVISIONS

A. If special tools are required for routine maintenance, they shall be supplied by the Contractor.

B. Allowance shall be made for convenient access to components critical to the operation of the ADS.

C. The Contractor shall provide corrective and preventive maintenance from Substantial Completion for the ADS through Final Acceptance.

1.05 WARRANTY

A. Provide in accordance with DIVISION 01 Specifications.

B. The Contractor shall warrant that the ADS and its components are new and manufactured using new materials, and are of good quality, suitable for aircraft use, and are free and clear from liens, encumbrances and title defects.

C. The Contractor shall repair or replace (parts and labor), at his expense, within twenty-four (24) hours, defects which constitute a breach of warranty, provided the Contractor is notified of such defects within one (1) year following the date of formal written Final Acceptance by the Architect.

D. The warranty period shall not commence until the complete system is placed in service, and is accepted by the Owner's Representative.

1.06 MAINTENANCE

A. Manuals.

1. Not less than thirty (30) days prior to Final Acceptance inspections, the Contractor shall supply three (3) copies of technical manuals per each model or type of ADS purchased under this Contract.

2. The technical manuals designed for convenient field use shall contain the following information:

a. Description and operation.

b. Maintenance instructions including troubleshooting/diagnostics.

c. Overhaul instructions.

d. List of parts and part numbers.

e. Illustrated parts list.

f. Recommended spare parts list and source.

B. Hardware items including, but not limited to, bolts, studs, nuts, washers, and fasteners shall be in English Units.

C. The Contractor shall maintain an adequate inventory of proprietary or vendor fabricated or modified parts, especially the long-lead time items considered as insurance, for routine maintenance of the units. Stock shall be maintained, whether or not the unit is in current production, for a minimum of ten (10) years from date of the last unit manufactured. An adequate inventory of industry standard parts shall also be available.

D. Prior to final acceptance and during the on-airport storage and installation, the Contractor shall be responsible for the maintenance, and provide general protection for deterioration of the ADS units.

E. Maintenance Agreement: Provide a continuing maintenance agreement to the Owner, in a maintenance agreement as described in DIVISION 01 of the specifications.

1. The firm performing maintenance service shall be authorized by the Contractor and approved by the Owner.

F. The Contractor shall provide the Owner with Service Bulletins outlining product improvement data resulting from continuing field operation experiences

G. In addition to the minimum requirements listed above, the maintenance manuals shall meet the requirements as indicated in DIVISION 01, SECTION 017700.

1.07 TRAINING REQUIREMENTS

A. The ADS and its controls shall be such that it can be easily operated by personnel possessing no special skills and with minimum training. Maintenance requirements shall present no special problems to personnel knowledgeable in their respective fields of plumbing, electrical or general mechanical assembly.

B. Training shall be conducted by the Contractor utilizing prepared texts, slides, actual ADS units and other instructional aids as appropriate.

C. The Contractor shall, upon completion of the training program, provide the Owner with ten (10) operating instructional brochures and then three (3) maintenance manuals for each model or type of ADS.

D. The Contractor shall provide operator training and maintenance training, in separate sessions by a qualified Contractor's representative, for each model or type of ADS provided under this Contract. Training shall be conducted at the installation site as designated and provided for by the Owner. Operation training shall also include proper training of the operators to avoid damaging the equipment by improper use. Training shall be provided in conjunction with that for the passenger loading bridges.

E. Training dates shall be mutually agreed upon by the Contractor and the Owner and shall be conducted prior to scheduled commercial service.

F. In addition to the minimum requirements listed above, training shall meet the requirements as indicated in DIVISION 01, SECTION 017700.

1.08 SUBMITTALS

A. Compliance submittals include, but are not limited to, the fabrication drawings, general outline drawings, equipment assembly drawings, equipment installation drawings, complete unit and internal wiring diagrams, external connect diagrams, structures attachment drawings, and performance data. In addition to the minimum requirements listed above, training shall meet the requirements as indicated in DIVISION 01, SECTION 017700.

1.09 OPERATION AND MAINTENANCE DATA

A. Operating Procedures: Include routine normal operating instructions. Include special operating instructions where required.

B. Pilot Instructions: Include instructions and procedures for ADS system use by aircraft pilots and operators.

C. Maintenance Requirements: Include routine procedures and guide for troubleshooting, disassembly and reassembly instructions, and checking instructions.

D. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.10 ENVIRONMENTAL CONSIDERATIONS

A. The ADS shall operate satisfactorily under Atlanta temperature conditions.

B. Structural components and materials shall be designed or selected for an anticipated twenty (20) year life.

1.11 CODES, REGULATION AND REFERENCES

A. Electrical equipment and methods of installation shall conform to the requirements and recommendations of the American Insurance Association (AIA), the National Electrical Manufacturers Association (NEMA), and the National Electrical Code (NEC).

B. Wiring and installation shall be in accordance with National Electrical Code as well as state and local codes.

PART 2 - PRODUCTS

2.01 INSTALLATION QUALIFICATIONS

A. Products proposed shall have been in use at operating airports with similar operations to Hartsfield-Jackson Atlanta International Airport a period of not less than five (5) years. A minimum of 100 ADS Units of the proposed design shall have been installed within the last five years with at least twenty five (25) ADS Units in a single order.

B. The Contractor and/or its Subcontractor shall install the ADS System to manufacturers/suppliers installation specification. Installation methods shall comply with the applicable sections as outlined in the base building construction documents. The ADS system shall have been pre-approved by the PBB manufacturer. The Contractor and/or its Subcontractor shall be responsible for system installation, testing, commissioning and training.

2.02 COMPONENTS

A. LED Alignment Unit:

1. The LED alignment unit (azimuth) housing shall be constructed of cast aluminum with an aluminum shroud.

2. The housing assembly shall contain two (2) illuminated elements. These elements shall have the appearance of bars or wands with the forward element being green and the rear element being red when illuminated. These elements shall be capable of being replaced without having to re-align the unit. The elements shall incorporate redundant LED arrays, such that failure of one or even two elements of an array within a LED bar shall not have an impact that would be detrimental to the guidance of an incoming aircraft.

3. There shall be a weatherproof switch mounted in the exterior of the housing for a means of disconnecting incoming power.

4. There shall be a 3/4" hub mounted in the housing for the incoming power connections.

5. The power supply shall be mounted inside the housing and shall be adequate for operating at 120 volts AC.

6. Easy access to the power supply shall be from a removable cover secured by screws or latches.

B. Signal Unit:

1. The signal unit shall consist of red, yellow, and green sections.

2. Signal sections shall accommodate polycarbonate signal lenses.

3. Each signal section lamp holder shall be factory wired from the lamp receptacle to a terminal strip located in the signal housing of the ADS unit.

4. Lamps shall be of the proper size for adequate visual color and signal identification when illuminated. The yellow and green signal lamps shall be incandescent and rated for traffic signal duty. The red stoplight shall be of LED construction.

5. The signal unit shall operate at 120 volts AC.

C. Hand-held Controller:

1. The hand-held controller shall be NEMA 4 construction with a strain relief. The controller shall be connected using type SOOWA or equal cord with a high visibility yellow jacket with a minimum of 5C-#16 AWG.

2. Legend identifications for switch positions shall be adequately identified for red, yellow, and green signals.

3. The hand-held controller shall be located on the passenger loading bridge on a retractable device adjacent to the aircraft side of the wheel bogie. Construction of the device shall be of a similar nature as indicated on the drawings. The Contractor shall include necessary wire, conduit, and disconnection devices as required with the cable retraction device.

D. Miscellaneous Assembly Parts:

1. Miscellaneous parts shall be included to completely assemble components of the unit structurally.

2. Miscellaneous components with the exception of nuts and bolts shall be hot dipped galvanized or powder coated.

E. Wire and conduit for assembly and installation shall be furnished by the Contractor in the field as required. The PBB manufacturer shall be required to furnish the ADS cable from the wheel bogey location of the emergency stop pushbutton to a terminal block at the rotunda of the PBB. This terminal block will be used to connect the ADS display.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The ADS shall be mounted to the ADS poles or PBB structure as required and shown on the Contract Documents.

B. The Contractor shall furnish and install necessary labor and material including brackets, poles, backboards, supporting hardware, devices, and electrical wiring to make a complete and operable system.

C. ADS unit(s) shall be supplied only at aircraft centerline locations shown on the Drawings. Where there is an existing ADS mounting pole the Contractor shall remove it from its existing position and relocated it to the correct position.

D. Installation including structural, civil and electrical requirements shall be by the Contractor.

3.02 INSTALLATION REQUIREMENTS

A. The Contractor shall provide qualified supervisory and service personnel during the installation of the ADS's to assure a proper installation. This representative shall also be available to the Architect at no charge on delivery of the first unit and shall be on call for a timely response within eight (8) hours for a period of sixty (60) days after each ADS is officially available for airline operations. This is to ensure adequate and reliable field service support to correct equipment failures that normally occur during the initial operating period.

B. During the on-site delivery, storage, and installation process, the Contractor shall be responsible for the protection of ADS units from damage or tampering.

C. The Contractor shall coordinate with the passenger loading bridge contractor for the provision for or installation of all necessary brackets prior to final factory painting of the PBB. The intent is to eliminate site welding after final factory painting. Any exceptions must be approved in advance by the Architect.

3.03 COORDINATION WITH OTHER CONTRACTORS

A. The Contractor shall cooperate and coordinate his Work with the passenger loading bridge contractor and base building contractor for the installation of the ADS's.

B. The Contractor shall cooperate and coordinate his Work with the contractor providing electrical power at the passenger loading bridge for the complete provision of electrical service.

3.04 ACCEPTANCE PROCEDURES

A. In addition to requirements listed below, the Contractor meet the requirements of DIVISION 01, SECTION 017700 for closeout procedures and substantial completion.

B. Preliminary Inspection:

1. A functional inspection and demonstration of each unit shall be performed at the installation site by a factory-trained and authorized representative of the Contractor in the presence of the Architect.

2. Verification of compliance with this Specification shall be accomplished by inspection, review of data, demonstration, testing, or combination of these.

C. Final Inspection:

1. Owner's Representative Commissioning Agent and the Architect shall perform the final system verification testing and inspection of the ADS units after full compliance by the Installing Contractor and manufacturer of all outstanding punch list items as determined from the preliminary inspection and meeting the requirements of SECTION 018100 – COMMISSIONING.

2. The Architect reserves the right to employ an independent Testing Laboratory (hereinafter referred to as "Laboratory") to inspect the ADS's to verify the manufacturer's compliance with the specified requirements. Deficiencies and/or violations reported by the Laboratory shall be immediately corrected by the Contractor at no additional cost and then re-inspected by the Laboratory. Cost of re-inspection shall be the responsibility of the Contractor.

3. Final acceptance of the system shall be made in writing to the Contractor after satisfactory completion of punch list items, for installed units as determined by the Owner's Representative and Commissioning Agent.

4. The Contractor shall submit record drawings in accordance with DIVISION 01, Section "Project Record Documents".

3.05 TEST

A. Before turning system over to airport personnel for operation, a complete system check must be made to insure compliance with manufacturer's requirements. The Contractor shall verify compliance with paragraph 1.01, C. The Owner is responsible for supplying the various aircraft required for this test in a timely manner. Testing shall meet the requirements of SECTION 018100 – COMMISSIONING.

END OF SECTION 135600

SECTION 142115
ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. 1 traction elevator as follows:
   1. 1 Gearless MRL Passenger Elevator, located in A-380 Gate

B. All engineering, equipment, labor, and permits required to satisfactorily complete elevator installation required by Contract Documents.

C. Applicable conditions of General, Special, and Supplemental Conditions, and Division 1.

D. Preventive maintenance as described herein.

E. Additional equipment or finishes furnished under other sections, installed under this section:
   1. CCTV system
   2. Card reader security system – Access Control System/Security Card reader provisions (Card Readers provided by others) installed in elevator cab and hall pushbutton stations, at all landings served.
   3. Hands-free Intercom provisions (Ring Communications model SS900B)

F. Cartage and Hoisting: All required staging, hoisting, and movement to, on, and from the site including new equipment, reused equipment, or dismantling and removal of existing equipment.

1.2 RELATED WORK PROVIDED UNDER OTHER SECTIONS

A. Hoistway and Pit:
   1. Clear, plumb, substantially flush hoistway with variations not to exceed 1" at any point.
   2. Supports at each floor for car and counterweight guide rail fastening including supports for car guide rail fastening above top landing. Intermediate car guide rail support when floor heights exceed 14'-0" or as designated on contract drawings. Intermediate counterweight guide rail supports where floor heights exceed 16'-0". Building supports not to deflect in excess of 1/8" under normal conditions.
   3. Installation of guide rail bracket supports in concrete. Inserts or embeds, if used, will be furnished under this Section.
   4. Hoist machine supports including two (2) additional horizontal supports above the top terminal landing on the machine side of the hoistway. Locate as required for selected Contractors' equipment.
   5. Wall blockouts and fire rated closure for control and signal fixture boxes which penetrate walls.
   6. Cutting and patching walls and floors.
   7. Concrete wall pockets and/or structural steel beams for support of hoist machine, rope sheaves, and dead-end hitch beams. Support deflection shall not exceed 1/1666 of span under static load.
   8. Erect front hoistway wall after elevator entrances are installed.
   9. Grout floor up to hoistway sills and around hoistway entrances.
   10. Pit access stationary ladder for elevators.
   11. Structural support at pit floor for buffer impact loads, guide rail loads.

12. Waterproof pit. Indirect waste drain or sump with flush grate and pump. Sump pump/drain capacity minimum 3000 gallons per hour, per elevator.
13. Protect open hoistways and entrances during construction per OSHA Regulations.
14. Protect car enclosure, hoistway entrance assemblies, and special metal finishes from damage.
15. Hoistway smoke relief venting.
16. Hoist machine ventilation, heating, and/or cooling. Maintain minimum temperature of 55°F, maximum 90°F at the location of the hoist machine.
17. Seal fireproofing to prevent flaking.
18. Partition between machine space and hoistway where hoist machine is mounted offset from hoistway.

B. Control Room and Machinery Spaces:
1. Enclosure with access. Provide ships ladder or stair with guard railing. Include similar access to overhead machinery space.
2. Self-closing and locking access door.
3. Ventilation and heating. Maintain minimum temperature of 55° F, maximum 90° F. Maintain maximum 80% relative humidity, non-condensing.
4. Paint walls and ceiling.
5. Class "ABC" fire extinguisher in elevator controller space.
6. Seal fireproofing to prevent flaking.
7. Self-closing and locking governor access door and access means. If required.
8. Fire sprinklers where required.
9. Overhead floor grating for access to overhead machinery space. If required.

C. Electrical Service, Conductors, and Devices:
1. Lighting and GFCI convenience outlets in pit, controller space, and overhead machinery spaces. Provide one additional non-GFCI convenience outlet in pit for sump pump.
2. Three-phase mainline copper power feeder with true earthen grounding to terminals of elevator controller in the controller space with protected lockable "open" disconnecting means.
3. Single-phase copper power feeder to elevator controller for car lighting and exhaust blower with individual protected lockable "open" disconnecting means located in the controller space.
4. Emergency telephone line to each individual elevator control panel in elevator machine room. Telephone shall be Talk-A-Phone ETP-100M. Coordinate with Electrical Engineer and/or the University's Telephone Services to provide raceway from telephone switch equipment to elevator controller.
5. Fire alarm initiating devices in elevator lobby for elevator and controller space to initiate firefighters' return feature. Device at top of hoistway if sprinklered. Provide alarm initiating signal wiring from hoistway or controller space connection point to elevator controller terminals. Device in machine room and at top of hoistway to provide signal for general alarm and discrete signal for Phase II firefighters' operation.
6. Temporary power and illumination to install, test, and adjust elevator equipment.
7. Means to automatically disconnect power to affected elevator drive unit and controller prior to activation of the controller space fire sprinkler system, and/or hoistway fire sprinkler system. Manual shut-off means shall be located outside bounds of the controller space.
8. When sprinklers are provided in the hoistway all electrical equipment, located less than 4'-0" above the pit floor shall be identified for use in wet locations. Exception: seismic protection devices.

D. Standby Power Provision: If Provided

1. Standby power of normal voltage characteristics via normal electrical feeders to run one elevator per group at full-contract car speed and capacity.
2. Conductor from auxiliary form "C" dry contacts, located in the standby power transfer switch to a designated elevator control panel. Provide a time delay of 30 - 45 seconds for pre-transfer signal in either direction.
3. Standby single-phase power to group controller, and elevator controller for car lighting, exhaust blower, emergency signaling device.
4. Means for absorbing regenerated power during an overhauling load condition per NEC 620.91. Elevator(s) will employ IGBT drive, presenting a non-linear active load.
5. Standby power to machine room, pit, and overhead machinery space lighting.
6. Standby power to hoist machine and control room ventilation or air conditioning.
7. Standby power to emergency communications device(s).

1.3 DEFINITIONS

A. Terms used are defined in the latest edition of the Safety Code for Elevators and Escalators, ASME A17.1.

B. Reference to a device or a part of the equipment applies to the number of devices or parts required to complete the installation.

C. Provisions of this specification are applicable to all elevators unless identified otherwise.

D. All applicable requirements of the current UTK Division 14 Elevator Design Criteria to be included as part of this project.

1.4 QUALITY ASSURANCE

A. Approved Contractors: Alternate Contractors must receive approval of Architect and/or Consultant at least 14 calendar days prior to bid date.
1. Gearless Elevator(s): KONE, Otis, Schindler, Thyssen Krupp.
2. Car Enclosure: Eklund's Inc., Gunderlin, Ltd., Hauenstein & Burmeister, KONE, Otis, Schindler, Thyssen Krupp, Tyler or Airport approved alternates
3. Hoistway Entrance: Hauenstein & Burmeister, KONE, Otis, Schindler, Thyssen Krupp, Tyler.

B. Compliance with Regulatory Agencies: Comply with most stringent applicable provisions of following codes, laws, and/or authorities, including revisions and changes in effect:
1. Safety Code for Elevators and Escalators, ASME A17.1
2. Guide for Inspection of Elevators, Escalators, and Moving Walks, ASME A17.2
3. Elevator and Escalator Electrical Equipment, ASME A17.5
4. National Electrical Code, NFPA 70
5. Americans with Disabilities Act, ADA
6. Local Fire Authority
7. Requirements of IBC and all other Codes, Ordinances and Laws applicable within the governing jurisdiction
8. Life Safety Code, NFPA 101
9. Uniform Federal Accessibility Standard, UFAS

C. Warranty:
1. Material and workmanship of installation shall comply in every respect with Contract Documents. Correct defective material or workmanship which develops within one year from date of final acceptance of all work to satisfaction of Architect, Purchaser and

Consultant at no additional cost, unless due to ordinary wear and tear, or improper use or care by Purchaser. Perform maintenance in accordance with terms and conditions indicated in the Preventive Maintenance Agreement.

2. Defective is defined to include, but not limited to: operation or control system failures, car performance below required minimum, excessive wear, unusual deterioration, or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise, or vibration, and similar unsatisfactory conditions.
3. Make modifications, requirements, adjustments, and improvements to meet performance requirements in Parts 2 and 3.

1.5 DOCUMENT VERIFICATION

A. In order to discover and resolve conflicts or lack of definition which might create problems, Contractor must review Contract Documents for compatibility with its product prior to submittal of quotation. Purchaser will not pay for change to structural, mechanical, electrical, or other systems required to accommodate Contractor's equipment.

1.6 SUBMITTALS

A. Within 20 calendar days after award of contract and before beginning equipment fabrication submit Scaled or Fully Dimensioned Layout: Plan of pit, hoistway, and control room indicating equipment arrangement and elevation section of hoistway. Allow 10 calendar days for response to initial submittal.

B. Within 60 calendar days after award of contract and before beginning equipment fabrication submit;
   1. Details of car enclosures, hoistway entrances, and car/hall signal fixtures.
   2. Design Information: Indicate equipment lists, reactions, and design information on layouts.
   3. Power Confirmation Information: Include motor horsepower, code letter, starting current, full-load running current, and demand factor.
   4. Fixtures: Cuts, samples, or shop drawings.
   5. Finish Material: Submit 3" x 12" samples of actual finished material for Architect review of color, pattern, and texture. Compliance with other requirements is the exclusive responsibility of the Contractor. Include, if requested, signal fixtures, lights, graphics, Braille plates, and details of mounting provisions.
   6. Written Maintenance Control Program (MCP) specifically designed for the equipment included under this contract. Include any unique or product specific procedures or methods required to inspect or test the equipment. In addition, identify weekly, bi-weekly, monthly, quarterly, and annual maintenance procedures, including statutory and other required equipment tests.

C. Acknowledge and/or respond to review comments within 14 calendar days of return. Promptly incorporate required changes due to inaccurate data or incomplete definition so that delivery and installation schedules are not affected. Contractor's revision response time is not justification for equipment delivery or installation delay.

1.7 PERMIT, TEST AND INSPECTION

A. Obtain and pay for permit, license, and inspection fee necessary to complete installation.

B. Perform test required by Governing Authority in accordance with procedure described in ASME A17.2 Guide for Inspection of Elevators, Escalators, and Moving Walks in the presence of Authorized Representative.

C. Supply personnel and equipment for test and final review by Consultant as required in Part 3.

1.8 MAINTENANCE

A. Interim:

1. When the elevator is near completion and ready for service, Hartsfield-Jackson Atlanta International Airport or General Contractor may accept the elevator for interim use and place in service.

2. During this period, the HJAIA or General Contractor may pay a mutually agreed amount per month for preventive maintenance services. Indicate the cost amount per month, with bid.

3. Temporary acceptance form must be acceptable to HJAIA or General Contractor and signed prior to use.

4. User must provide or pay for temporary hoistway and car enclosures; protect installed equipment and finishes; and pay for all cleaning, repairs and replacement of materials necessary to restore the elevator/s to "as-new" condition prior to final acceptance by the HJAIA.

B. Warranty Maintenance:

1. Provide preventive maintenance and 24-hour emergency callback service for two years commencing on date of final acceptance by Purchaser. Systematically examine, adjust, clean, and lubricate all equipment. Repair or replace defective parts using parts produced by the Contractor of installed equipment. Maintain elevator machine room, hoistway, and pit in clean condition.

2. Use competent personnel, acceptable to the Purchaser, supervised and employed by Contractor.

3. The warranty maintenance period specified in Item 1.8 B. above shall be extended one (1) month for each three (3) month period in which equipment related failures average more than .25 per unit per month.

4. Purchaser retains the option to delete cost of warranty maintenance from new equipment contract and remit twenty four (24) equal installments directly to Contractor during period in which maintenance is being performed.

PART 2 - PRODUCTS

2.1 SUMMARY

A. Passenger Elevators

Number:	Cars #1
Capacity:	4000#
Class Loading:	Passenger Class A
Contract Speed:	350 F.P.M.
Roping:	1:1, 2:1 or 2:1 Underslung
Machine:	Gearless
Machine Location:	Contractors' Standard Location
Operational Control:	Group Automatic Microprocessor- Based System Microprocessor-Based System
Motor Control:	AC Variable Voltage Variable Frequency Microprocessor-Based with Digital Closed-Loop Feedback
Power Characteristics:	480 Volts, 3 Phase, 60 Hertz
Stops:	2 Front
Openings:	2 Front
Floors Served:	Apron & Terminal
Travel:	37'-6"
Platform Size:	8'-0" Wide X 6'-2" Deep
Minimum Clear Inside Car:	7'-8" Wide X 5'-5" Deep
Entrance Size:	4'-0" Wide X 7'-0" High
Entrance Type:	Single Speed Center Opening
Door Operation:	High Speed, Heavy-Duty, Door Operator, Minimum Opening Speed 2-1/2 F.P.S.
Door Protection:	Infrared, Full Screen Device, with Differential Timing Nudging and Interrupted Beam Time
Safety:	Flexible Guide Clamp-Type B, Car
Guide Rails:	Planed Steel Tees
Buffers:	Oil or Spring

Car Enclosure:	As Specified and/or detailed on architectural drawings.
	9'-0" Clear Height Under Canopy
	Pad Buttons and Vinyl-Covered Pads
	Battery Powered Emergency Car Lighting. Provide Separate Constant Pressure Test Button in Car Service Compartment.
Signal Fixtures:	LED Illumination Contractor's Standard Design, Vandal Resistant Assembly
Hall And Car Pushbutton Stations:	Single Hall Pushbutton Riser Single Car Operating Panel
	Vandal Resistant Car and Hall Pushbuttons
Car and Car Position Indicators:	Single Digital with Car Direction Arrows
In Car Lanterns:	All Car Entrance Columns with Volume Adjustable Electronic Chime or Tone. Sound Twice for Down Direction, Vandal Resistant Assembly
Communication System:	Self-Dialing, Vandal Resistant, Push To Call, Two-Way Communication System with Recall, Tracking and Voiceless Communication
	Hands-free Intercom provisions (Ring Communications model SS900B)
Fixture Submittal:	Submit Brochure Depicting Contractor's Proposed Designs with Bid
Additional Features,	Car and Counterweight Roller Guides
	Car Top Inspection Station
	Firefighters' Service, Phase I and II, including Alternate Floor Return
	Accessibility and Emergency Medical Services Signage
	Swing Car Return Panel Arranged for Integral Car Operating Panel

Hoistway Access Switches Top and Bottom Floors

Hoistway Door Unlocking Device
All Floors

Platform Isolation

Load-Weighing Device

Anti-Nuisance Feature

Independent Service Feature

Card Reader Provisions – Access Control System/Security Card reader provisions (Car Readers provided by others) installed in elevator cab and hall pushbutton stations, at all landings served.

CCTV Provisions

Machine, Power Conversion Unit, and Controller Sound Isolation

Tamper Resistant Fasteners for All Fastenings Exposed to the Public

Two Year Warranty Maintenance with 24-Hour Call-Back Service

Sill Support Angles

No Visible Company Name or Logo

Wiring Diagrams, Operating Instructions, and Parts Ordering Information

System Diagnostic Means and Instructions

2.2 MATERIALS

A. Steel:
   1. Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.
   2. Sheet Steel (for Unexposed Work): Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A568 and A569.
   3. Structural Steel Shapes and Plates: ASTM A36.

B. Stainless Steel: Type 302 or 304 complying with ASTM A167, with standard tempers and hardness required for fabrication, strength and durability. Apply mechanical finish on fabricated work in the locations shown or specified, Federal Standard and NAAMM nomenclature, with

texture and reflectivity required to match Architect's sample. Protect with adhesive paper covering.

C. Aluminum: Extrusions per ASTM B221; sheet and plate per ASTM B209.

D. Plastic Laminate: ASTM E84 Class A and NEMA LD3.1, Fire-Rated Grade (GP-50), Type 7, 0.050" ±.005" thick, color and texture as follows:
   1. Exposed Surfaces: Color and texture selected by Architect and/or as specified on architectural drawings.

E. Paint: Clean exposed metal parts and assemblies of oil, grease, scale, and other foreign matter and factory paint one shop coat of standard rust-resistant primer. After erection, provide one finish coat of industrial enamel paint. Galvanized metal need not be painted.

F. Prime Finish: Clean all metal surfaces receiving a baked enamel paint finish of oil, grease, and scale. Apply one coat of rust-resistant primer followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of primer.

G. Baked Enamel Finish: Prime finish per above. Unless specified "prime finish" only, apply and bake three (3) additional coats of enamel in the selected solid color.

2.3 CAR PERFORMANCE

A. Car Speed: ± 3% of contract speed under any loading condition.

B. Car Capacity: Safely lower, stop and hold 125% of rated load.

C. Car Stopping Zone: ±1/4" under any loading condition.

D. Door Opening Time: 2.0 Seconds from start of opening to fully open:

E. Door Closing Time: 3.2 Seconds from start of closing to fully closed:

F. Car Ride Quality:
   1. Horizontal and vertical acceleration within car during all riding and door operating conditions. Not more than 20 mg peak to peak (adjacent peaks) in the 1 - 10 Hz range.
   2. Acceleration and Deceleration: Smooth constant and not less than 3 feet/second^2 with an initial ramp between 0.5 and 0.75 second.
   3. Sustained Jerk: Not more than 6 feet/second^3.
   4. Measurement Standards: Measure and evaluate ride quality consistent with ISO 18738, using low pass cutoff frequency of 10 Hz and A95 peak-to-peak average calculations.

G. Noise and Vibration Control
   1. Airborne Noise: Measured noise level of elevator equipment and its operation shall not exceed 55 dBA inside car under any condition including door operation and car ventilation exhaust blower on its highest speed. Limit noise level in the machine room relating to elevator equipment and its operation to no more than 80 dBA. All dBA readings to be taken 3'-0" off the floor and 3'-0" from the equipment using the "A" weighted scale.
   2. Vibration Control: All elevator equipment provided under this contract, including power unit, controller, oil supply lines, and their support shall be mechanically isolated from the building structure and electrically isolated from the building power supply and to each

other to minimize the possibility of objectionable noise and vibrations being transmitted to occupied areas of the building.

2.4 OPERATION

A. Collective Microprocessor-Based:
Include, as a minimum, the following features:

1. Operate car without attendant from pushbuttons in car and at each floor. When car is available, automatically start car, and dispatch it to floor corresponding to registered car or hall call. Once car starts, respond to registered calls in direction of travel and in the order the floors are reached.
2. Reverse car direction only when all car calls have been answered, or all hall and car calls ahead of car and corresponding to the direction of car travel have been answered.
3. Slow car and stop automatically at floors corresponding to registered calls, in the order in which they are approached in direction of travel. As slowdown is initiated for a hall call, automatically cancel hall call. Cancel car calls in the same manner. Hold car at arrival floor an adjustable time interval to allow passenger transfer.
4. Answer calls corresponding to direction in which car is traveling unless call in the opposite direction is highest (or lowest) call registered.
5. Illuminate appropriate pushbutton to indicate call registration. Extinguish light when call is answered.

B. Other Items:
1. Load Weighing: Provide means for weighing car passenger load.
2. Anti-Nuisance Feature: If car loading relative to weight in car is not commensurate with number of registered car calls, cancel car calls. Systems employing either load weighing or door protective device for activation of this feature are acceptable.
3. Independent Service: Provide controls for operation of car from its pushbuttons only. Close doors by constant pressure on desired destination floor button or door close button. Open doors automatically upon arrival at selected floor.

C. Firefighters' Service: Provide equipment and operation in accordance with code requirements.

D. Automatic Car Stopping Zone: Stop car within 1/4" above or below the landing sill. Maintain stopping zone regardless of load in car, direction of travel, distance between landings, hoist rope slippage, or stretch.

E. Remote Monitoring and Diagnostics: Equip controller with standard ports, interface boards, and drivers to accept maintenance, data logging, fault finding diagnostic, and monitoring computers, keyboards, modems, and programming tools. The system shall be capable of driving remote color CRT monitor(s) that continually scan and display the status of each car and call.

F. Motion Control: Microprocessor based AC, variable-voltage, variable frequency with digitally encoded closed-loop velocity feedback suitable for operation specified and capable of providing smooth, comfortable car acceleration, retardation, and dynamic braking. Limit the difference in car speed between full load and no load to not more than ±3% of the contract speed.

G. Door Operation: Automatically open doors when car arrives at main floor. At expiration of normal dwell time, close doors.

H. Standby Lighting and Alarm: Car mounted battery unit with solid-state charger to operate alarm bell and car emergency lighting. Battery to be rechargeable with minimum 5-year life

expectancy. Include required transformer. Provide constant pressure test button in service compartment of car operating panel.

I. Standby Power Operation: IF provided. Upon loss of normal power, adequate standby power will be supplied via building electrical feeders to simultaneously start and run car at contract car speed and capacity.

J. Card/Proximity Reader Security System: Provide provisions inside Car for reader unit. Mount reader unit as directed by Architect and cross connect from car pushbuttons to control module in control room. Reader control unit, mounting brackets, wiring materials, logic circuits, etc., by Security Subcontractor. Provide a filler plate to match card slot size and car return panel finish, including direction of graining, where card slot or proximity reader cutout is not initially utilized. Elevator control systems shall facilitate system tracking of persons accessing secure floors via printout by passenger I.D. number, floor accessed, and time of entry.

2.5 CONTROL ROOM EQUIPMENT

A. Arrange equipment in spaces shown on drawings.

B. Solid State Power Conversion and Regulation Unit: Provide solid-state, alternating current, variable voltage, variable frequency (ACV3F), I.G.B.T converter/inverter drives.
   1. Design unit to limit current, suppress noise, and prevent transient voltage feedback into building power supply. Provide internal heat sink cooing fans for the power drive portion of the converter panels. Conform to IEEE standards 519-1992 for line harmonics and switching noise.
   2. Isolate unit to minimize noise and vibration transmission. Provide isolation transformers, filter networks, and choke inductors.
   3. Suppress solid-state converter noises, radio frequency interference, and eliminate regenerative transients induced into the mainline feeders or the building standby power generator.
   4. Supplemental direct-current power for the operation of hoist machine brake, door operator, dispatch processor, signal fixtures, etc., from separate static power supply.
   5. ACV3F Drives for gearless elevators shall be regenerative and utilize IGBT converter/inverter and dynamic braking during overhauling condition.

C. Encoder: Direct drive, solid-state, digital type. Update car position at each floor and automatically restore after power loss.

D. Controller: UL/CSA labeled.
   1. Compartment: Securely mount all assemblies, power supplies, chassis switches, relays, etc., on a substantial, self-supporting steel frame. Completely enclose equipment with covers. Provide means to prevent overheating.
   2. Relay Design: Magnet operated with contacts of design and material to insure maximum conductivity, long life, and reliable operation without overheating or excessive wear. Provide wiping action and means to prevent sticking due to fusion. Contacts carrying high inductive currents shall be provided with arc deflectors or suppressors.
   3. Microprocessor-Related Hardware
      a. Provide built-in noise suppression devices which provide a high level of noise immunity on all solid-state hardware and devices.
      b. Provide power supplies with noise suppression devices.
      c. Isolate inputs from external devices (such as pushbuttons) with opto-isolation modules.
      d. Design control circuits with one leg of power supply grounded.

e. Safety circuits shall not be affected by accidental grounding of any part of the system.
f. System shall automatically restart when power is restored.
g. System memory shall be retained in the event of power failure or disturbance.
h. Equipment shall be provided with Electro Magnetic Interference (EMI) shielding within FCC guidelines.

4. Wiring: CSA labeled copper for factory wiring. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
5. Permanently mark components (relays, fuses, PC boards, etc.) with symbols shown on wiring diagrams.
6. Monitoring System Interface: Provide controller with serial data link through RJ45 Ethernet connection and install all devices necessary to monitor items outlined in Section 2.13. Elevator contractor responsible to connect monitoring system interface to control room monitoring compartment and LAN. Wiring from the LAN to the control room monitoring compartment by others.
7. Provide controller or machine mounted auxiliary, lockable "open" disconnect if mainline disconnect is not in sight of controller and/or machine.

E. Sleeves and Guards: Provide 2" steel angle guards around cable or duct slots through floor slabs and/or walls. Provide rope and smoke guards for sheaves, cables, and cable slots in control room.

F. Noise/Vibration Isolation: All elevator equipment including their supports and fastenings to building, shall be mechanically and electrically isolated from the building structure and main line power feeders to minimize objectionable noise and vibration transmission to car, building structure, or adjacent occupied areas of building.

2.6 HOISTWAY EQUIPMENT

A. Gearless Traction Hoist Machine:
1. AC induction or P.M.S.M. ACV3F gearless traction type motor with brake, drive sheave, and deflector sheave mounted in proper alignment on a common, isolated machine support frame at the top of the hoistway or mounted on the back of the guide rail at the top landing.
2. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.
3. Provide ladders and platforms with handrails and toeboards for overhead machine and/or sheave access within the bounds of the control room as required.

B. Machine and Equipment Support Beams:
1. Provide structural steel frame required for direct support of and attachment to building structure of hoist machine, deflector sheaves, overhead sheaves, governor, and hoist rope dead-end hitch assemblies.
2. Provide bearing plates, anchors, shelf angles, blocking, embedment, etc., for support and fastening of machine support frame or equipment to the building structure.
3. Isolate machine and/or machine support frame to prevent noise and vibration transmission to building structure.

C. Governor: Centrifugal-type, car driven with pull-through jaws and bi-directional shutdown switches. Provide required bracketing and supports for attachment to guide rail or machine support frame.

D. Emergency Brake: Provide means to prevent ascending car over-speed and unintended car movement per code.

E. Guide Rails: Planed steel T-sections for car and counterweight of suitable size and weight for the application, including brackets for attachment to building structure. Provide bracketing, at top and bottom of floor beams. No additional structural points of rail attachment, other than those shown on the Contract Documents, will be provided.

F. Buffers, Car and Counterweight: Oil or Spring type with blocking and support channels.

G. Sheaves: Machined grooves and sealed bearings. Provide mounting means to machine support frame and car and counterweight structural members.

H. Counterweight: Steel frame with metal filler weights.

I. Counterweight Guide Shoes: Spring dampened roller guide shoes.

J. Counterweight Guard: Metal guard in pit.

K. Governor Rope and Encoder Tape Tensioning Sheaves: Mount sheaves and support frame on pit floor or guide rail. Provide frame with guides or pivot point to enable free vertical movement and proper tension of rope and tape.

L. Hoist and Governor Ropes:
1. 8 x 19 or 8 x 25 Seale construction, traction steel type. Fasten with staggered length, adjustable, spring isolated wedge type shackles.
2. Flat, polyurethane coated reinforced steel belts.
3. Governor rope to suit Contractor's specification.

M. Compensation: Contractor's standard application. Pit mounted guide assembly shall provide quiet, effective restraint without excessive wear of components. Inhibit rubbing or chafing against hoistway or equipment within hoistway or pit. Application must meet performance/noise level requirement of specification.

N. Terminal Stopping: Provide normal and final devices.

O. Electrical Wiring and Wiring Connections:
1. Conductors and Connections: Copper throughout with individual wires coded and connections on identified studs or terminal blocks. Use no splices or similar connections in wiring except at terminal blocks, control compartments, or junction boxes. Provide 10% spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the control room. Provide four pair of spare shielded communication wires in addition to those required to connect specified items. Tag spares in control room.
2. Conduit: Painted or galvanized steel conduit, EMT, or duct. Conduit size, 1/2" minimum. Flexible heavy-duty service cord may be used between fixed car wiring and car door switches for door protective devices.
3. Traveling Cables: Flame and moisture-resistant outer cover. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway. Provide five (5) pair of shielded wires and two (2) RG-6/U type coaxial cables for card reader. Provide two (2) RG-6/U coaxial CCTV cables within traveling cable from car controller to car top, plus 3'-0" excess loop at both ends. Provide two (2) pair 14 gauge wire for CCTV power.
4. Auxiliary Wiring: Connect fire alarm initiating devices, emergency two-way communication system, CCTV, card reader and announcement speaker and/or background music in car controller in control room.

P. Entrance Equipment:
1. Door Hangers: Two-point hanger roller with neoprene roller surface and suspension with eccentric upthrust roller adjustment.
2. Door Tracks: Bar or formed, cold-drawn removable steel tracks with smooth roller contact surface.
3. Door Interlocks: Operable without retiring cam. Paint interlock box flat black.
4. Door Closers: Spring, spirator, or jamb/strut mounted counterweight type. Design and adjust to insure smooth, quiet mechanical close of doors.
5. Hoistway Door Unlocking Device: Provide unlocking device with escutcheon in door panel at all floors, with finish to match adjacent surface.
6. Hoistway Access Switches: Mount in wall at top and bottom floor(s). Provide switch with faceplate.

Q. Floor Numbers: Stencil paint 4" high floor designations in contrasting color on inside face of hoistway doors or hoistway fascia in location visible from within car.

2.7 HOISTWAY ENTRANCES

A. Complete entrances bearing fire labels from a nationally recognized testing laboratory approved within the governing jurisdiction.

B. Frames: 14 gauge hollow metal at all floors. Bolted and lapped head to jamb assembly at all floors. Provide Arabic floor designation/Braille plates, centered at 60" above finished floor, on both side jambs of all entrances. Provide plates at main egress landing with "Star" designation. For designated emergency car, provide "Star of Life" designation plates at height of 78" – 84" above finished floor on both side jambs at all floors. Braille indications shall be below Arabic floor designation. Provide cast floor designation/Braille plates as manufactured by SCS, Vision Mark, or Entrada.

C. Door Panels: Minimum 18 gauge steel, sandwich construction without binder angles. Provide leading edges of center-opening doors with rubber astragals. Provide a minimum of two (2) gibs per panel, one at leading and one at trailing edge with gibs in the sill groove entire length of door travel. Construct door panels with interlocking, stiffening ribs.

D. Sight Guards: Minimum 16 gauge, same material and finish as hoistway entrance door panels. Construct without sharp edges.

E. Sills: Extruded aluminum.

F. Sill Supports: Structural or formed steel designed to support door sill based upon car loading classification. Mount to eliminate need for grout under the sill.

G. Fascia, Toe Guards and Hanger Covers: Minimum 16 gauge furniture steel with black enamel finish.

H. Struts and Headers: Provide for vertical support of entrances and related material. Provide door open bumpers on entrances equipped with vertical struts.

I. Finish of Frames and Doors: #4 Stainless Steel.

2.8 CAR EQUIPMENT

A. Frame: Welded or bolted, rolled or formed steel channel construction to meet load classification specified.

B. Safety Device: Type "B," flexible guide clamp.

C. Platform: Isolated type, constructed of steel, or steel and wood which is fireproofed on underside. Design and construct to accommodate load classification requirements. Provide Class "A" construction for passenger elevators.

D. Platform Apron: Minimum 16 gauge steel, reinforced and braced to car platform with black enamel finish.

E. Guide Shoes: Roller type with three or more spring dampened, sound-deadening rollers per shoe.

F. Finish Floor Covering: Color selected by Architect.

G. Sills: One piece extruded aluminum with extruded extension between car entrance columns to face of car front return.

H. Doors: Provide as specified for hoistway entrance doors.

I. Door Hangers: Two-point hanger roller with neoprene roller surface and suspension with eccentric upthrust roller adjustment.

J. Door Track: Bar or formed, cold-drawn removable steel track with smooth roller contact surface.

K. Door Header: Construct of minimum 12 gauge steel, shape to provide stiffening flanges.

L. Door Electrical Contact: Prohibit car operation unless car door is closed.

M. Door Clutch: Heavy-duty clutch, linkage arms, drive blocks and pickup rollers or cams to provide positive, smooth, quiet door operation. Design clutch so car doors can be closed, while hoistway doors remain open.

N. Restricted Opening Device: Restrict opening of car door(s) outside unlocking zone.

O. Door Operator: High speed, heavy-duty closed loop door operator capable of opening doors at no less than 2-1/2 f.p.s. Accomplish reversal in no more than 2-1/2" of door movement. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Maintain consistent, smooth, and quiet door operation at all floors, regardless of door weight or varying air pressure.

P. Door Control Device:
   1. Infrared Reopening Device: Black, fully enclosed device with full screen infrared matrix or multiple beams extending vertically along leading edge of each door panel to minimum height of 7'-0" above finished floor. Provide extension of housing and lens full height of door panels. Device shall prevent doors from closing and reverse doors at normal opening speed if beams are obstructed while doors are closing, except during nudging

operation. In event of device failure, provide for automatic shutdown of car at floor level with doors open

2. Nudging Operation: After beams of door control device are obstructed for a predetermined time interval (minimum 20.0 - 25.0 seconds), warning signal shall sound and doors shall attempt to close with a maximum of 2.5 foot pounds kinetic energy. Activation of the door open button shall override nudging operation and reopen doors.
3. Interrupted Beam Time: When beams are interrupted during initial door opening, hold door open a minimum of 3.0 seconds. When beams are interrupted after the initial 3.0 second hold open time, reduce time doors remain open to an adjustable time of approximately 1.0 - 1.5 seconds after beams are reestablished.
4. Differential Door Time: Provide separately adjustable timers to vary time that doors remain open after stopping in response to calls.
   a. Car Call: Hold open time adjustable between 3.0 and 5.0 seconds.
   b. Hall Call: Hold open time adjustable between 5.0 and 8.0 seconds. Use hall call time when car responds to coincidental calls.

Q. Car Operating Panel:
1. One car operating panel with faceplate, consisting of a metal box containing vandal resistant operating fixtures, mounted behind the car stationary front return panel. Faceplate shall be hinged and constructed of stainless steel, satin finish.
2. Suitably identify floor buttons, alarm button, door open button, door close button and emergency push-to-call button with SCS, Visionmark, or Entrada cast tactile symbols rear mounted. Configure plates per local building code accessibility standards including Braille. Locate operating controls no higher than 48" above the car floor; no lower than 35" for emergency push-to-call button and alarm button.
3. Provide minimum 3/4" diameter raised floor pushbuttons which illuminate to indicate call registration.
4. Provide alarm button to ring bell located on car. Illuminate button when actuated.
5. Provide keyed stop switch at bottom of car operating panel in locked car service compartment. Mark device to indicate "run" and "stop" positions.
6. Provide "door open" button to stop and reopen doors or hold doors in open position.
7. Provide "door close" button to activate door close cycle. Cycle shall not begin until normal door dwell time for a car or hall call has expired, except firefighters' operation.
8. Provide firefighters' locked box as required by code.
9. Provide firefighters' Phase II key switch with engraved instructions filled red. Include light jewel, audible signal, and call cancel button.
10. Provide lockable service compartment with recessed flush door. Door material and finish shall match car return panel or car operating panel faceplate.
11. Include the following controls in lockable service cabinet with function and operating positions identified by permanent signage or engraved legend:
    a. Inspection switch.
    b. Light switch.
    c. Two-position exhaust blower switch. Three-position exhaust blower switch.
    d. Independent service switch.
    e. Constant pressure test button for battery pack emergency lighting.
    f. 120-volt, AC, GFCI protected electrical convenience outlet.
    g. Stop switch.
    h. Switch to select either floor voice annunciation, floor passing tone, or chime.
    i. Card reader override switch.
12. Provide six (6) sets of keys for all switches and control features, properly tagged and marked.
13. All Code required and specified engraving shall be provided. Photo etching and/or stick-on signage will not be accepted. Provide engraved or approved etched signage as follows with approved size and font:

a. Phase II firefighters' operating instructions on main operating panel above corresponding key switch filled red.
b. Car number on main car operating panel.
c. "Certificate of Inspection on File in Building Office" on main car operating panel.
d. Car capacity in pounds on main car operating panel service compartment door.

R. Car Top Control Station: Mount to provide safe access and utilization while standing in an upright position on car top.

S. Work Light and Duplex Plug Receptacle: GFCI protected outlet at top and bottom of car. Include on/off switch and lamp guard.

T. ELEVATOR TWO-WAY VOICE COMMUNICATION:
1. Provide elevators with a complete hands-free telephone communication system, which satisfies requirements of Elevator Code, including a battery back-up capable of operating communication system for a minimum period of four (4) hours, in the event of a power loss. Phone unit must have a minimum of two-number programmed dialing abilities along with the ability to automatically enable two-way voice communications initiated by a device outside of the elevator cab.
2. Hands-free telephone unit shall be securely mounted behind car operating panel, while a circular pattern of perforations (3" in diameter) shall be made directly in front of speaker. Where required, an additional perforation shall be made for the microphone.
3. In the general area of speaker perforations, surface engrave elevator number (1" high) and phrase "In case of emergency, press help button, wait for answer" in letters at least ¼" high. All engraving shall be filled in black.
4. Provide shielded wiring running between in-car telephone and controller. Assume responsibility for final installation and hook-up of two-way communication system and co-ordinate, with Owner, specific phone line requirements and where calls are to be automatically directed.
5. Communication system shall comply with all Elevator Codes.

2.9 CAR ENCLOSURE

A. Provide complete as specified herein and finish details on Architectural Drawings. Provide the following features.
1. Walls: Manufacturer's standard 14 gauge steel shell with 12 gauge canopy.
   a. Cab interiors as specified and/or detailed on architectural drawings.
2. Canopy: as specified and/or detailed on architectural drawings.
3. Ceiling: as specified and/or detailed on architectural drawings downlights.
4. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with #4 stainless steel.
5. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
   a. Door Finish: Stainless steel panels: No. 4 brushed finish.
6. Cab Sills: Extruded aluminum, mill finish.
7. Handrail: as specified and/or detailed on architectural drawings.
8. Bumper Rail: as specified and/or detailed on architectural drawings.
9. Ventilation: Morrison AA blower, mounted on the car top.
10. Note: Clear underside of ceiling height must be 9'-0".
11. Flooring: as specified and/or detailed on architectural drawings.

2.10 HALL CONTROL STATIONS

A. Pushbuttons: Provide 1 riser with flush mounted faceplates per floor. Buttons shall be vandal-resistant (see pre-qualified products) and meet the requirements of CBC Title 24. Include pushbuttons for each direction of travel which illuminate to indicate call registration. Include approved engraved message and pictorial representation prohibiting use of elevator during fire or other emergency situation as part of faceplate. All Code required and specified engraving shall be provided. Photo-etching or stick-on signage will not be accepted. Pushbutton design shall match car operating panel pushbuttons. Provide with L.E.D. illumination.

2.11 SIGNALS

A. Hall Lanterns: Provide at each entrance to indicate travel direction of arriving car. Locate as detailed on architectural drawings. Illuminate up or down LED lights and sound tone once for up and twice for down direction prior to car arrival at floor. Sound level shall be adjustable from 20 - 80 dBA measured at 5'-0" in front of hall control station and 3'-0" off floor. Illuminate light until the car doors start to close. Provide advanced hall lantern notification to comply with ADA hall call notification time.

B. Car Position Indicator: Alpha-numeric digital indicator containing floor designations and direction arrows a minimum of 1/2" high to indicate floor served and direction of car travel. Locate fixture in car operating panel. When a car leaves or passes a floor, illuminate indication representing position of car in hoistway. Illuminate proper direction arrow to indicate direction of travel.

C. Faceplate Material and Finish: #4 stainless steel for all fixtures.

D. Floor Passing Tone: Provide an audible tone of no less than 20 decibels and frequency of no higher than 1500 Hz, to sound as the car passes or stops at a floor served.

E. Firefighters' Key Box: Flush-mounted box with lockable hinged cover. Engrave instructions for use on cover per Local Fire Authority requirements.

F. Fixtures shall be located as directed by Architect. Where applicable, identify all indicators and manual switches with appropriate engraving. Provide conduit and wiring to any control panel.

G. Floor Passing Tone: Provide an audible tone of no less than 20 decibels and frequency of no higher than 1500 Hz, to sound as the car passes or stops at a floor served.

H. Firefighters' Key Box: Flush-mounted box with lockable hinged cover. Engrave instructions for use on cover per Local Fire Authority requirements.

PART 3 - EXECUTION

3.1 SITE CONDITION INSPECTION

A. General: Furnish labor, materials, and equipment necessary for tests. Notify the AHJIA five (5) days in advance when ready for the final review of the elevator. Final acceptance of installation will be made only after all field-quality control reviews have been completed, identified deficiencies have been corrected, all Owner's information and certificates have been received, and the following items have been completed to the satisfaction of the AHJIA and Consultant.

B. Provider shall perform review and evaluation of all aspects of its work prior to requesting Consultant's final review. Work shall be considered ready for Consultant's final contract compliance review when copies of Provider's test and review sheets are available for Consultant's review and all elements of work or a designated portion thereof are in place and elevator or groups of elevators are deemed ready for service as intended.

C. Furnish labor, materials, and equipment necessary for Consultant's review. Notify Consultant a minimum of five (5) working days in advance when ready for final review.

D. Consultant's written list of observed deficiencies of materials, equipment and operating systems will be submitted to Provider for corrective action. Consultant's review shall include as a minimum:

1. Workmanship and equipment compliance with Contract Documents.
2. Contract speed, capacity, floor-to-floor, and door performance comply with Contract Documents.
3. Performance of following items are satisfactory:
   a. Starting, accelerating, running
   b. Decelerating, stopping accuracy
   c. Door operation and closing force
   d. Equipment noise levels
   e. Signal fixture utility
   f. Overall ride quality
   g. Performance of door control devices
   h. Operations of emergency two-way communication device
   i. Operations of Phase I & II Firefighters' Service
   j. Operations of any seismic devices
   k. Operations of special security features and floor lock-off provisions
   l. Operations of remote monitoring devices
4. Test Results:
   a. In all test conditions, obtain specified contract speed, performance times, stopping accuracy without re-leveling, and ride quality to satisfaction of Purchaser and Consultant. Tests shall be conducted under both no load and full load condition.
   b. Temperature rise in motor windings limited to 50° Celsius above ambient. A full-capacity, one (1) hour running test, stopping at each floor for ten (10) seconds in up and down directions, may be required.

E. Performance Guarantee: Should tests review reveal/identify defects, poor workmanship, variance or noncompliance with requirements of specified Codes and/or ordinances, or variance or noncompliance with the requirements of Contract Documents, Provider shall complete corrective work in an expedient manner to satisfaction of Purchaser and Consultant at no cost as follows:

1. Replace equipment that does not meet Code or Contract Document requirements.
2. Perform work and furnish labor, materials, and equipment necessary to meet specified operation and performance.
3. Perform and assume cost for retesting required by Governing Code Authority, Purchaser and Consultant to verify specified operation and/or performance.

F. A follow-up final contract compliance review shall be performed by Consultant after notification by Provider that all deficiencies have been corrected. Provide Consultant/University with copies of the initial deficiency report marked to indicate items which Provider considers complete. If additional reviews are required due to Provider's gross non-compliance with initial and follow-up

deficiency reports, Consultant shall bill Provider at normal billing rates plus expenses, and Provider acknowledges it will pay for additional compliance reviews.

3.2 OWNER'S INFORMATION, MAINTENANCE MATERIALS AND TOOLS

A. General: Within thirty (30) days following final acceptance of the elevator installation, provide all wiring diagrams, written information, supplemental data, spare parts and diagnostic tools necessary for proper maintenance and adjustments of the equipment, including the following: (Materials must be job-specific for this project.)

B. Wiring Diagrams:

1. Provide two (2) copies and one (1) Mylar reproducible transparency of all wiring diagrams, including straight-line wiring diagrams of all "As Built and Installed" elevator electrical circuits, complete with an index of the location and function of all components. Note: Mylar reproducible shall be Photographic Grade, 5 mil thickness, matted both sides and printed on back side. Provide photographic negatives for all drawings.
2. Leave one (1) complete set of final corrected installation diagrams and adjuster's wiring dope sheets on the job.

C. Shop Drawings: Provide three (3) copies of all final corrected construction and installation drawings.

D. Operation and Maintenance (O&M) Manuals: Provide three (3) neatly bound and indexed sets of O&M manuals containing the following:

1. Sequence of operation and/or flow charts of the motion and supervisory control panels and related operating equipment. Include logic diagrams for all individual and group microprocessors.
2. Operation and maintenance instructions, consisting of detailed application data and instructions for all equipment components, including car, corridor and remote signal/control fixtures.
3. Lubrication program, including recommended procedures and grades of cleaners and lubricants to be used.
4. Parts Catalogs for all replaceable parts, including ordering forms and instructions. NOTE: If a given component is made up of smaller parts, the smaller parts shall also be clearly identified by number.
5. Summary of contract data for each type of equipment furnished, including quantities and part numbers.

   Step-by-step installation and adjusting procedures, as used by equipment manufacturers and installer's field personnel, for each type of equipment furnished. This shall include, but not be limited to, complete data and settings for the following:

   a. Motion Controllers:
      (1) Power conversion and drive unit adjustments, including relay air gaps, current operated relays, overload relays, timed circuits, acceleration and deceleration patterns and all other field adjustable settings.
      (2) Overload relays, timed circuits, and all other field-adjustable settings.
   b. Motors: Air gap, compounding, neutral setting and all other necessary adjustments.
   c. Selectors, etc.
   d. Hoistway switches, inductors, transducers, vanes, cams, etc.
   e. Terminal landing slow-down device.
   f. Leveling/re-leveling units.
   g. Guide shoes: Roller guide spring tension and stop settings.

h. Door operator: Door operator motor, control switches, cams, rheostats, potentiometers and resistors.
i. Car and hoistway doors: Door closers, door and gate locks, clutches or bayonets, pick-up and drive rollers, door un-locking cam and car door restrictors.
j. Door protective devices: Focusing, testing, adjusting and maintenance procedures.
k. Communications, annunciating, monitoring and security systems.
l. Pump flow and leveling control valves, relief valves and jack packing gland.

E. Supplemental Data:

1. List of necessary tools, instruments and other equipment used in the adjusting procedure, including the techniques for incorporating them in procedures.
2. Final adjusting data for elevator unit, including settings for the following:
   a. Selectors/encoders.
   b. Hoistway switches, inductors, transducers, etc.
   c. Door operator control switch settings.
   d. Full-load starting and running current.
   e. Current settings of current-operated relays.
   f. Timers: Time delay settings, including method and equipment needed to program microprocessor.
   g. Electronic power supply voltages necessary for correct functioning of equipment and from where measured.
   h. Full-load starting and running current.
   i. Timers: Time delay settings, including method and equipment needed to program microprocessor.
   j. Electronic power supply voltages necessary for correct functioning of equipment and from where measured.
3. During the warranty period and for a period of not less than two (2) years following expiration of warranty, provide the AHJIA with any and all supplementary bulletins or correspondence, issued by either the equipment manufacturer, supplier, or installer, relative to any improved replacement parts and any revised procedures for maintenance, trouble shooting and adjustment on any and all equipment installed.
4. Provide any and all data required or requested by AHJIA to facilitate equipment maintenance and adjustment.
5. All materials to be turned over to AHJIA at the close of the project. This shall include keys, manuals, tools, parts, drawings, etc.

G. Systems that require periodic entry of codes, etc. due to elapsed time or accumulated faults, calls, etc will not be acceptable. All required diagnostic tools shall be furnished to the Owner at the end of the contract. Equipment Design is to be "Non-Proprietary Type".

Life expectancy: It is anticipated that the installation be capable of providing at least twenty-five (25) years of dependable service before renovation is considered. This statement of life expectancy assumes that a quality, full maintenance program remains in effect throughout the life of the equipment.

Maintenance Tools and Software Documentation: Provide all tools designed specifically for tasks associated with the examination, maintenance, trouble-shooting, repair and adjustment of the elevator equipment installed, which are not readily available through normal purchasing channels. These shall include top-level, solid-state diagnostic tools and related software documentation which the Equipment Manufacturer and Installer supplies to his/her adjusters and service personnel.

Diagnostic tools may be hand-held or built into the controller system and shall be of the type not requiring periodic re-charging or re-programming, nor be of the automatic destruct type. Or, if they do require re-programming/re-charging, this re-programming/re-charging shall be provided to the AHJIA at no charge throughout the life of the equipment.

Diagnostic tools and supporting software may not be programmed so as to operate only with this unit installation serial number/s.

CD-ROM with software programs used for each elevator unit.

Special tools and software documentation shall become the property of the University.

Final retention will be withheld until equipment and data is received by University and reviewed by Consultant.

3.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver material in Contractor's original unopened protective packaging.

B. Store material in original protective packaging. Prevent soiling, physical damage, or moisture damage.

C. Protect equipment and exposed finishes from damage and stains during transportation, erection, and construction.

3.4 INSTALLATION

A. Install all equipment in accordance with Contractor's instructions, referenced codes, specification, and approved submittals.

B. Install control room equipment with clearances in accordance with referenced codes and specification.

C. Install all equipment so it may be easily removed for maintenance and repair.

D. Install all equipment for ease of maintenance.

E. Install all equipment to afford maximum accessibility, safety, and continuity of operation.

F. Remove oil, grease, scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel.
   1. All exposed equipment and metal work installed as part of this work which does not have architectural finish.
   2. Control room equipment, hoistway equipment including guide rails, guide rail brackets, and pit equipment.
   3. Neatly touch up damaged factory-painted surfaces with original paint color. Protect machine-finish surfaces against corrosion.

3.5 FIELD QUALITY CONTROL

A. Work at jobsite will be checked during course of installation. Full cooperation with reviewing personnel is mandatory. Accomplish corrective work required prior to performing further installation.

B. Have Code Authority acceptance inspection performed and complete corrective work.

3.6 ADJUSTMENTS

A. Install rails plumb and align vertically with tolerance of 1/16" in 100'-0". Secure joints without gaps and file any irregularities to a smooth surface.

B. Static balance car to equalize pressure of guide shoes on guide rails.

C. Lubricate all equipment in accordance with Contractor's instructions.

D. Adjust motors, power conversion units, brakes, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks, and safety devices to achieve required performance levels.

3.7 CLEANUP

A. Keep work areas orderly and free from debris during progress of project. Remove packaging materials on a daily basis.

B. Remove all loose materials and filings resulting from work.

C. Clean control room equipment and floor.

D. Clean hoistways, car, car enclosure, entrances, operating, and signal fixtures.

END OF SECTION

SECTION 143100
ESCALATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: one (1) A. Heavy-duty, transit-type escalator as follows:
   1. Escalator Width:
      a. Escalator 1: 48" (40" step)
   2. Escalator Balustrade:
      a. Escalator 1: #4 Stainless Steel Metal

B. Related Requirements:
   1. Division 01 Section "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
   2. Division 03 Section "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.

1.2 DEFINITIONS

A. Terms used are defined in the latest edition of the Safety Code for Elevators and Escalators, ASME A17.1.

B. Reference to a device or a part of the equipment applies to the number of devices or parts required to complete the installation.

C. Provisions of this specification are applicable to all escalators unless identified otherwise.

1.3 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with Section 407 in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

1.4 SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for and operation, control, and signal systems. Include product data for signal fixtures, lights, graphics, Braille plates, and details of mounting provisions.

B. Shop Drawings:
   1. Include plans, elevations, sections, and large-scale details indicating layout, coordination with building structure, relationships with other construction, and locations of equipment.
   2. Indicate maximum dynamic and static loads imposed on building structure at points of support and maximum and average power demands.
   3. Power Confirmation Information: Include motor horsepower, code letter, starting current, full-load running current, and demand factor. Provide maximum and average power consumption.

C. Samples for Initial Selection: For finishes involving surface treatment, paint selection.

D. Samples for Verification: For exposed finishes:
   1. Samples of sheet materials: 3" (75 mm) square.
   2. Running trim members: 4" (100 mm) lengths.

E. Operation and Maintenance Data:
   1. To include in emergency, operation, and maintenance manuals.
   2. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include diagnostic and repair information available to Manufacturer's and Installer's maintenance personnel.

F. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.5 QUALITY ASSURANCE

A. Compliance with Regulatory Agencies: Comply with most stringent applicable provisions of following codes, laws, and/or authorities, including revisions and changes in effect:
   1. Safety Code for Elevators and Escalators, ASME A17.1
   2. Guide for Inspection of Elevators, Escalators, and Moving Walks, ASME A17.2
   3. Elevator and Escalator Electrical Equipment, ASME A17.5
   4. National Electrical Code, NFPA 70
   5. Americans with Disabilities Act, ADA A117.1
   6. Local Fire Authority
   7. Requirements of most stringent provision of local authority having jurisdiction.
   8. Life Safety Code, NFPA101

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver material in Contractor's original unopened protective packaging.

B. Store material in original protective packaging. Prevent soiling, physical damage, or moisture damage.

C. Protect equipment and exposed finishes from damage and stains during transportation and construction.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair, restore, or replace escalator work that fails in materials or workmanship within specified warranty period.

B. Failures include, but are not limited to: operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

C. Warranty Period: One (1) year from date of Substantial Completion.

1.8 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include twelve (12) months full maintenance by skilled employees of escalator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   1. Perform maintenance during normal working hours.
   2. Perform emergency callback service during normal working hours Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of sixty minutes or less.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. KONE Inc.
   2. Mitsubishi Electric Corporation.
   3. Otis Elevator Co.
   4. Schindler Elevator Corp.
   5. ThyssenKrupp Elevator.

B. Source Limitations: Obtain escalators and elevators specified in another Division 14 Section from single manufacturer.

2.2 ESCALATORS

A. Escalator System, General: Manufacturer's standard escalators systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard escalator systems and as required for complete system.

B. Description:
   1. Escalator Identification: Escalator 1
   2. Size:
      a. Escalator 1: 48" Wide (40" Step)
   3. Speed: 100 fpm
   4. Rise:
      a. Escalator 1: 37'-6" ±
   5. Floors Served:
      a. Escalator 1: Apron to Terminal
   6. Configuration: Linear
   7. Angle of Inclination: 30°
   8. Operation: Reversible
   9. Drive Motor Gear Box: Worm, Planetary Or Helical
   10. Balustrades: Vertical to deck
   11. Balustrade Finish: Satin finish stainless steel
   12. Deck Configuration: Low inner and outer
   13. Deck Finish: Satin finish stainless steel
   14. Molding and Trim: Match deck finish
   15. Skirt Panels: Match deck material and finish with low friction application
   16. Handrail Color: Black
   17. Step Tread and Riser: Cleated and meshed with adjacent step with tread demarcation inserts, tread sides and rear. Demarcation Color: Yellow
   18. Power Supply: 480 Volts, 3 Phase, 60 Hertz

19. Additional Features:
    a. Step demarcation lighting
    b. Emergency stop buttons
    c. Caution signs at each landing. Engraved plate to match deck material and finish.
    d. Truss isolation
    e. Oilless step chain
    f. Combplate lighting
    g. Deck guards
    h. Galvanized steel truss
    i. Monitoring system

2.3 MATERIALS

A. Steel
   1. Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.
   2. Sheet Steel (for Unexposed Work): Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A568/A568 M-03.
   3. Structural Steel Shapes and Plates: ASTM A36.

B. Stainless Steel: Type 302 or 304 complying with ASTM A240, with standard tempers and hardness required for fabrication, strength, and durability. Apply mechanical finish on fabricated work in the locations shown or specified, Federal Standard and NAAMM nomenclature, with texture and reflectivity required to match Architect's sample. Protect with adhesive paper covering.
   1. No. 4 Satin: Directional polish finish. Graining directions as shown or, if not shown, in longest dimension.

C. Aluminum: Extrusions per ASTM B221: sheet and plate per ASTM B209.

D. Paint: Clean exposed metal parts and assemblies of oil, grease, scale, and other foreign matter and factory paint one shop coat of standard rust-resistant primer. After erection, provide one finish coat of industrial enamel paint. Galvanized metal surfaces need not be painted

E. Prime Finish: Clean all metal surfaces receiving a baked enamel paint finish of oil, grease, and scale. Apply one coat of rust-resistant primer followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of primer.

2.4 PERFORMANCE

A. Step Speed: Unit shall be capable of operating at contract speed under any loading condition in either direction of travel.

B. Handrail Speed: Consistent with step speed.

C. Noise and Vibration Control: Provide sound isolation within truss as required to limit noise levels relating to escalator equipment and its operation to no more than 60 dBA, measured 3'-0" above escalator at any point of its length.

2.5 OPERATION

A. Each unit shall be capable of operating smoothly and quietly at rated speed with synchronized step and handrail operation and speed in either direction of travel.

2.6 MACHINE ROOM EQUIPMENT

A. Driving Machine: Worm geared, planetary, or helical spur gear reduction unit coupled directly to AC induction or P.M.S.M. drive motor. Handrail drive shall be directly coupled to drive machine

B. Drive Motor: Three-phase, operating at no greater than 1800 rpm. Motors shall be designed to operate in confined unvented spaces. Motor insulation class "F" or greater. Motor starting shall incorporate SCR soft start with closed transition.

C. Brake: Electromechanical brake to safely decelerate, stop, and hold rated load. Brake shall stop escalator operating in the down direction at a relatively constant rate not greater than three feet/second^2.

D. Controller: UL/CSA labeled.
   1. Compartment: Securely mount all assemblies, power supplies, chassis switches, relays, etc., in a substantial steel cabinet, removable from machine space for ease of access to controls and wiring. Include mainline circuit breaker, phase, and overload protection.
   2. Microprocessor-Related Hardware:
      a. Provide built-in noise suppression devices which provide a high level of noise immunity on all solid-state hardware and devices.
      b. Provide power supplies with noise suppression devices.
      c. Isolate inputs from external devices, such as safety switches, with opto-isolation modules.
      d. Design control circuits with one leg of power supply grounded.
      e. Safety circuits shall not be affected by accidental grounding of any part of the system.
      f. System fault log memory shall be retained in the event of power failure or activation of any safety device.
      g. Equipment shall be provided with Electro Magnetic Interference (EMI) shielding within FCC guidelines.
   3. Wiring: CSA labeled copper for factory wiring. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
   4. Permanently mark components (relays, fuses, PC boards, etc.) with symbols shown on wiring diagrams.
   5. Monitoring System Interface: Provide controller with serial data link through RJ 45 Ethernet connection and install all devices necessary to monitor items outlined in Section 2.13. Escalator Contractor responsible to connect monitoring system interface to machine room monitoring compartment and LAN. Wiring from LAN to the machine room monitoring compartment by others.
   6. Remote Monitoring and Diagnostics: Equip each controller with standard ports, interface boards, and drivers to accept maintenance, data logging, fault finding diagnostic, and monitoring system computers, keyboards, modems, and programming tools. The system shall be capable of driving remote color CRT monitor(s) which continually scan and display the status of each escalator.

E. Step Drive Assembly: Direct or indirect drive. Machine sprockets at each side over which step chains, step chain rollers, or steel cord reinforced polyurethane cog belt shall pass and transmit motion from machine to steps. If indirect chain drive is used between machine and drive

sprocket, provide emergency brake on drive assembly to automatically set if drive chain fails. Provide roller-type sealed bearings.

2.7 WELLWAY EQUIPMENT

A. Truss: Steel truss to safely carry entire load of escalator, including all components, full-capacity load and weight of exterior truss and balustrade covering material; Exterior cladding material, per design. Provide required factor of safety. Provide clearly identified exterior cladding support attachment locations on exposed sides and bottom of the entire length of truss. Provide structural truss reinforcement as required for support to eliminate need for intermediate building supports..

B. Truss Extensions: Provide truss and access cover extensions at upper and/or lower landings as required and/or as shown on contract drawings to suit building structural support locations.

C. Truss Isolation: Provide isolation pads at support locations to isolate truss and prevent transmission of vibration to building structure.

D. Drip Pans: Oil-tight, steel pans with sufficient strength to withstand weight of workmen entire width and length of truss.

E. Step Tracks: Construct from steel. Tracks shall be bolted sections including transitions to facilitate maintenance and replacement if required. Track sections, including transitions, shall be factory installed and aligned to insure smooth, quiet operation of running gear under all conditions. The individual track section, together with transition section, lower reversing station tension carriage, main drive shaft, and handrail drive shaft shall form a fully independent assembly.

F. Step Bands: Roller chain constructed of steel links with hardened pins or cast links connecting adjacent steps and engaging step drive assembly. Provide synthetic composition roller assemblies with sealed bearings. Escalator design shall permit step band inspection and operation while unit is running with steps removed.

G. Step Guidance System: Provide a step guidance system to control the horizontal and vertical movement of the steps.

H. Lower Reversing Station Tension Carriage: Fully independent, floating track system with spring tensioning device to maintain constant step band tension.

I. Step Assembly: Single piece die-cast aluminum, fastened to the step band. Step rollers shall have sealed bearings and be tired with synthetic composition material. Treads and riser shall be cleated. Steps shall be covered on the underside with sound-deadening material. Steps shall be removable from unit without disassembly of balustrade. Provide renewable step demarcation inserts on trailing edge of each step tread and both sides of each step tread.

J. Safety Devices: Provide step and handrail safety devices.
   1. Broken drive train/step chain
   2. Broken drive chain/drive belt
   3. Skirt obstruction
   4. Missing bridge (if required)
   5. Reversal stop
   6. Step up-thrust
   7. Handrail speed

8. Missing step
9. Step level
10. Handrail entry
11. Combplate impact
12. Step Demarcation Lights
13. Stop switch

K. Electrical Wiring:
1. Conductors: Copper throughout with individual wires coded and all connections identified on studs or terminal blocks. Type SO cable may be utilized for wiring conducting 30 volts or less, per NEC 620-21.
2. Conductors: 31 Volt RMS or greater. Provide conduit, junction boxes, connections, and mounting means per requirements of Division 16. Provide painted or galvanized steel or aluminum conduit, conduit size minimum 3/8". Flexible conduit exceeding 18" in length shall not be used.

2.8 HANDRAILS

A. Construction: Reinforced rubber running on metal guides. Handrail shall be spliced and vulcanized with smooth joint. Handrail shall be driven at the same speed as the steps. Provide tensioning device and slack-tension switch.

2.9 BALUSTRADE

A. Interior Panel: Reinforced 14 gauge metal .

B. Skirt Panels: Reinforced 14 gauge metal, if required by Contractor’s own design. Install to maintain loaded step gap clearance per code. Provide panels with skirt brushes. Extend skirt panel beyond combplates and wrap around base of newel.

C. Deck Boards: Reinforced 14 gauge metal. All deck section joints shall abut to provide a smooth surface to surface connection with butt joint transition, top and bottom, horizontal to incline sections.

D. Newel Ends: Continuous metal guides at upper and lower end of the balustrade, matching profile of handrail guides. Newel end shall include a multi-roller bearing system to minimize friction and provide smooth return of handrail.

E. Finishes:
1. Interior Panels:
   a. Satin finish stainless steel reinforced vertical panels with section joints vertical to escalator incline from skirt to handrail guide above.
2. Skirt Panels: Match deck material and finish with low friction application.
3. Inner and Outer Deck: Satin finish stainless steel.

F. Trim and Moldings: Match deck finish.

2.10 LANDINGS

A. Flat Steps: Provide upper and lower landings with two flat steps.

B. Step Demarcation Lighting: Provide minimum of two green fluorescent step demarcation lights within the step band at upper and lower landings. Locate within a maximum of 16" from combplates.

C. Combplates: Aluminum or other alloy provided with non-slip surface. Provide removable comb sections. Apply yellow powder coat finish.

D. Combplate Lighting: Provide combplate lighting in skirt panel on both sides of units at both upper and lower landings.

E. Landing Plates: Aluminum or other alloy with non-slip surface. Plate shall extend from combplates to equipment access plates at upper and lower ends. Plates shall extend full width of truss.

F. Equipment Access Plates: Aluminum or other alloy with non-slip surface. Provide removable access plates to provide for entry into equipment spaces at upper and lower ends. Plates shall cover entire truss openings. Access plates shall match material and finish of adjacent landing plates. Provide landing plate and access floor plate without visible manufacturer’s name or logo.

2.11 SIGNAL AND CONTROL FIXTURES

A. Operating Station: Provide upper and lower newel or stanchion mounted operating stations. Mount on right side when facing unit. Match deck finish. Function and operating positions of switches and buttons shall be identified with engraved characters which are readily visible from a standing position. Each station shall contain the following:
   1. Red “emergency stop” button. The button shall be covered with a transparent cover which can be readily lifted or pushed aside. When the cover is moved, an audible warning signal shall be activated. The signal shall have a minimum sound intensity of 80 dBA at the button location. The cover shall be engraved “EMERGENCY STOP”; “MOVE COVER” or equivalent legend (i.e. “LIFT COVER,” “SLIDE COVER,” etc.); and “PUSH BUTTON.” “EMERGENCY STOP” shall be in letters not less than 1/2" (13mm) high. Other required wording shall be in letters not less than 3/16" (4.8mm) high. The cover shall be self-resetting.
   2. Key switch to “start” unit.
   3. Key directional control switch.

B. Fault Indicator: Provide upper and lower end of truss with fault indicator to display source of fault without removal of equipment access plate. Locate indicator in handrail inlet box or deck board visible from landing plate.

C. Diagnostic Access Port: Provide upper and lower landings with RJ-11 diagnostic access port.

2.12 SIGNS

A. Landing Signs: Provide caution signs at top and bottom landings. Engraved plate with material and finish to match decking.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to beginning installation of equipment, examine wellway and pit areas. Verify no irregularities exist which affect execution of work specified.

B. Do not proceed with installation until work in place conforms to project requirements.

3.2 INSTALLATION

A. Install all equipment in accordance with Contractor's instructions, referenced codes, specification, and approved submittals.

B. Install all equipment so it may be easily removed for maintenance and repair.

C. Install all equipment for ease of maintenance.

D. Install all equipment to afford maximum accessibility, safety, and continuity of operation.

E. Remove oil, grease, scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel.
   1. All exposed equipment and metal work installed as part of this work which does not have architectural finish.
   2. Machine room equipment truss.
   3. Neatly touch up damaged factory-painted surfaces with original paint color. Protect machine-finish surfaces against corrosion.

F. Clean all architectural finishes and replace or restore any surfaces damaged during construction to like new condition.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of escalator installation and before permitting escalator use, perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Operating Test: Load escalator to rated capacity and operate continuously for 30 minutes over full travel distance. Record temperature rise of escalator machine during 30-minute test period. Record failure to perform as required.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on escalators.

3.4 ADJUSTING

A. Track Alignment: Re-align factory installed tracks if required to ensure continuous 4-point contact with step and chain rollers. Secure joints without gaps and file any irregularities to a smooth surface.

B. Lubricate all equipment in accordance with Contractor's instructions.

C. Adjust motors, brakes, controllers, stopping switches, and safety devices to achieve required performance levels.

D. Adjust brakes and controlled descent devices to stop escalator with variable load. Drive machine brakes shall stop the down running escalator at a rate no greater than three feet/second^2.

E. Adjust handrail speed to coincide with step speed.

3.5 CLEANUP

A. Keep work areas orderly and free from debris during progress of project. Remove packaging materials on a daily basis.

B. Remove all loose materials and filings resulting from work.

C. Clean machine room equipment, truss interior, and pit.

D. Clean balustrades, deck boards, skirt panels, operating and signal fixtures, and trim.

3.6 TEST RESULTS

A. Review procedure shall apply for individual escalators, portions of groups of escalators, and completed groups of escalators accepted on an interim basis or escalators and groups of escalators completed, accepted, and placed into operation.

B. Contractor shall perform review and evaluation of all aspects of its work prior to requesting Consultant's final review. Work shall be considered ready for Consultant's final contract compliance review when all Contractor's tests are complete and all elements of work or a designated portion thereof are in place and escalator or groups of escalators are deemed ready for service as intended.

C. Furnish labor, materials, and equipment necessary for Consultant's review. Notify Consultant a minimum of five working days in advance when ready for final review of escalator or group.

D. Equipment and Instruments: Furnish equipment and instruments to perform required tests. The following instruments may be necessary to complete the tests:
1. Multi meter
2. 500 Volt Megger
3. Alternating-current voltmeter and ammeter
4. Celsius-calibrated thermometers (two minimum)
5. Precision tachometer
6. Decibel meter for noise test

E. Consultant's written list of observed deficiencies of materials, equipment, and operating systems will be submitted to Contractor for corrective action. Consultant's review shall include as a minimum:
1. Workmanship and equipment compliance with Contract Documents.
2. Contract speed and performance comply with Contract Documents.
3. Performance of following is satisfactory:
   a. Starting and running
   b. Stopping

c. Controlled descent
d. Equipment noise levels
e. Signal and operating devices
f. Overall ride quality
g. Handrail speed
h. Operations of safety devices

4. Operating Tests:
   a. Overspeed Protection Device: Test by operating at rated speed, tripping overspeed device manually.
   b. Handrail-Tension Device: Test manually.
   c. Broken Drive Chain Devices: Test by operating at rated speed, tripping broken chain device manually.
5. Test Results
   a. In all test conditions obtain specified contract speed, handrail speed, controlled descent, performance, stopping, ride quality, and operation noise levels to satisfaction of Purchaser and Consultant. Tests shall be conducted under both no load and full load condition.
   b. Temperature rise in motor windings limited to 50° Celsius above ambient.

F. Performance Guarantee: Should Consultant's review identify defects, poor workmanship, variance, or noncompliance with requirements of specified codes and/or ordinances, or variance or noncompliance with the requirements of Contract Documents, Contractor shall complete corrective work in an expedient manner to satisfaction of Purchaser and Consultant at no cost as follows:
   1. Replace equipment which does not meet code or Contract Document requirements.
   2. Perform work and furnish labor, materials, and equipment necessary to meet specified operation and performance.
   3. Perform retesting required by Governing Code Authority, Purchaser, and Consultant.

G. A follow-up final contract compliance review shall be performed by Consultant after notification by Contractor that all deficiencies have been corrected. Provide Consultant with copies of the initial deficiency report marked to indicate items which Contractor considers complete.

3.7 PURCHASER'S INFORMATION

A. Provide three sets of neatly bound written information necessary for proper maintenance and adjustment of equipment within 30 days following final acceptance. Final retention will be withheld until data is received by Purchaser and reviewed by Consultant. Include the following as minimums:
   1. Straight-line wiring diagrams of "as-installed" escalator circuits with index of location and function of components. Provide one set reproducible master. Mount one set wiring diagrams on panels, racked, or similarly protected, in escalator machine room space. Provide remaining set rolled and in a protective drawing tube. Maintain all drawing sets with addition of all subsequent changes. These diagrams are Purchaser's property.
   2. Written Maintenance Control Program (MCP) specifically designed for the equipment included under this contract. Include any unique or product specific procedures or methods required to inspect or test the equipment. In addition, identify weekly, bi-weekly, monthly, quarterly, and annual maintenance procedures, including statutory and other required equipment tests.
   3. Lubrication instructions, including recommended grade of lubricants.
   4. Parts catalogs for all replaceable parts including ordering forms and instructions.
   5. Four sets of keys for all switches and control features properly tagged and marked.

6. Diagnostic equipment complete with access codes, adjusters manuals and set-up manuals for adjustment, diagnosis and troubleshooting of escalator system, and performance of routine safety tests.

END OF SECTION

Hartsfield-Jackson
Atlanta International Airport

GATE "F3" RECONFIGURATION
Maynard H. Jackson Jr. International Terminal
"F" Concourse

Contract # FC-5801-A
Project WBS D.05.26.001

PROJECT MANUAL
VOLUME 2 OF 2

Divisions 21 - 34

Issue for Bid
April 17, 2015

Hartsfield Jackson + Partnership
191 Peachtree NE, Suite 2250, Atlanta, GA 30303

h-j+p

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Galvanized-Steel Wall Pipes: ASTM a 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

C. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

D. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

E. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide **1-inch** annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas **2 inches** above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

END OF SECTION 210517

SECTION 210518 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated and rough-brass finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish concealed–hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass–type with polished, chrome-plated finish.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass-type with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass–**or** split-casting brass-type with polished, chrome-plated finish.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge. Retain one of first two subparagraphs below.
g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
h. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with rough-brass finish.
i. Bare Piping in Equipment Rooms: One-piece, stamped-steel type–or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.

2. Escutcheons for Existing Piping:

a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed-or exposed-rivet-hinge.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
g. Bare Piping in Unfinished Service Spaces: Split-casting brass type with polished, chrome-plated-rough-brass finish.
h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
i. Bare Piping in Equipment Rooms: Split-casting brass type with rough-brass finish.
j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 210518

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Sprinklers.

B. Related Requirements:

1. Section 230523 "General-Duty Valves for Water-Based Fire-Suppression Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.

C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified fire protection contractor’s professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Items penetrating finished ceiling include the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.

B. Qualification Data: For qualified Installer.

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction.

D. Welding certificates.

E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

F. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility.

    a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

1.8 FIELD CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Construction Manager or Owner no fewer than two days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Construction Manager's or Owner's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

1. Sprinkler system design shall be approved by authorities having jurisdiction.

a. Margin of Safety for Available Water Flow and Pressure: 10–percent, including losses through water-service piping, valves, and backflow preventers.
b. Sprinkler Occupancy Hazard Classifications:
1) Building Service Areas: Ordinary Hazard, Group 1.
2) Electrical Equipment Rooms: Ordinary Hazard, Group 1.
3) General Storage Areas: Ordinary Hazard, Group 1Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
4) Office and Public Areas: Light Hazard.

2. Minimum Density for Automatic-Sprinkler Piping Design:
a. Light-Hazard Occupancy: 0.10 gpm over Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
b. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
c. Special Occupancy Hazard: As determined by authorities having jurisdiction.

3. Maximum Protection Area per Sprinkler: According to UL listing.
4. Maximum Protection Area per Sprinkler:

a. Office Spaces: 120 sq. ft. Storage Areas: 130 sq. ft.
b. Mechanical Equipment Rooms: 130 sq. ft.
c. Electrical Equipment Rooms: 130 sq. ft.
d. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

2.2 STEEL PIPE AND FITTINGS

A. Standard-Weight, Galvanized and Black Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.

C. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

D. Galvanized and Uncoated Steel Couplings: ASTM A 865/A 865M, threaded.

E. Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

F. Malleable- or Ductile-Iron Unions: UL 860.

G. Cast-Iron Flanges: ASME 16.1, Class 125.

H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

J. Grooved-Joint, Steel-Pipe Appurtenances:

1. Pressure Rating 175-psig minimum.
2. and Uncoated Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

K. Steel Pressure-Seal Fittings: UL 213, FM Global-approved, 175-psig pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

2.3 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
   a. Anvil International, Inc.
   b. National Fittings, Inc.
   c. Shurjoint Piping Products.
   d. Tyco Fire &Building Products LP.
   e. Victaulic Company.

2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

    a. AGF Manufacturing Inc.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco Fire & Building Products LP.
    d. Victaulic Company.
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved.

C. Branch Line Testers:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
    a. Elkhart Brass Mfg. Company, Inc.
    b. Fire-End & Croker Corporation.
    c. Potter Roemer.
2. Standard: UL 199.
3. Pressure Rating: 175 psig.
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
    a. AGF Manufacturing Inc.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco Fire & Building Products LP.
    d. Victaulic Company.
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
    a. CECA, LLC.

b. Corporate Piping System Co.
c. Merit Manufacturing; a division of Anvil International, Inc.

2. Standard: UL 1474.
3. Pressure Rating: 250-psig minimum.
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

F. Flexible Sprinkler Hose Fittings:

1. Standard: UL 1474.
2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
3. Pressure Rating: 175-psig minimum
4. Size: Same as connected piping, for sprinkler.

2.4 SPRINKLERS

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating for Residential Sprinklers: 175-psig maximum.

C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

D. Pressure Rating for High-Pressure Automatic Sprinklers: 250-psig Automatic Sprinklers with Heat-Responsive Element:
1. Nonresidential Applications: UL 199.
2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

E. Sprinkler Finishes: Chrome plated.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

~~1.~~ Ceiling Mounting: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting**:** Chrome-plated steel one piece, flat.

G. Sprinkler Guards:

1. Standard: UL 199.
2. Type: Wire cage with fastening device for attaching to sprinkler.

2.5 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes NPS 2 and smaller.

E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

G. Install alarm devices in piping systems.

H. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

I. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.

J. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

K. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

L. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

2.6 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

2.7 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

2.8 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

2.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

2.10 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

2.11 PIPING SCHEDULE

A. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller~~,~~ shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
3. Standard-weight black-steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.
4. Standard-weight black-steel pipe with plain ends; steel welding fittings; and welded joints.

B. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 4, shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

C. Standard-pressure, wet-pipe sprinkler system, NPS 5 and larger ~~s~~hall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, black-steel pipe with cut or roll grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

2.12 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers**.**
2. Rooms with Suspended Ceilings: Pendent, recessed, flush, and concealed sprinklers as indicated.
3. Wall Mounting: Sidewall sprinklers.

B. Provide sprinkler types in subparagraphs below with finishes indicated.
1. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
2. Upright and Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313

SECTION 220010

PLUMBING GENERAL

PART 1 - GENERAL

1.01 DESCRIPTION

A. These plumbing general provisions specified herein apply to all Sections of Division 22.

B. Refer to the General and Supplementary Conditions and Division 01 for special requirements and conditions which apply to all Sections of Division 22.

C. This Section includes responsibilities and obligations in support of the performance verification specified in Section 220090, Plumbing Performance Verification.

1.02 QUALITY ASSURANCE

A. Conform to the following:

1. International Energy Conservation Code-2009 with Georgia State Amendments-2012.

2. International Fuel Gas Code-2012 with Georgia State Amendments-2014.

3. International Plumbing Code-2012 with Georgia State Amendments-2014.

B. Codes, standards and regulations specified herein refer to the edition date. Revisions and addenda to these codes, standards and regulations shall be part of these specifications. Provisions of referenced codes, standards, and regulations do not create duty or responsibility by the Architect or the Owner, unless otherwise specified herein.

C. Codes, standards and regulations referred to are minimum standards. Where the requirements of these specifications or drawings exceed those of the codes, standards and regulations, the drawings or specifications shall govern.

D. Plumbing Design Coordination:

1. Reasonable efforts have been made to coordinate plumbing with the following associated trades.

2. Electrical:

a. The power ratings of motors, and other plumbing electrical equipment with the electrical characteristics serving them, as specified herein and indicated on the Drawings, have been established as minimums which will allow that equipment to satisfactorily function while producing the required capacities. These power ratings include a safety factor deemed appropriate to accommodate common differences between design parameters and field construction practices. Under no circumstances shall equipment with power ratings less than those indicated on the Drawings or specified herein be provided.

b. Differences among manufacturers of plumbing equipment make it impossible to produce a single electrical design which will satisfy the varying electrical requirements of those manufacturers. Consequently, the Contractor shall coordinate the electrical requirements of the plumbing equipment actually furnished on this Project, and provide the electrical systems required by that equipment. This coordination effort shall be completed prior to the installation of either the plumbing equipment or the electrical systems serving that equipment. Electrical system revisions required to coordinate with the plumbing equipment actually furnished shall be provided at no additional cost to the Owner.

3. HVAC:

a. Coordinate with the HVAC equipment for final locations of floor drains and make-up water.

E. Adhesives, Mastics, and Sealants:

1. Adhesives, mastics, sealants, and sealant primers used inside the building (defined as inside the weatherproofing envelope and applied on site) shall comply with SCAQMD Rule 1168-2005 for low volatile organic compound content limits.

2. Aerosol adhesives shall comply with GS 36-2013 for low volatile organic compound content limits.

F. Paints and Coatings:

1. Anticorrosive and antirust paints applied to interior ferrous metal shall not exceed a volatile organic compound content limit of 250 g/L per GS 11-2013.

1.03 SPACE CONDITIONS

A. Drawings are diagrammatic in nature and, unless explicitly dimensioned, indicate approximate locations of fixtures, apparatus, equipment and piping. Changes in the location, and offsets, of same which are not shown on the Drawings but are necessary in order to accommodate building conditions and coordination with the work of other trades, shall be made during the preparation of coordination drawings and prior to initial installation, without additional cost to the Owner.

B. Provide access to equipment and apparatus requiring operation, service or maintenance throughout the life of the system.

C. Piping or equipment shall not be installed in electrical equipment rooms, elevator equipment rooms, or elevator shafts unless specifically indicated on the Drawings. In addition, piping or plumbing equipment shall not be installed in the space equal to the width and depth of switchgear, switchboards, panelboards, and motor control centers from floor to structure above nor within the working space in front, rear and/or side (where rear and/or side access is required to work on equipment) of electrical equipment (switchgear, switchboards, panelboards, motor control centers, variable frequency drives, transformers, and starters). Dimensions of the working space shall be a minimum depth of 42" horizontally, the width of the equipment or 30", whichever is greater, and the height of the equipment or 78", whichever is greater. Minimum depth shall be increased to 60" for equipment rated over 600 V.

1.04 ASBESTOS MATERIALS

A. Materials containing asbestos or any trace of asbestos related materials shall not be used on this Project.

1.05 DEFINITIONS

A. Exposed piping or conduit is that which can be seen when the building is complete without opening or removing access doors or panels or accessible ceiling components.

B. Other piping or conduit is considered to be concealed.

1.06 CONTINUITY OF EXISTING SERVICE AND SYSTEMS

A. Schedule work so existing systems will not be interrupted when they are required for normal usage of the existing building. Obtain approval from the Owner and Architect at least 7 days prior to any utility interruption or connection.

B. Perform work at such time and in such manner as to cause minimum inconvenience to the Owner and as approved by the Architect. No allowance will be made for lack of knowledge of existing conditions.

1.07 TEMPORARY SERVICES

A. Temporary utilities shall be in accordance with requirements specified herein.

B. Immediately after award of contract, determine the time of demolition in the existing building and the time of excavation for the new building, and be ready to:

1. Arrange with the Architect for making new connections to existing mains.

2. Remove existing equipment and cap piping.

3. Protect existing piping in the path of new construction.

1.08 RELATED WORK DESCRIBED IN OTHER DIVISIONS

A. Installation of access panels in wall and ceiling construction.

B. Cutting, coring, waterproofing, and patching of walls, floors, ceilings, roofs and structure of existing buildings.

C. Painting, except as specified herein.

D. Electric power, interlock, and control wiring, except as specified herein.

E. Installation of starters, contactors, thermal overload switches, and remote push buttons, except as specified herein.

F. Foundation drainage system.

G. Catch basin construction.

H. Manhole construction.

I. Demolition, including removal of fixtures, piping, and equipment.

1.09 UTILITY CONNECTIONS AND SERVICE

A. Water:

1. Arrange for connection to the existing water service and extension of service. Pay charges in connection therewith.

B. Sewer:

1. Arrange for the sewer connections and pay charges in connection therewith.

2. The installation shall comply with the requirements of the Water Pollution Control Division of the City.

1.10 SUBMITTALS

A. Within 15 days after notice to proceed, submit a schedule indicating the proposed submission date of each submittal specified herein. Schedule shall anticipate the submittal review time, the possible need for resubmittals, and the time required for fabrication, shipping and integration into the construction sequence. Architect will advise of any conflicts in reviewing submittals that the proposed schedule presents.

B. Submittals shall be prepared in a line-by-line format corresponding to these Specifications and shall indicate compliance with each requirement specified herein and indicated on the Drawings.

1. In addition to any other transmittals or cover sheets used, fill out and attach to each individual submittal a copy of the Cover Sheet for Submittals to Newcomb & Boyd included at the end of this Section.

2. Indicate manufacturer's installation instructions.

3. Indicate deviations, if any, including any from the manufacturer's installation instructions.

4. Reproductions or electronic versions of design drawings shall not be used in the preparation of shop drawings.

5. Resubmittals that are required to address review comments shall include a cover transmittal with a written explanation of how each review comment has been addressed.

6. Submittals not specifically required, or not complying with the format requirements, will be returned unreviewed.

7. Shop drawings shall be provided in AutoCAD 2013 format.

8. Submittals in 3-ring binders shall include an index of contents and divider tabs.

C. Shop drawings shall include the following:

1. Trade shop drawings (i.e., plumbing piping system drawings and electrical main feeder raceway drawings) shall be submitted within 30 days after award of contract.

2. Approved trade shop drawings shall be utilized as the basis for the coordination drawings. Coordination drawings shall be submitted within 30 days after approval of trade shop drawings.

3. Coordination drawings shall utilize either manual or electronic means of analyzing the work of each trade in spatial relationship with other trades. Locations of conflicts between trades, and the proposed resolution for each conflict, shall be noted on the coordination drawings submitted.

4. No work shall be fabricated and/or installed prior to receipt by the Contractor of approved trade shop drawings and approved coordination drawings without specific written authorization from the Architect. No change orders will be approved or design assistance provided for remedial field coordination activities for work fabricated and/or installed prior to receipt by the Contractor of approved trade shop drawings. and approved coordination drawings.

D. General submittals shall include the following:

1. Performance Verification Supervisor qualifications.

2. Coordination drawings, with dimensions and elevations, of plumbing work including equipment, piping with fittings, valves, accessories and sleeves where applicable, coordinated with the work of other trades, including HVAC, fire suppression, electrical, structural, and architectural, minimum 1/4" = 1'-0" scale.

3. Seismic restraint devices, including calculations, restraint selection, installation details and written confirmation that a licensed engineer prepared the calculations.

E. Plumbing submittals shall include the following:

1. Drains and cleanouts.

2. Hot water circulating pumps.
3. Insulation.
4. Piping system drawings, showing equipment, piping, fittings, elevations, dimensions, valves, sleeves, and accessories, coordinated with building conditions and other trades, minimum 1/4" = 1'- 0" scale.
5. Plumbing fixtures and trim.
6. Sump pumps.
7. Temperature maintenance cable.
8. Valves.
9. Wall hydrants and hose bibs.

1.11 EQUIPMENT AND INSTALLATION REQUIREMENTS

A. Equipment and materials shall, unless otherwise specified herein, be new and shall be of the customary standard and quality furnished by the designated manufacturer for that catalogue number.

B. Materials and equipment shall be UL listed, and shall bear the UL listing mark on products for which standards have been established and for which listing is regularly furnished by UL.

1. In lieu of the UL listing, or where standards have not been established by UL and UL listing is not regularly furnished, materials and equipment shall be listed by a laboratory recognized under the OSHA Nationally Recognized Testing Laboratory Program or by a laboratory accredited by International Accreditation Service. Examples include:

a. Canadian Standard Association.
b. ETL Testing Laboratories, Inc.
c. MET Electrical Testing Company, Inc.

PART 2 - PRODUCTS

2.01 HANGERS AND SUPPORTS

A. General:

1. Make hanger assemblies and channel strut systems complete with hanger rods, nuts, bolts, screw attachments, and upper supports attached to the structure as applicable to Project requirements.
2. Select hanger assemblies for single piping, using the weight of piping, insulation, and valves being supported.
3. Select channel strut systems for gang piping, using the combined weight of the piping, insulation, and valves being supported.
4. Select supports for equipment with an additional live load of 300 lb for workers and supplies.

B. Pipe Hangers:

1. Steel piping and insulated water piping 0.5" to 3": adjustable band hanger, steel with galvanized finish and threaded swivel knurl nut.

a. Manufacturer: Anvil 69, B-Line B3170NF, or PHD 141.

2. Steel piping and insulated water piping 4" and larger: adjustable clevis hanger, steel with galvanized finish.

   a. Manufacturer: Anvil 260, B-Line B3100, or PHD 451.

3. Cast iron piping (insulated and non-insulated): AWWA adjustable clevis hanger, steel with galvanized finish.

   a. Manufacturer: Anvil 590, B-Line B3102, or PHD 420.

4. Channel strut systems for gang piping: minimum 14 gauge galvanized steel strut with factory-punched attachment holes, and galvanized straps, nuts, bolts, washers, and accessories. Straps shall be designed so that the attachment nut is captive on the shoulder of the strap when tightened, and designed to provide a surface on the turned down edge against the pipe while making positive contact with the side walls of the channel.

   a. Manufacturer: Anvil, B-Line, PHD, or Unistrut.

C. Equipment Supports:

1. Channel strut systems for equipment supports: minimum 14 gauge galvanized steel strut with factory-punched attachment holes for hanger rods, with stainless steel nuts, and washers.

   a. Manufacturer: Anvil, B-Line, PHD, or Unistrut.

D. Hanger Rods:

1. One-piece stainless steel type, threaded as required.

2. Sizes for single hangers:

Pipe Size	Rod Diameter
2" and smaller	0.375"
2.5" and 3"	0.5"
4" and 5”	0.625"
6" and 8”	0.75"
10" and 12”	0.875"
14” to 18”	1.0”

E. Embedded Concrete Inserts:

1. Single hanger type for piping and equipment up to 1400 lb load limit per hanger: malleable iron with galvanized finish, channel nuts, extended anchors, and nut cavity protection.

   a. Manufacturer: Anvil 282, or B-Line B3014.

2. Single hanger type for piping and equipment up to 1000 lb load limit per hanger: steel with galvanized finish, channel nuts, anchor tabs, and nut cavity protection.

   a. Manufacturer: Anvil 281, B-Line 2505-2508, or PHD 951.

3. Multiple hanger type for piping up to 2000 lb/ft: steel with galvanized finish, channel nuts, end caps, anchor tabs, and nut cavity protection.

   a. Manufacturer: Anvil PS-5000, or B-Line B221.

F. Expansion Anchor Type, Concrete/Masonry Inserts:

1. Steel sleeve type: for bolting frames to concrete slabs and walls. Complete with threaded stud body, expansion sleeve, hex nut, washer, and stainless steel construction. Anchors shall have a minimum 1000 psig pull out strength.

   a. Manufacturer: Hilti, ITW, or Powers.

2. Steel overhead sleeve type: to concrete slabs for threaded hanger rods. Complete with threaded stud body, expansion sleeve, female threaded rod coupling nut, washer, and stainless steel construction. Anchors shall have a minimum of 1000 psig pull out strength.

   a. Manufacturer: Hilti, ITW, or Powers.

3. Drop-in shell type: for threaded hanger rods to post-tension and precast concrete structures. Complete with female threaded steel shell, expansion cone, flush embedment lip, and stainless steel construction. Anchors shall have a minimum of 1000 psig pull out strength.

   a. Manufacturer: Hilti, ITW, or Powers.

4. Steel sleeve type for bolting to concrete block and brick walls: complete with split expansion sleeve over a threaded stud bolt body with integral expander, nut, washer, and stainless steel construction. Anchors shall have a minimum 300 psig pull out strength.

   a. Manufacturer: Hilti, ITW, or Powers.

G. Steel Beam and Joist Clamps:

1. Wide mouth flange clamp with galvanized finish, cup point set screw with lock nut, and retaining strap.

   a. Manufacturer: Anvil 93, B-Line 3033, or PHD 360.

2. Center of beam clamp, steel with galvanized finish, screw and tightening nut, and adjustable for 4" to 12" flange widths.

   a. Manufacturer: Anvil 133/134, B-Line 3055, or PHD 625.

H. Split Ring Clamps:

1. Steel piping 0.5" to 3": hinged split ring pipe clamp, malleable iron with galvanized finish, threaded rod, and base plate with mounting holes.

   a. Manufacturer: Anvil 138R, B-Line B3198H, or PHD 508R.

2. Copper piping 0.5" to 2": hinged split ring pipe clamp, malleable iron with copper finish, threaded rod, and base plate with mounting holes.

   a. Manufacturer: Anvil CT138R, B-Line B3198HCT, or PHD 512H.

I. Pipe Stand Supports:

1. Piping 4" and larger: steel floor stanchion type with galvanized finish, adjustable pipe saddles with U-bolt yoke, locknut nipple, threaded riser, and threaded baseplate with mounting holes.

   a. Manufacturer: Anvil 265, B-Line B3092, or PHD 876.

J. Offset Pipe Clamps:

1. Piping 0.75" to 12": steel offset pipe clamp with galvanized finish, top and bottom rings with nuts and bolts.

   a. Manufacturer: Anvil 103, B-Line B3148, or PHD 535.

K. Riser Clamps:

1. Steel piping: standard type, steel with galvanized finish, nuts, and bolts.

   a. Manufacturer: Anvil 40, B-Line B3373, or PHD 551.

2. Cast iron piping: AWWA type, steel with galvanized finish, nuts, and bolts.

   a. Manufacturer: Anvil 261, B-Line B3373DI, or PHD 522.

3. Copper tubing to 6" in size: steel with copper finish, nuts, and bolts.

   a. Manufacturer: Anvil CT-121, B-Line B3373CT, or PHD 552.

L. Accessories:

1. Insulation protectors: minimum 18 ga galvanized rolled steel with radius to fit the outside diameter (OD) of the insulation. Provide protectors 12" long for 6" and smaller ODs, 18" long for 8" to 10" ODs, and 24" long for 12" and larger ODs.

   a. Manufacturer: Anvil 167, B-Line B3151, or PHD 170.

2.02 VALVE TAGS

A. Minimum 19 gauge polished brass, 1.5" minimum size. Tags shall be round. Stamped numbers and letters shall be not less than 0.75" high, and filled with black paint.

2.03 IDENTIFICATION MATERIALS

A. Pipe identification shall be 5 mil thick self-adhering laminated vinyl label, meeting ANSI/ASME A13.1-2007. Lengths may vary due to wording. Widths and legends shall be as follows:

Pipe Diameter (Including Insulation)	Label Width	Size of Legend (Letters)
0.75" to 1.25"	8"	0.5"
1.5" to 2"	8"	0.75"
2.5" to 6"	12"	1.25"
8" to 10"	24"	2.5"
Over 10"	32"	3.5"

1. Legends shall be in full words, easy to read and understand, and in contrasting color to background color.

2. Roll tape flow arrows: 5 mil thick self-adhering laminated vinyl tape, meeting ANSI/ASME A13.1-2007. The tape's background shall match the pipe identification label's background, and flow arrow shall match the legend lettering.

B. Nameplates and signs: rigid laminated plastic, engraved with white letters. Background color shall be:

System	Color
Equipment served by emergency power	Red
Other equipment	Black

2.04 SLEEVES

A. Sleeves shall be standard weight steel pipe except sleeves for concealed piping through floors not in structural members, and through interior drywall construction may be formed from 26 gauge galvanized sheet metal lapped and pop riveted.

B. Sleeves in rated floor slabs shall be cast-in-place, factory-assembled one-piece watertight type.

2.05 PENETRATION SEALS

A. Firestops:

1. Firestops shall consist of an asbestos-free fill material, forming/backing/damming materials, and accessories needed to complete a UL classified through-penetration firestopping system. Fill material shall not slump or sag and shall be the required thickness in the fully cured state.

2. Firestops shall be designed to seal through-penetrations against flame, heat, smoke and water in compliance with ASTM E84-2013a, ASTM E119-2012a, ASTM E814-2013, and UL 723-2008.

3. Firestops shall be specifically designed and rated for the individual application, including movement, materials, moisture, penetrating item material, and fire and smoke ratings of the penetrated construction.

4. Manufacturer: 3M, GE, Flammadur, Hilti, Hubbard, Nelson, Rectorseal, or Thomas & Betts.

B. Expansion Seals:

1. Waterproof, modular, mechanical expansion type consisting of synthetic rubber grommets or interlocking links shaped to continuously fill the annular space between the penetrating item and the opening. Sizing of links and sleeve shall be determined by the manufacturer.

2. Manufacturer: Calpico Pipe Linx, Metraflex MetraSeal, or Thunderline Link Seal.

2.06 CONCRETE

A. Normal weight concrete (145 pcf) using Type I Portland Cement, 1" maximum size coarse aggregate to provide a minimum 28 day compressive strength of 3000 psi.

2.07 GROUT

A. Nonshrink type, conforming to ASTM C1107/C1107M-2013 when tested at fluid consistency. Grout shall exhibit zero bleeding at every age when mixed to fluid consistency. Minimum 28 day compressive strength, when mixed to fluid consistency, shall be 7000 psi.

B. Manufacturer: Cormix, or Master Builders.

2.08 ESCUTCHEONS

A. Split hinged type, constructed of chromium-plated steel or cast brass, sized to fit over insulation and to cover sleeve.

2.09 UNDERGROUND WARNING TAPE

A. Tape shall be acid- and alkali-resistant polyethylene film tape, 6" wide with minimum thickness of 0.004", specifically designed for marking and locating of underground utilities.

B. Tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3' deep. The metallic core of the tape shall be encased in a protective jacket or provided with other means of corrosion protection.

C. Tape color shall be as specified below and shall bear a continuous printed inscription describing the specific utility:

Utility	Color
Domestic cold water	Blue
Rainwater	Green
Soil	Green
Waste	Green
Utility located underground, but not listed above	Blue

D. Manufacturer: Brady, Boddingtons, Carlton Industries, Seton, or Thor Enterprises.

PART 3 - EXECUTION

3.01 PROTECTION OF EQUIPMENT AND MATERIALS DURING CONSTRUCTION

A. Provide protective covers, skids, plugs or caps to protect equipment and materials from damage or deterioration during construction.

B. Store equipment and material under cover, and off the ground or floors exposed to rain.

C. For outdoor storage, protective covers of 10 mil thick black sheet plastic shall be fitted over equipment and materials. Covers shall be reinforced to withstand wind and precipitation. Set equipment and material on skids or platforms of height to avoid damage or deterioration from spattering and ground water.

D. Plug ends of pipes when work is stopped to prevent debris from entering the pipes.

E. Provide dust and debris protection for equipment, motors, and bearings operated during construction up to date of substantial completion.

F. Provide protective covers on floor drains and floor sinks during construction to prevent debris from entering the waste piping system. Do not use any covering that will deface the drain grate's finish.

3.02 EXISTING EQUIPMENT, FIXTURES, AND PIPING SYSTEMS

A. The existing installation shall remain as is except as otherwise indicated on the Drawings or specified herein. Connect the new work with the existing work and adapt the existing work to the changes in the building and systems.

B. Coordinate the installation of new piping and other equipment with existing equipment which is to remain operational to avoid conflict with operating performance and working clearances.

C. Remove piping rendered useless due to changes. Cap outlets in piping.

D. Relocate concealed piping which is exposed by the removal of walls and reconnect.

E. Exercise care in removing plumbing fixtures which are to be reused so they are not damaged, and protect fixtures which are to remain in place while work is in progress.

F. Sleeves left open by removal of piping shall be cut flush with the finished slab, and filled with grout flush with both sides of slab.

G. Existing plumbing fixtures which are removed and are not reused in the new work shall be turned over to the Owner.

H. Material and equipment which has been removed and not accepted by the Owner shall become the property of the Contractor and shall be removed from the site.

I. Material and equipment which has been removed shall not be used in the new work, except as specified herein.

J. Where existing piping and equipment is indicated on the Drawings, its size and location shall be verified.

K. Utilize service procedures to maximize recycling, and prohibit venting, of chlorofluorocarbons and hydrochlorofluorocarbons during servicing, removal, and disposal of equipment containing refrigerants, in accordance with the Clean Air Act Amendments-1990, Title VI.

3.03 EQUIPMENT AND INSTALLATION REQUIREMENTS

A. Equipment shall be installed and connected as specified herein or indicated on the Drawings in accordance with the manufacturers' instructions and recommendations for this Project. Furnish and install auxiliary piping, water seals, valves, and electrical connections recommended by the manufacturer for operation.

B. Provide roughing, traps, tail pieces, fittings, and connecting piping, and make final water supply and drain connections to equipment.

C. Refer to manufacturer's or equipment supplier's shop drawings for exact type, number, location, dimensions and size of connections to equipment.

D. Motor quantities, sizes and equipment wattage ratings specified herein or indicated on the Drawings are the minimum requirements, unless noted otherwise. Motor quantities, sizes and equipment wattage ratings less than those specified herein or indicated on the Drawings are not acceptable. Larger motor sizes and equipment wattage ratings may only be provided if necessary to meet the prescriptive requirements specified herein or indicated on the Drawings. Where multiple motors or motor sizes or equipment wattage ratings larger than specified herein or indicated on the Drawings are furnished, provide and coordinate the corresponding increased number or capacity of feeders and other electrical equipment serving them, at no additional cost to the Owner.

E. Motors and pumps shall be statically and dynamically balanced and shall have steady state radial vibration levels which do not exceed the following:

Equipment	Peak-to-Peak Displacement mil
Motors	
under 600 rpm	4
600 to 1000 rpm	3
1000 to 2000 rpm	2
over 2000 rpm	1
Pumps and motors	
over 1800 rpm	1
under 1800 rpm	2

F. Field-installed equipment controls or sensor wiring shall be installed in conduit. Low voltage control and sensor wiring shall be installed in conduits separate from line voltage control wiring and power wiring.

G. Where water pipe sizes at equipment vary from the pipe size indicated on the Drawings, provide appropriate reducers/increasers directly adjacent to the pipe-equipment unions.

H. Unless otherwise specified herein or indicated on the Drawings, the size of the valves, piping, and accessories dedicated to a piece of equipment shall not be less than the pipe size to which they are connected.

3.04 HANGERS AND SUPPORTS

A. General:

1. Piping support spacing shall be from center to center of the support.

2. Support connected piping and equipment independently of each other.
3. Adjust hangers, clamps, and supports so that loading and support is uniform.
4. Suspend hanger rods only from the structure: do not suspend from piping, equipment, or ductwork.
5. Isolate bare copper tubing from ferrous metal hangers and channel strut supports with felt or rubber liners.

B. Hangers and Supports:

1. Support 2.5" and smaller piping independently in a parallel plane, and equally spaced side to side, except where a channel strut is used.
2. Support 3" and larger piping independently in a parallel plane, and equally spaced side to side.
3. Provide supports for piping 3" and larger, within 1' of each elbow and tee, and at each valve and strainer.
4. At groups of close-coupled valves and strainers installed in the same line, provide multiple hangers to eliminate any stress on the piping and valve joints.
5. Support domestic hot and cold water piping in chases and walls behind plumbing fixtures with brackets and U-bolts secured to the cast iron, fixture carriers, or wall studs as applicable. Select U-bolts to bear on the piping.

C. Channel Struts:

1. Where multiple pipes 0.5" to 2.5" run parallel and in the same plane, a channel strut system may be used.
2. The strut spacing shall support the smaller diameter pipe.

D. Insulated Piping:

1. For insulated piping, provide insulation protectors at each hanger and/or channel strut.
2. For insulated piping, except cast iron, select hangers and channel strut clamp sizes, for the insulation's outside diameter. Select hangers and clamps to not compress the insulation.
3. Insulated piping shall run continuous, without any breaks at hangers or channel struts, except cast iron, which shall rest directly on the hanger or channel strut.
4. Select hangers for insulated cast iron pipe to bear on the pipe. Wrap the insulation around the hanger bottom and fill and seal any voids within the hanger's upper part.
5. Install restraints on drainage piping 5" and larger, at changes in direction, and changes in pipe diameters greater than two pipe sizes, as required by the International Plumbing Code-2012.

E. Horizontal Support Spacing:

1. Supports for copper tubing: 0.5" to 1.25" maximum of 5', 1.5" to 2.5" maximum of 8', and 3" and larger maximum of 10'.
2. Supports for cast iron piping: excluding fittings, maximum of 5'.
3. Supports for steel piping: 0.5" to 1" maximum of 7', 1.5" to 2.5" maximum of 9', and 3" and larger maximum of 12'.

F. Vertical Support Spacing:

1. Anchor vertical 0.5" water piping 6' and longer in chases or walls, at the pipe's midpoint with split ring clamps attached to the studs.
2. Anchor vertical piping 8' to 16' in length, located within one space at the pipe's midpoint with offset pipe clamps or split ring clamps, as applicable, attached to the building.
3. Anchor vertical piping over 16' in length, located within one space at 8' intervals, with offset pipe clamps or split ring clamps, as applicable, attached to the building.
4. Support soil, waste, vent, and rainwater stacks with riser clamps at each floor.
5. Support soil, waste, vent, and rainwater piping vertical to horizontal offsets above grade, with a hanger on the first elbow of the offset.
6. Support vertical piping in open shafts on channel struts at every floor line, and as specified above.

G. Embedded Concrete Inserts:

1. Use for piping and equipment supports in new concrete construction.
2. Single hanger type: where the weight to be supported exceeds 50% of the inserts rated load capacity, install 2 No. 3 reinforcing rods 30" long, attached to the extended anchors at each end of the insert.
3. Multiple hanger type: where the weight to be supported exceeds 50% of the inserts rated load capacity, install No. 3 reinforcing rods 30" long, attached to the extended anchors at each end of the insert, and on 12" centers.

H. Expansion Anchor Type Concrete and Masonry Inserts:

1. Use for piping in cured concrete construction.
2. Install per manufacturer's requirements.
3. Select for maximum load plus a safety factor of 3 times the calculated load.

3.05 SLEEVES

A. Provide sleeves where pipes pass through walls, floors and roofs, except in the following circumstances:

1. Cast iron pipe built into masonry walls.
2. Concealed wall openings of the required diameter in non fire- or smoke-rated construction.
3. Concealed floor openings formed by the use of plastic forming devices providing a circular opening of the required diameter.
4. Core drilled concealed openings. Openings in roofs shall not be core drilled. Obtain written permission prior to core drilling.
5. Pipes passing through concrete floor slabs on grade.

B. Sleeves shall be placed into position prior to wall, floor, or roof construction. Sleeves shall be tight-fitting and cut smooth.

C. Floor sleeves shall be cast in place, watertight, and extend from the bottom of the slab to 2" above the finished floor.

D. Wall sleeves shall extend 1" on each side of walls.

E. Make sleeves through outside walls above and below grade watertight, and provide stainless steel escutcheons inside and outside.

F. Size sleeves to have a minimum of 1" annular space to the outside diameter of pipe and/or the pipe insulation, except as follows:

1. Sleeves in nonrated construction shall be sized to provide clearance all around pipe, including insulation, to accommodate thermal movement. Clearance shall be minimum 0.75".

2. Sleeves for borosilicate glass piping shall be 2" larger than pipe diameter.

G. Furnish 4 psf lead flashing for sleeves through flat built-up roofs extending at least 8" from the sleeve in all directions.

3.06 PENETRATION SEALS

A. General:

1. Install in accordance with the manufacturer's published instructions to achieve ratings and classifications specified herein. A copy of these instructions shall be maintained and available on site.

2. The void between piping or insulation and sleeves, except as specified herein, shall be filled by packing with fiberglass and caulking both ends 1" deep, with appropriate compound to match the wall and floor fire rating.

B. Firestops:

1. Close and firestop abandoned penetrations and penetrations through fire- and smoke-rated construction. Materials used to seal these penetrations shall continue the construction’s fire and smoke resistance ratings uninterrupted and shall maintain an effective barrier against the spread of flame, smoke, water and hot gases. Install after installation of piping and conduits.

C. Exterior Wall Seals:

1. Piping without insulation: use expansion seals between pipes and sleeves. Where walls exceed the width of expansion seals, use two seals, one being flush with the inside sleeve face and the second with the outside sleeve face. Fill the annular void space between the two seals.

2. Piping with insulation: pack center annular space between the insulation and the sleeve with fiberglass, then caulk 1" deep from each face to the fiberglass with nonhardening sealant. Smooth sealant with face of sleeve.

3.07 IDENTIFICATION OF PIPING

A. Label piping specified under this Division in accordance with ANSI/ASME A13.1-2007.

B. Labels shall be on the lower quarters of horizontal piping, except where such location would be obscured and at the plane of observation on vertical piping.

C. Wrap arrow tape completely around the pipe at each end of the label, with arrows pointing in direction of flow.

D. Locate pipe labels as follows:

1. Within mechanical rooms and above suspended ceilings:

a. Within 18" of each valve or valve assembly.

b. Within 36" of tees at both main and branch.

c. Within 36" of each 90º elbow.

d. Not over 20' intervals along horizontal piping.

e. At midpoint on vertical risers where visible.

f. Within 18" on each side of a wall.

g. Within 36" of connections to equipment or vessels.

2. Piping concealed in chases or shafts:

a. Each pipe visible through an access door or panel on each level.

3. Piping exposed in finished rooms:

a. Omit identification of piping 0.5" and smaller exposed at connections to equipment or plumbing fixtures.

b. With the above exception, identify not less than 1 point on each piping run visible in each room with identification on not over 20' intervals.

E. Piping with temperature maintenance cable shall be additionally labeled, "Electronically Traced" on the outside of the insulation jacket.

F. Schedule of Piping Identification:

Piping System	Color Coding Background/Lettering	Legend
Drainage Systems		
Sanitary	Green/White	Sanitary
Waste	Green/White	Waste
Vent	Green/White	Vent
Rainwater	Green/White	Rainwater
Overflow Rainwater	Green/White	Overflow Rainwater
Water Systems		
Cold Water	Green/White	Domestic Cold Water
Hot Water	Green/White	Domestic Hot Water
Hot Water Circulating	Green/White	Domestic Hot Water Circulating
Specialty Systems		
Compressed Air	Blue/White	Compressed Air

3.08 VALVE TAGS AND SCHEDULES

A. Provide numbered brass tags on valves except at plumbing fixtures. Attach tags to valve stems with brass S-hooks or brass chain.

B. Tags on new valves shall continue the numbering sequence of existing valves.

C. Provide for each system a typewritten schedule of valves giving number, location (room number), and function of each with a small scale diagram outlining general piping layout and location of each numbered valves.

3.09 IDENTIFICATION OF EQUIPMENT

A. General:

1. Identification shall consist of upper case letters.

2. Each piece of equipment shall be appropriately identified by nameplates with 0.25" high letters.

   a. Identification shall include the equipment designation and device function, e.g., Water Pressure Booster Pump, WPB-1.

3.10 MOTORS AND STARTERS

A. Provide motors for equipment covered in Division 22 unless otherwise specified herein. Select motors for operation not exceeding a 1.0 service factor and within the nameplate amperage and nominal power rating.

B. Provide starters, push buttons, thermal overload switches, and contactors for equipment covered in Division 22 unless otherwise specified herein.

C. Provide 120 V secondary control power transformers for control circuits where equipment is served at 208 V or higher.

3.11 FUSES

A. Provide fuses in equipment furnished under this Division of the specifications.

B. Provide 3 spare fuses of each size, UL class, and voltage rating furnished under this Division of the specifications and turn over to the Owner. Obtain a receipt for same.

3.12 EQUIPMENT AND EQUIPMENT ROOMS

A. Remove dust, dirt, rust, stains, and temporary covers.

B. Foreign matter shall be blown, vacuumed, flushed, or cleaned out of and from new equipment, fixtures, floor drains, piping, pumps, motors, bearings, devices, switches, controls, and panels.

C. Clean and polish identification plates.

D. In equipment rooms, clean equipment, insulation, piping, conduit, and room surfaces from dust and dirt and maintain in a clean condition from date of substantial completion until final completion of work and corrective work.

E. Remove excess material from the Project site.

3.13 FOUNDATIONS:

A. Provide concrete foundations for the following floor-mounted equipment:

Equipment	Foundation
Water heaters	4" high pad

1. Foundation height shall accommodate seismic anchors, but shall be not less than the minimum specified above.

B. Foundations shall be continuous and shall have beveled edges and smooth flat finish. Foundations shall be reinforced with No. 3 bars a maximum of 12" on center each way, and held in place with dowel rods at each corner anchored in the slab. Dowel rods shall not penetrate through the slab.

C. Roughen and clean exposed slabs before pouring foundations. Apply bonding agent to surfaces in contact.

D. Foundations shall extend a minimum of 6" beyond the equipment footprint in all directions, including appurtenances, vibration isolators, base elbow supports, and motors.

E. Equipment attached directly to foundations or inertia bases; bases provided with grout holes; and bases consisting of a structural frame shall have voids filled with grout after attachment to foundation.

F. Fill voids between baseplates and foundations, and level equipment, with grout.

3.14 ACCESS PANELS - BUILDING

A. Where plumbing work is concealed by walls or ceilings, or is inaccessible, provide an access panel to provide access for service and maintenance.

B. Plumbing work located above ceilings is considered accessible if the ceiling is the accessible type and is arranged for access to the equipment.

C. Fire-rated access panels shall be provided in fire barriers with ratings to match the construction fire rating.

D. Installation of access panels is specified under another Division.

3.15 ESCUTCHEONS

A. Provide escutcheons where exposed piping passes through walls, floors and ceilings in finished areas.

3.16 UNDERGROUND WARNING TAPE

A. During backfill, install tape continuously along length of piping, 12" to 18" above the piping for:

1. Domestic cold water.
2. Rainwater.
3. Soil.
4. Waste.
5. Utility located underground, not listed above.

3.17 PAINTING

A. Except where otherwise specified herein, painting shall be done under another Division. Surfaces shall be left clean and free from oil.

B. Equipment factory finishes damaged or deteriorated during construction shall be repaired to match original finish.

C. Where galvanizing is broken during fabrication or installation, recoat exposed areas with zinc-rich paint.

D. Exterior ferrous equipment, piping and supports shall be painted with 2 coats of rust preventive paint, color selected by the Architect.

E. Exposed interior uninsulated black steel piping, and exposed nongalvanized ferrous accessories, hangers, rods, inserts, and mechanical supports shall be prepared and painted with 1 coat of rust preventive paint prior to other painting or identification, or 2 coats of rust preventive paint if no other painting is specified.

F. Conduits, insulation, pipe, hangers, and saddles visible through architectural openings shall be painted flat black.

3.18 EXCAVATION AND BACKFILLING

A. General:

1. As applicable to the building and site plumbing work, excavation, shoring, bracing, backfilling, and compaction shall conform to Division 31, Earthwork, except as superseded herein.

2. The cutting and patching of hardscapes, and restoration of landscapes shall conform to Division 31, Earthwork.

3. Determine exact location of existing underground utilities before excavation.

4. Install underground piping outside the building with 36" minimum cover, unless specified otherwise herein.

B. Excavation:

1. General:

a. At minimum excavations shall comply with 29 CFR 1926.651-2011 and 29 CFR 1926.652-2010 or where applicable, an OSHA approved state plan.

b. Excavations shall be no longer or deeper than necessary.

c. When the excavated bottom contains rock or any similar material, excavate a minimum of 4" deeper than the required bottom grade, and restore with specified backfill material then compact.

d. When the bottom is over excavated, backfill to the required bottom grade with specified material then compact.

e. When the excavated bottom contains non-compactable soil and vegetation, refer to Division 31, Earthwork, for directions in removal and grade restoration.

2. Piping:

a. Excavate to the pipe's bottom line and grade. Provide recesses for pipe hubs where applicable. Pipe barrels shall be laid full length on firm bedding.

b. For plastic piping, excavate 4" deeper than the bottom line and grade, then prepare for beding backfill to restore pipe's bottom line and grade.

3. Structures: excavate to 4" below the bottom grade as indicated on the structure's detail, and prepare for a bed of leveling backfill. Keep the excavation to within the minimum area needed to install or construct the structure.

C. Backfilling:

1. General:

a. Backfill material shall be free from rocks and debris.

b. Backfill material where applicable, shall be compactable to a minimum 95% Standard Procter Density.

c. At any settling of backfill, refill the void area, recompact, and leave level with adjacent grade.

2. Backfill Material:

a. From excavated grade to 12" above pipe: compaction grade sand, crushed gravel, crushed stone, or rock dust.

b. From 12" above the pipe to finished grade: compaction grade sand, crushed gravel, crushed stone, rock dust, or excavated material free of rocks over 2" in diameter.

c. The top 18" under lawn and planting areas is required to be approved planting soil per Project's requirements.

3. Backfill Requirements:

a. Install backfill evenly in layers not over 6" deep, compacting each layer.

b. Piping: work backfill material under each lower quarter of pipes, and along barrels, taking caution not to damage pipe material or coating.

c. Structures: apply backfill material around structures, and bring up to grade in even layers.

4. Compaction:

a. Compaction inside buildings and in paved areas shall be a minimum 95% Standard Procter Density. In other areas it shall meet the compaction of the adjacent grade.

b. For all 95% compactions, a third party testing laboratory shall perform compaction test every 30', or fraction thereof, on piping runs, and at every 6' around structures.

c. Piping: use hand held tampers only around piping to 12" above the pipe. Above 12" hand guided electric tampers may be used. Do not use heavy compaction equipment or machinery which would displace or damage piping.

d. Structures: hand guided electric tampers may be used. Use caution not to damage the structure. Do not use heavy compaction equipment or machinery which would displace or damage structures.

e. Do not use water for compaction.

3.19 COORDINATION

A. Provide offsets, transitions, and fittings to coordinate the work of each trade with that of other trades, including HVAC, fire suppression, electrical, structural, and architectural.

3.20 OPERATION AND MAINTENANCE MANUALS

A. These operation and maintenance manual requirements supplement operation and maintenance manual documentation requirements of other Sections of these specifications.

B. Operation and maintenance documentation, in hardback 3-ring loose-leaf binders except full size drawings and CDs, shall cover the plumbing systems. Documentation shall include an operations and maintenance documentation directory, emergency information, operating manual, maintenance manual, test reports, and construction documents.

C. The operation and maintenance documentation package shall be submitted as one comprehensive package to the Architect 3 months before systems start-up, and shall be updated, revised and completed at completion of, construction.

D. Compile and coordinate the documentation for equipment and systems installed. Documentation shall be typewritten and shall contain, at a minimum, the following information.

1. Introduction:

a. Project name, contractors' and subcontractors' names, addresses, and telephone and facsimile numbers.

b. Index.

2. Operations and Maintenance Documentation Directory:

a. Explanation of the identification system used, including lists of systems, equipment, and component identifiers and names.

3. Emergency Information:

a. Information for technical and nontechnical personnel about actions recommended during emergency situations to protect life and property and to minimize disruption to the building occupants. Emergencies shall, at a minimum, include:

1) Fire.

2) Security breach.

3) Water outage.

4) Power failure.

5) Plumbing overflow or rupture.

6) Heating failure.

7) Cooling failure.

4. Operating Manual:

a. General Information:

1) Building function.

2) Building description.

3) Operating standards and logs.

b. Technical Information:

1) System description.

2) Operating routines and procedures.

3) Special procedures.

4) Basic troubleshooting.

5. Maintenance Manual:

a. Descriptions (specifications) of the equipment and components.

b. Description of function, as applicable: the function of the equipment, procedures before start-up, functional parameters (input, output) at the design load and at part loads, and performance verification procedures.

c. Recommended maintenance and lubrication procedures and their recommended frequency for this Project.

d. Recommended list of spare parts, part numbers, and the place(s) from which they can be obtained.

e. Original purchase order number; date of purchase; name, address, and the telephone number of the vendor; and warranty information.

f. Installation information.

g. Other information needed for the preparation of documents supporting the management of operation and maintenance programs.

6. Test Reports and Certifications:

a. Copies of tests and certifications performed during manufacture and construction, including but not limited to the following:

1) Receipt for spare fuses.

2) Receipt for instruction of operating personnel.

3) Certification of plumbing piping tests.

4) Results of domestic water system disinfection tests.

7. Construction Documents:

a. Record drawings.

b. Approved submittals, including revised shop drawings indicating as-installed conditions.

c. Equipment identification charts and schedules.

d. Warranty certificates.

e. Inspection certificates.

f. Performance verification report.

E. Submit a receipt signed by the Owner acknowledging receipt of the operation and maintenance documentation package.

3.21 RECORD DRAWINGS

A. A record of field and as-installed conditions shall be maintained at the site, shall be kept current throughout the Project, and shall be used in the preparation of the final record drawings. Field and as-installed conditions shall be recorded on design drawings and shall be marked to include addenda, change orders, field changes and selections made during construction.

B. Upon completion of the Project, submit marked-up design drawings indicating field and as-installed conditions, and shop drawings incorporating changes made during construction for piping and equipment. Submit the following:

1. 2 sets of bound prints.

2. Full size PDFs on CDs.

3.22 MAINTENANCE

A. Equipment operated prior to the date of substantial completion shall be maintained in accordance with manufacturer's recommendations.

B. Prepare and submit a lubrication chart listing for each piece of equipment:

1. Points requiring lubrication.

2. Recommendations for a single manufacturer's lubricants with brand name and designation.

3. Frequency of lubrication required.

C. Lubricate each item of apparatus requiring lubrication prior to start-up in accordance with the manufacturer's recommendations.

END OF SECTION 220010

COVER SHEET FOR
SUBMITTALS TO NEWCOMB & BOYD

Project: _____ Date: _____

Item: _____ Submittal Number: _____

Manufacturer: _____ Model: _____

Specification Paragraph and/or Drawing Number: _____

Capacity: _____

Electrical Characteristics (including identification of all separate connections or services required): _____

_____

_____

_____

Accessories: _____

_____

_____

_____

Options: _____

_____

_____

_____

Deviations (if any; if none, state so): _____

_____

General Contractor Approval: _____

SECTION 220090

PLUMBING PERFORMANCE VERIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

SCHEDULE 1 - General provisions and other plumbing systems are specified in other Sections of Division 22.

A. Performance verification is an ongoing process and shall be performed throughout construction. Performance verification verifies that systems are operating in a manner consistent with the Construction Documents.

B. This Section covers plumbing systems performance verification, as required to demonstrate that the equipment and systems of Division 22 are ready for safe and satisfactory operation, as defined by the Construction Documents. Performance verification shall include, but shall not be limited to, identification of piping and equipment, cleaning, lubrication, start-up, check-out, and testing and adjusting systems, preparation of equipment and systems documentation and of maintenance and operation manuals, Owner training, and preparation of record drawings.

C. Performance verification shall conclude with the completion of required deferred testing, training, and system documentation as specified herein and required to demonstrate the proper operation of the plumbing equipment and systems provided by this Division.

D. Verify, at a minimum, the performance of the following systems and equipment and witness the following tests:

1. Section 224200, Plumbing Fixtures:
   a. Fixture tests.
   b. Plumbing fixtures.
2. Section 224300, Drainage Systems:
   a. Piping and joint tests.
   b. Rainwater system.
   c. Sanitary, waste and vent system.
3. Section 224400, Water Systems:
   a. Freezeproof hydrants.
   b. Mixing valves.
   c. Piping and joint tests.
   d. Temperature maintenance cable.
   e. Thermal expansion tanks.
   f. Water heaters.
4. Section 224600, Specialty Systems:
   a. Compressed air system.
   b. Piping and joint tests.

1.02 QUALITY ASSURANCE

A. Provide a Plumbing Performance Verification Supervisor with ten years experience in plumbing contracting. The Plumbing Performance Verification Supervisor shall become familiar with the Owner's project requirements and the requirements of the performance verification process as defined in this Section and if applicable, the commissioning process defined in Division 29. The Plumbing Performance Verification Supervisor shall coordinate and execute the required performance verification activities.

B. The Plumbing Performance Verification Supervisor shall review submittal data for conformance with the requirements of the Project, shall monitor compliance with the requirements specified herein for storage and protection of equipment during construction, shall authorize the initial starting of equipment and systems in a manner to avoid damage to equipment, shall oversee start-up, testing and balancing, and shall document that the scheduled and specified performance requirements of each system have been accomplished.

C. Refer to ASHRAE Guideline 0-2013, The Commissioning Process, and Guideline 4-2008 (RA 2013), Preparation of Operating and Maintenance Documentation for Building Systems.

1.03 PERFORMANCE VERIFICATION RESPONSIBILITIES

A. The Plumbing Performance Verification Supervisor shall be responsible for scheduling, supervising, and coordinating and executing the start-up, testing, and performance verification activities as specified herein. Include and itemize the cost of performance verification in the contract price, and in each purchase order or subcontract written, include requirements for submittal data, performance verification efforts and documentation, operations and maintenance data, and training as specified herein.

B. Plumbing performance verification shall take place in three phases. Performance verification requirements for each phase are as follows:

1. Construction Phase:

a. Attend a performance verification scoping meeting and additional such meetings, initially scheduled monthly until prefunctional testing of equipment and systems begins, and weekly thereafter during the construction phase to facilitate the performance verification process. The Plumbing Performance Verification Supervisor shall coordinate meeting attendance.

b. Report in writing to the Architect at least as often as performance verification meetings are scheduled, concerning the status of plumbing activities as they affect the performance verification process, the status of each discrepancy identified the prefunctional and functional testing process, explanations of any disagreements with the identified deficiencies, and the proposed resolution and schedule for correction of the deficiency.

c. Provide documentation of installed systems and equipment, and develop functional testing procedures. This documentation shall include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures; full details of any Owner-contracted tests; pump curves; full factory testing reports, if any; and full warranty information, including responsibilities of the Owner to keep the warranty in force. In addition, the installation, start-up and check-out materials that are actually shipped inside the equipment and the actual field check-out sheet forms to be used by the factory or field technicians shall be submitted to the Architect.

d. Develop and submit to the Architect for review and comment, prior to equipment or system start-up, a complete start-up and initial check-out plan using manufacturer's

start-up procedures and prefunctional checklists for the performance of the equipment to be verified.

e. Assist in clarifying the proposed operation and control of equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

f. Prepare the specific functional test procedures as specified herein and review the proposed functional test procedures to ensure feasibility, safety, and equipment protection, and provide necessary written alarm limits to be used during the tests. Obtain Architect approval for proposed functional test procedures.

g. Prepare a preliminary schedule for performance verification activities, including pipe and system pressure and leakage testing, flushing and cleaning, equipment start-up, and testing, and update the schedule during the construction period, as appropriate. Notify the Architect immediately when the performance verification activities not yet performed or not yet scheduled will delay construction.

h. Plumbing equipment start-up shall not be initiated until completion of pressure and leakage testing and cleaning as specified in other Sections of Division 22.

i. Provide start-up and prefunctional testing for equipment and execute the plumbing-related portions of the prefunctional checklists for the verification of the performance of all the equipment during the start-up and initial check-out process.

j. Perform and document start-up and system operational check-out procedures, providing a copy to the Architect.

k. Correct noncompliance items before beginning functional performance testing. Water testing and adjusting shall be completed with discrepancies and problems remedied before functional testing of the respective water-related systems.

2. Acceptance Phase:

a. Place equipment and systems into operation and continue their operation during each working day of the testing, adjusting and balancing, and performance verification activities, as required.

b. For each system or area, have required prefunctional checklists, calibrations, start-up and prefunctional tests of the plumbing systems and associated controls completed prior to beginning the testing, adjusting and balancing process.

c. Provide skilled technicians to execute starting and prefunctional testing of equipment and to execute the functional tests for each individual piece of equipment and system. Technicians shall be available and present during the agreed upon scheduled tests and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

d. Perform functional testing for specified equipment and interpret the test data, as necessary.

e. Correct deficiencies (differences between specified and observed performance) as identified by the Plumbing Performance Verification Supervisor and interpreted by the Architect and retest the equipment, as required to demonstrate proper operation and performance.

f. Prepare operation and maintenance manuals as specified herein, including clarifying and updating the original sequences of operation to as-built conditions.

g. Maintain marked-up record drawings and produce final record drawings of Project drawings and contractor-generated coordination drawings. List and identify on these record drawings the locations of control system components, and sensor installations that are not equipment mounted.

h. Provide specified training of the Owner's operating personnel.

i. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

3. Warranty Period:

a. Execute deferred functional testing.

b. Correct deficiencies and make necessary adjustments to operations and maintenance manuals and as-built drawings system or equipment modifications made during the warranty period and those identified in any deferred functional performance testing.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Standard testing equipment required to perform start-up, initial check-out, prefunctional, and required functional testing shall be provided for the equipment or system being tested.

B. Test equipment shall be of the quality and accuracy required to test and/or measure system performance with the tolerances specified and shall have been calibrated within the last 12 months, or as specified herein. Equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates available on request.

1. Temperature sensors and digital thermometers shall have a certified calibration within the past 12 months and a resolution of ±0.1ºF. Accuracy of temperature test equipment shall be at least twice that of the instrumentation being tested.

2. Pressure sensors shall have a certified calibration within the 12 months and a resolution of 0.05% of sensor range. Accuracy of pressure test equipment shall be at least twice that of the instrumentation being tested.

3. Accuracy of other sensors shall be at least twice that of the instrumentation being tested.

PART 3 - EXECUTION

3.01 SUBMITTALS

A. Submit additional documentation as required to support the performance verification process. This additional submittal documentation shall include, at a minimum, the proposed start-up and initial check-out procedures, and prefunctional checklists.

3.02 START-UP PLAN AND PREFUNCTIONAL TESTING

A. Prefunctional testing shall be required for each piece of equipment to ensure that the equipment and systems are properly installed and ready for operation, so that functional testing may proceed without delays. Follow the approved start-up, initial check-out, and prefunctional testing procedures. Sampling strategies shall not be used for prefunctional testing. The prefunctional testing for equipment and subsystems of a given system shall be successfully completed and documented prior to functional testing of the system.

B. Procedures for performance verification shall include:

1. Start-up and initial check-out plan: develop the detailed start-up and prefunctional testing plans for equipment and systems that are to be performance verified, as specified herein. Review the proposed procedures and prefunctional testing documentation to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed.

2. The start-up and initial check-out plan shall consist, as a minimum, of the following:

a. The manufacturer's standard written start-up and check-out procedures copied from the installation manuals and manufacturer's normally used field check-out sheets. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.

b. First-run checklist for equipment, including:

1) Equipment properly set.

2) Alignment of shafts and couplings.

3) Adjustment of vibration isolators.

4) Piping and equipment properly connected.

5) Completion of initial lubrication procedures.

6) Wiring properly connected.

7) Electrical overload relays appropriate for load.

8) Electrical accessories properly installed and adjusted.

9) Controls, safeties, and time switches properly set.

10) Verification of direction of motor rotation after final electrical connections by jogging motor.

11) Measurement of ampere draw of electric motors and comparison with nameplate rating and with overload heater ratings.

12) Monitoring of temperature build-up in motors and bearings.

c. Contractor-developed prefunctional checklists.

3. Identify which entity is responsible for executing and documenting each of the line item tasks and note that trade on the form. Each form may have more than one trade responsible for its execution.

C. Four weeks prior to start-up, schedule equipment and systems start-up and check-out and notify the Architect in writing. The execution of the prefunctional checklists, start-up and check-out shall be directed and performed by the Contractor, in accordance with manufacturer's published procedures. The Architect shall be present for the start-up, check-out, and prefunctional testing of the first unit of each type of equipment, and any other tests he designates.

D. Sensor calibration: calibration of sensors associated with a given piece of equipment or system shall be included as part of the prefunctional testing and listed on the appropriate test checklists and reports for the system.

E. Completed start-up, check-out, and prefunctional test forms shall be completed and submitted to the Architect for review. List outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The

procedures form and any outstanding deficiencies shall be provided to the Architect within 2 days of test completion. The Architect shall review the Contractor's start-up and prefunctional testing reports and shall submit either a noncompliance report or an approval form to the Contractor. The Contractor shall correct items that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the Architect as soon as outstanding items have been corrected and resubmit an updated start-up report and a statement of correction on the original noncompliance report. When requirements are completed, the Architect shall recommend approval of the start-up and prefunctional testing of each system and schedule the functional testing of the equipment or system.

F. Complete start-up and prefunctional testing for a system before functional test of that system may proceed.

3.03 RETESTING OF EQUIPMENT AND/OR SYSTEMS

A. Provide labor and materials required for retesting of any functional test found to be deficient.

B. Prior to retesting, submit required data indicating that the deficient items have been completed and/or corrected to the Architect for approval and rescheduling of the functional test. If during the retesting it becomes apparent that the deficient items have not been completed and/or corrected as indicated in the data provided by the Contractor, the retesting shall be stopped. Costs for the design team to further supervise the retesting of a functional test shall be the responsibility of the Contractor.

3.04 DEFERRED TESTING

A. Schedule and coordinate, with the approval of the Architect, tests delayed until building construction is completed, required building occupancy or loading, weather, or other conditions are suitable for the demonstration of equipment or system's performance, as specified herein. Deferred testing shall be executed, documented, and deficiencies corrected as specified herein for functional testing.

3.05 TESTING DOCUMENTATION, NONCONFORMANCE, AND APPROVALS

A. List outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the functional test procedure forms or on an attached sheet. The functional test procedure forms and any outstanding deficiencies shall be provided to the Architect within 2 days of test completion. The Architect shall review the Contractor's start-up and prefunctional testing documentation and shall submit either a noncompliance report or an approval form to the Contractor. Work with the Architect to correct and retest deficiencies or uncompleted items. Correct items that are deficient or incomplete in a timely manner, and notify the Architect as soon as outstanding items have been corrected and resubmit an updated start-up report and a statement of correction on the original noncompliance report. When requirements are completed, schedule the functional testing of the equipment or system.

B. As functional performance testing progresses and deficiencies are identified, work with the Architect to resolve the issues.

3.06 OPERATION AND MAINTENANCE MANUALS

A. The Plumbing Performance Verification Supervisor shall compile and prepare documentation for equipment and systems covered in Division 22 and deliver this documentation for inclusion in the operation and maintenance manuals prior to the training of the Owner's personnel.

3.07 INSTRUCTION OF OPERATING PERSONNEL

A. The Plumbing Performance Verification Supervisor shall schedule, coordinate and assemble, and deliver the documentation of training required by Division 22.

3.08 FUNCTIONAL TESTS

A. Functional test requirements for the demonstration of proper system and equipment operation shall be defined by the Plumbing Performance Verification Supervisor. Execution of these test and demonstration of the required performance shall be the responsibility of the Contractor.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or subsystems at the discretion of the Plumbing Performance Verification Supervisor. Beginning system testing before full completion of construction shall not relieve the Contractor from fully completing the system, including prefunctional checklists.

C. Functional testing shall be completed and test documentation approved by the Architect before the Project will be considered substantially complete.

END OF SECTION 220090

SECTION 222500

PLUMBING INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and other plumbing systems are specified in other Sections of Division 22.

B. This Section covers thermal insulation for plumbing equipment and piping specified in Division 22.

C. Items not to be insulated:

1. Water supplies to plumbing fixtures. See Section 224200, Plumbing Fixtures for insulation of water supplies to ADA fixtures.

2. Underground domestic cold water piping.

D. This Section includes responsibilities and obligations in support of the performance verification specified in Section 220090, Plumbing Performance Verification.

1.02 DEFINITIONS

A. Rainwater piping conveys water from areas exposed to rainfall.

B. Exterior piping is exposed to outdoor temperature.

1.03 QUALITY ASSURANCE

A. Conform to the following:

1. International Energy Conservation Code-2009 with Georgia State Amendments-2012.

2. International Plumbing Code-2012 with Georgia State Amendments-2014.

B. Products of the manufacturers listed will be acceptable for use for the specific functions specified herein. Materials shall be compatible with the materials to which they are applied, and shall not corrode, soften or otherwise attack such material in either the wet or dry state.

C. Materials shall be applied subject to their temperature limits. Methods of application of insulating materials or finishes not specified in detail herein shall be in accordance with the particular manufacturer's published recommendations.

D. Insulation shall be applied by experienced workers regularly employed for this type of work.

1.04 RATINGS

A. Insulation and accessories, unless specifically excepted herein, shall have a maximum composite flame spread rating of 25 and a maximum smoke developed rating of 50. Materials that are factory-applied shall be tested as assembled. Materials which are field-applied may be tested individually. No fugitive or corrosive treatments shall be employed to impart flame resistance.

B. Flame spread and smoke developed ratings shall be in accordance with ASTM E84-2013a. Products or their shipping cartons shall bear a label indicating flame spread and smoke developed ratings.

C. Treatment of pipe jackets to impart flame and smoke safety shall be permanent. The use of water-soluble treatments is prohibited.

D. Vapor retarders shall have a maximum permeance of 0.02 perm at 73.4°F.

1.05 ALTERNATE THICKNESSES

A. Specified thicknesses may be increased or reduced for insulation materials having thermal resistivity, K-values, different from those listed. Submit calculations in accordance with ASHRAE/IESNA 90.1-2013, and documentation of product performance.

PART 2 - PRODUCTS

2.01 INSULATION

A. Fiberglass Pipe and Blanket Insulation:

1. Pipe insulation: maximum K-value for preformed pipe insulation: 0.23 Btu·in/(h·ft²·°F) at 75°F.

a. Manufacturer: CertainTeed, Johns Manville, Knauf, or Owens Corning.

2. Blanket insulation: maximum K-value for blanket insulation: 0.28 Btu·in/(h·ft²·°F) at 75°F.

a. Manufacturer: CertainTeed, Johns Manville, Knauf, or Owens Corning.

B. Flexible Elastomeric Tubing Insulation:

1. Insulation: flexible closed-cell elastomeric tubing insulation, plenum rated per ASTM E84-2013a with low VOC, and CFC-free. Thermal conductivity (K-value) at 75°F 0.25 Btu·in/(h·ft²·°F).

2. Fittings: tube miter-cut, and/or factory fabricated.

3. Joints and seams: contact adhesive.

4. Manufacturer: Aeroflex Aerocel, Armacell AP Armaflex and AP Armaflex FS, or K-Flex Insul-Tube.

C. Fiberglass Board Insulation:

1. Maximum K-value of 0.28 Btu/in/(h/ft^2/°F) at 75°F, 3 pcf minimum density, and a maximum operating temperature of 850°F.

2. Manufacturer: CertainTeed, Johns Manville, Knauf, or Owens Corning.

2.02 ACCESSORIES

A. Adhesives and Mastics:

1. Manufacturer: Aeroflex, Armacell, Childers, Epolux, Foster, Marathon, Pittsburg Corning PC 88, Pittsburgh Corning Pittcote 300 (interior) or 404 (exterior), or Vimasco.

B. Insulating Cement:

1. Mineral wool type, asbestos free, maximum K-value of 0.20 Btu·in/(h·ft²·°F) at 75°F.

2. Manufacturer: Industrial Insulation Group CalCoat-127, or Ramco Ramcote 1200.

C. Glass fabric: 10 x 10 threads per square inch construction white fiberglass scrim fabric.

D. Tape: pressure sensitive, foil-scrim-kraft backed.

2.03 ALUMINUM JACKETING

A. Piping: corrugated aluminum jackets, 0.016" thick with an embossed finish, and a factory heat laminated 3 mil moisture retarder film on the inner surface, and meeting ASTM B209-2010.

B. Fittings: stamped 2-piece (matching halves) aluminum fitting covers and end caps, 0.024" thick, with a factory heat lamination moisture retarder film on the inner surface.

PART 3 - EXECUTION

3.01 GENERAL

A. Surfaces to be insulated shall be clean, dry, and free of foreign material, rust, scale and dirt when insulation is applied.

B. Perform pressure and leakage tests and submit results required by other Sections before applying insulation.

C. Where existing insulation is damaged due to the new work, repair damage to match existing work or replace damaged portion with insulation specified for new work.

D. On piping where temperature maintenance cable is specified, to ensure the insulation's adequate fit, increase the insulation size as required to comply with the cable manufacturer's installation instructions.

3.02 INSULATION FOR HOT AND HOT WATER CIRCULATING PIPE

A. Insulate the following pipe with preformed fiberglass pipe insulation of the thickness indicated, with vapor retarder and white all service jacket with self-sealing lap:

	Fluid Design Operating Temperature Range, ºF	Insulation Thickness, Inches Pipe Sizes 0.5" - 1.25"	1.5" - 6"
Hot water and hot water circulating	110 to 140	1	1.5

1. Install insulation with jacket drawn tight and side laps and end joint butt strips secured. End joint butt strips shall be minimum 3" wide and of material identical to jacket. Seal ends of insulation at fittings, valves, and riser clamps.

2. Insulate fittings, flanges, strainers, and valve bodies with packing nut and stem left open, with preformed or mitered fiberglass. Wire fiberglass in-place and cover with a smoothing coat of insulating cement. Finish with glass fabric embedded into a coat of white breather mastic. Glass fabric shall overlap adjoining insulation at least 2".

3. Cover exposed fittings with glass fabric and mastic.

4. Do not insulate unions.

3.03 INSULATION FOR COLD PIPE

A. Insulate the following pipe with preformed fiberglass pipe insulation of the thickness indicated, with vapor retarder, white all service jacket, and self-sealing lap:

Domestic cold water above grade, 0.5" thick.

Branch waste, including drain and P-trap, receiving drainage from air conditioning equipment, 1.5" thick.

Horizontal rainwater, and secondary (emergency overflow) rainwater, including connections to roof drains and vertical leaders within the top floor to 48" down into the vertical, 1" thick.

1. Install insulation with jacket drawn tight with side-laps and end joint butt strips secured. End joint butt strips shall be same material as jacket, and not less than 3" wide. Seal ends of insulation at fittings, valves, and riser clamps.

2. Insulate fittings, flanges, strainers, and valve bodies with packing nut and stem left open, with preformed or mitered fiberglass. Wire fiberglass in-place and vapor seal with a layer of glass fabric embedded between two 0.063" coats of white vapor retarder mastic. Glass fabric shall overlap adjoining insulation at least 2".

3. Do not insulate unions.

3.04 ACCESSORIES

A. Adhesives and Mastics:

B. Seal open ends of insulation with a thick mastic coating.

C. Insulating Cement:

1. Install a minimum 0.5" thick coat with a smooth finish, and even with the adjacent insulation.

D. Glass Fabric:

1. For piping fittings and valves use tape form and for water storage tanks use sheet form.

E. Tape:

1. When applied to jacket insulation, wrap tape as tight as possible without crushing the insulation jacket.

F. Fitting Jackets:

1. Installation in mechanical rooms and exterior locations only.

3.05 INSTALLATION

A. Install insulation after piping has been tested and approved.

B. Insulation shall be clean and dry during installation and during application of any finish.

C. Provide removable and replaceable covers on equipment, and removable ends of strainers requiring insulation, that must be opened periodically for inspection, cleaning, or repair.

D. Install insulation materials with smooth and even surfaces, jackets drawn tight and cemented down smoothly at longitudinal and end laps. Do not use scrap pieces of insulation where a full length section will fit.

E. Install insulation, jackets and coatings continuous through openings and sleeves in nonrated construction. For penetrations of fire- or smoke-rated construction, insulation shall be butted tightly against firestops specified in Section 220010, Plumbing General. Tape butt joints.

F. Banding wires shall have the twisted terminals turned down toward the insulation without damaging the vapor retarder.

3.06 INSULATION PROTECTION

A. Protect interior fiberglass piping insulation exposed to damage with a corrugated aluminum jacket. Locate the longitudinal joints to shed water, and secure with aluminum bands at end joints and every 12" on center. Tightly abut end joints together. Install aluminum fitting-covers over fittings, overlapping the adjacent butt ends of the piping's aluminum jacket. Secure with aluminum bands.

B. Protect exterior piping insulation, except flexible elastomeric, with a corrugated aluminum jacket. Locate the longitudinal joints to shed water, and secure with aluminum bands at end joints and every 12" on center. Provide a 2" overlap at each end joint and seal with joint sealant. Install aluminum fitting-covers over fittings, overlapping the adjacent butt ends of the piping's aluminum jacket. Seal with joint sealant, and secure fitting covers with aluminum bands.

END OF SECTION 222500

SECTION 224200

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and other mechanical systems are specified in other Sections of Division 22.

B. This Section covers plumbing fixtures, trim and equipment.

C. See Section 224300, Drainage Systems for sanitary, vent, and rainwater systems.

D. See Section 224400, Water Systems for water systems.

E. This Section includes responsibilities and obligations in support of the performance verification specified in Section 220090, Plumbing Performance Verification.

1.02 QUALITY ASSURANCE

A. Conform to the following:

1. ICC A117.1-2009.
2. Safe Drinking Water Act-1996.
3. International Energy Conservation Code-2009 with Georgia State Amendments-2012.
4. International Plumbing Code-2012 with Georgia State Amendments-2014.

PART 2 - PRODUCTS

2.01 PLUMBING FIXTURES - GENERAL:

A. Fixtures shall have smooth impervious surfaces, free from defects and no concealed fouling surfaces and be Grade A quality, with name or trademark of the manufacturer printed on or pressed into the fixtures. In addition, a label which cannot be removed without destroying it, containing the manufacturer's name or trademark and the quality or class of the fixture, per ASME A112.19, shall be affixed to fixtures and not removed until after the work is accepted.

B. Products specified herein coming into contact with the potable water system, except showers, bathtub trim, and flush valves, shall be lead free.

C. Exposed waste and supply piping, including piping exposed when millwork doors are open, and mounting bolts of fixtures shall be chromium-plated.

D. Fixtures of the same construction shall be by the same manufacturer, e.g. vitreous china, water fountains, and stainless steel, unless otherwise specified herein.

E. Vitreous china fixtures shall be white.

F. Plumbing fixtures shall be complete with equipment, fittings, and trim as specified in Paragraph 2.03, Plumbing Fixture Trim.

2.02 PLUMBING FIXTURES

A. Water Closets:

1. F1, Water Closet, Wall Type Flush Valve, ADA:

a. Elongated vitreous china water-saving type, with siphon jet bowl, flush valve and trim for 1.28 gal per flush, seat, chair carrier, and chromium-plated nuts and washers.

b. Manufacturer: American Standard 2257.001, Kohler K-4325, Sloan ST-2059-A, or Toto CT708E.

B. Lavatories:

1. F2, Lavatory, Wall Type, ADA:

a. Vitreous china lavatory, 20" x 18", with 4" centers and fitted with faucet, supplies with stop valves, grid drain, P-trap, waste to wall, escutcheons, and floor-mounted carrier.

b. Manufacturer: American Standard 0355.012, Kohler K-2005, Sloan SS-3003, or Toto LT307.4.

C. Utility Sinks:

1. F3, Utility Sink, Freestanding, Molded Stone:

a. Molded stone sink with 1 compartment, minimum dimensions of 21" front to back, 23" left to right, and 13" deep. Provide unit with integral drain with stopper, enameled angle legs, deck mounted swing faucet with cold and hot water supplies, and P-trap.

b. Manufacturer: Fiat FL-1 with Fiat A1 faucet.

D. Counter Sinks:

1. F4, Break Room Sink, Stainless Steel, One Bowl, ADA:

a. Self-rimming 18 gauge type 304 stainless steel sink, 19" x 21" x 6", one compartment with 4-hole punch, faucet, supplies with stop valves, drain, P-trap, waste to wall, and escutcheons.

b. Manufacturer: Elkay LRAD-2219, or Just SL-ADA-1921-A-GR.

E. Service Sinks:

1. F5, Service Sink, Floor Type:

a. Terrazzo service sink, 24" x 24" x 12", with cast integral drain, 6" drop front with stainless steel rim guard on drop, wall-mounted faucet, hose with wall bracket, and wall-mounted mop bracket.

b. Manufacturer: Fiat TSB-3010, Florestone 91-24x24, or Stern-Williams HL-1800.

F. Emergency Fixtures:

1. F6, Emergency Eye/Face Wash, Wall Type, ADA:

a. Wall hung barrier-free unit, stainless steel emergency eye/face wash station, 0.5" supply, stay-open ball valve, soft foam spray heads with flip top dust covers, integral flow control, filter to remove water impurities, 1.25" drain, bowl dust cover, and ANSI compliant identification signage.

b. Manufacturer: Bradley S19224, or Guardian GBF1724.

G. Showers:

1. F7, Shower, ADA:

a. Pressure-balanced type 3-port mixing valve with adjustable temperature limit stop, check stops, hot and cold color-coded escutcheon, metal lever handle, 30" adjustable slide bar, hand held shower head with 1.5 gpm flow control, 60" long

metal hose, wall flange, inline vacuum breaker and swivel connector. Exposed metallic parts and accessories shall be chromium-plated.

b. Manufacturer: Leonard 4500 with 515P(G)-30, Powers P910H-L-W, or Symmons 96-300-B30-1.5-X-L-V.

H. Ice Maker Boxes:

1. F8, Refrigerator Ice Maker Connection Box:

a. Recessed, wall-mounted galvanized steel box, with support brackets, adjustable face plate, enameled white finish on exposed parts, and water valve with 0.5" inlet and 0.25" compression outlet.

b. Manufacturer: Guy Gray BIM875AB, or Oatey 39141.

2.03 PLUMBING FIXTURE TRIM

A. Water Closet Trim:

1. Flush Valves:

a. Sensor Flush Valves for Water Closets (Battery Type):

1) 1.28 gal per flush, complete with sweat solder adapter kit, back check angle stop valve, vacuum breaker, battery-powered infrared sensor for automatic operation including batteries and override button, and 11" rough.

2) Manufacturer shall be same as water closet manufacturer: American Standard 6065.121.002, Kohler K-10956, Sloan 8111-1.28, or Toto TET1LN32.

2. Water Closet Seats:

a. Elongated Heavy Weight:

1) Solid high impact plastic with open front seat, stainless steel posts, washers and nuts, and check hinges.

2) Manufacturer: Bemis 1955C, Beneke 523, or Church 295C.

3. Floor-Mounted Carriers:

a. Commercial Type:

1) For wall-hung water closets: commercial type with a 500 lb supported weight capacity, adjustable vertically and horizontally from the faceplate, with base support, adjustable coupling, gasket, and chromium-plated through-bolts and acorn nuts.

2) Manufacturer: Josam, Smith, Wade, or Zurn.

B. Lavatory Trim:

1. Faucets:

a. For ADA lavatories:

1) Dual handle type, polished chromium-plated brass body with gooseneck spout, 4" brass blade handles, color-coded indexes, quarter turn ceramic cartridges, 0.5" rigid brass inlet shanks on 4" centers, and 0.5 gpm vandal resistant aerator flow control.

2) Manufacturer: Chicago 895-317E2805-5ABCP, Speakman SC-3084-LD-CA-BO, or T&S B-0892-VF05-CR.

2. Supplies:

a. Lavatories:

1) Angle stops with 0.5" id x 5" inlet sweat tube, bell escutcheon, wheel handle control, 0.375" od x 12" flexible tube riser, and exposed piping and parts chromium-plated.

2) Manufacturer: Just JL26, Keeney 2100PCL12LF, McGuire LF170 ECO, or Zurn Z8808-XL-LR.

3. Drains:

a. Lavatories:

1) Grid type with chromium-plated cast brass top and strainer with 1.25", 17 gauge tailpiece.

2) Manufacturer: Just JSG7, Keeney 5680PCCR, McGuire 155A ECO, or Zurn Z8743-PC.

4. P-traps:

a. 1.25" tubular chromium-plated brass, with 17 gauge tubing drain to wall, wall flange, cast brass slip nuts, cleanout plug, and minimum 2" water seal.

b. Manufacturer: Just JT125, McGuire 8872 ECO, or Zurn Z8701-9.

5. ADA Insulation:

a. ADA fixtures: white molded closed-cell vinyl, 3-piece for tailpiece, P-trap, and waste arm, and 2-piece for supply stops, and risers.

b. Manufacturer: Insul-Tect I-T 101 and/or I-T 102, McGuire PW2125 and/or PW2150, Plumberex Handy-Shield MaXX, Pro Flo PF202WH, or Truebro 102 E-Z.

6. Floor-Mounted Carriers:

a. For wall-hung lavatories: floor-mounted commercial type, with concealed arm supports.

1) Manufacturer: Josam, Smith, Wade, or Zurn.

C. Utility Sink Trim:

1. Faucets:

a. Chromium-plated brass body, deck-mounted, with swing spout.

b. Manufacturer: Fiat A1.

2. Supplies:

a. Supplies for Utility Sinks:

1) Angle stops with 0.5" sweat inlet, 0.5" outlet, 0.5" od flexible tube riser, and wall escutcheon. Exposed piping and parts shall be chromium-plated.

2) Manufacturer: Just JVA25, Keeney 2048PCL12LF, or McGuire LF2167 ECO.

3. P-traps:
   a. 1.5" tubular chromium-plated brass, with 17 gauge tubing drain to wall, wall flange, cast brass slip nuts, cleanout plug, and minimum 2" water seal.
   b. Manufacturer: Just JT150, Kenney 5307PC867CR, McGuire 8912 ECO, or Zurn Z8702-9-B.

D. Counter Sink Trim:
1. Faucets:
   a. For sinks:
      1) High arc swing type with 10" high spout and 8" reach, polished chromium-plated with adjacent single lever handle, color-coded indexes, washerless cartridge, copper inlet tubing with 0.5" compression threads, hand spray with antisiphon hose, and 1.5 gpm vandal resistant aerator flow control.
      2) Manufacturer: Elkay LK3001CR, Just J-990-WF-VAR-1.5 GPM, or Zurn Z824SO-XL-HS-17M.
2. Supplies:
   a. Sinks:
      1) Angle stops with 0.5" id x 5" inlet sweat tube, bell escutcheon, wheel handle control, 0.5" od x 12" flexible tube riser, and exposed piping and parts chromium-plated.
      2) Manufacturer: Just JL27, Keeney 2780PCL12LF, or McGuire LF171 ECO.
3. Strainers:
   a. Grid type strainer:
      1) Chromium-plated finish brass body and flat strainer with brass lock nut, sealant washers, and 1.5" x 4" seamless 20 gauge tailpiece.
      2) Manufacturer: Elkay LK18, Just JSF8W, Keeney 1376PC, McGuire 152 ECO, or Zurn Z8739-PC.
4. P-traps:
   a. 1.5", tubular chromium-plated brass, with 17 gauge tubing drain to wall, wall flange, cast brass slip nuts, cleanout plug, and minimum 2" water seal.
   b. Manufacturer: Just JT150, Keeney 5307PC867CR, McGuire 8912 ECO, or Zurn Z8702-9-B.
5. ADA Insulation:
   a. Insulation kit for handicapped locations: white molded closed-cell vinyl, 3-piece for tailpiece, P-trap, and waste arm, and 2-piece for supply stops, and risers.
   b. Manufacturer: Insul-Tect I-T 101 and/or I-T 102, McGuire PW2125 and/or PW2150, Plumberex Handy-Shield MaXX, Pro Flo PF202WH, or Truebro 102E-Z.

E. Service Sink Trim:
1. Faucets:
   a. Chromium-plated with hose thread outlet, pail hook, vacuum breaker, integral checks, stop valves in shanks, and wall support.

b. Manufacturer: Chicago 540-LD897SGCCP, T&S B-0665-BSTP, or Zurn Z843M1-XL-CS.

2. P-traps:

a. For floor type service sinks: 3" cast iron.

3. Hose and Brackets:

a. 0.625" outside diameter x 36" long, heavy duty black hose with 0.75" coupling, and wall-mounted stainless steel hose bracket with spring loaded rubber grip.

b. Manufacturer: Fiat 832-AA, Florestone MR-370, or Stern-Williams T-35.

4. Mop Hangers:

a. 24" long stainless steel with 3 spring loaded rubber mop handle grips.

b. Manufacturer: Fiat 889-CC, Florestone MR-372, or Stern-Williams T-40.

PART 3 - EXECUTION

3.01 PLUMBING FIXTURES - GENERAL

A. Set fixtures level and in alignment with walls.

B. Caulk between fixtures and mounting surfaces with a white nonhardening mildew-resistant silicone sealant.

C. Install ADA fixtures in accordance with ICC A117.1-2009.

3.02 PLUMBING FIXTURES

A. Water Closets:

1. Wrench tighten flush valve stop cover to limit vandalism.

B. Showers Valves:

1. Field set the adjustable temperature limit stop for pressure-balanced shower valves to allow a maximum of 110°F hot water to pass through the valve at full hot.

3.03 PLUMBING FIXTURE TRIM

A. Fixture Trim - General:

1. Chair carrier feet shall be bolted to the floor slab. Carriers shall not depend upon wall construction or piping to prevent fixture movement.

2. Wrist blade handles on faucet fittings shall be aligned perpendicular to the spout when in the off position.

3. Faucets, shower valves, or flush valves used by handicapped persons shall operate with less than a 5 psi operating force.

B. Water Closets:

1. Install flush valves for ADA water closets with the manual override on the wide side of the toilet stall.

2. Where automatic sensor flush valves are installed, coordinate the distance from the bottom of the ADA grab bar and the highest portion of the flush valve to allow for cap removal and battery replacement.

C. Service Sinks:

1. Rough-in faucets for service sinks at 30" above the floor.

2. Install wall hung mop hanger on adjacent wall to faucet, centered with fixture, and with bottom at 48" above the floor.

D. Counter Sinks:

1. For counter-installed sinks, coordinate with counter top supplier for size of opening.

3.04 P-TRAPS

A. Set traps true and level, and tight and secure.

3.05 FIXTURE TESTS

A. Test plumbing fixtures for soundness, stability of support, and operation.

B. Test fixture accessories for smooth operation of handles and hand wheels, and proper operation of flow.

C. Test flush valves for stability at the wall with no movement.

D. Test the hot water temperature at each plumbing fixture, and ensure that the correct temperature water is flowing from the system.

3.06 CLEANING

A. Clean plumbing fixtures and plumbing related fixtures and equipment, including trim and accessories, with a commercial grade disinfectant cleaner.

END OF SECTION 224200

SECTION 224300

DRAINAGE SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and other plumbing systems are specified in other Sections of Division 22.

B. This Section covers plumbing drainage systems and equipment.

C. See Section 224200, Plumbing Fixtures for fixtures and trim.

D. See Section 224400, Water Systems for water systems and equipment.

E. This Section includes responsibilities and obligations in support of the performance verification specified in Section 220090, Plumbing Performance Verification.

1.02 QUALITY ASSURANCE

A. Conform to the following:

1. ICC A117.1-2009.

2. International Plumbing Code-2012 with Georgia State Amendments-2014.

B. Plumbing work in right-of-ways shall conform to Georgia Department of Transportation Standard Specifications for Construction of Roads and Bridges, 2008.

PART 2 - PRODUCTS

2.01 PIPING, FITTINGS, AND JOINTS

A. General:

1. Piping and fitting sizes listed are nominal inside diameter.

B. Soil, waste, vent, rainwater, 15" and smaller, below slab-on-grade and extending to 5' outside:

1. Piping: hub and spigot cast iron, service weight, petroleum asphaltic-coated inside and out, ASTM A74-2013a.

2. Fittings: hub and spigot cast iron, service weight, petroleum asphaltic-coated inside and out, ASTM A74-2013a.

3. Joints: one-piece elastomeric compression gasket, ASTM C564-2012.

C. Soil, waste, vent, rainwater, and secondary rainwater, 10" and smaller, above slab-on-grade throughout the building:

1. Piping: no-hub cast iron, petroleum asphaltic-coated inside and out, ASTM A888-2013a.

2. Fittings: no-hub cast iron, petroleum asphaltic-coated inside and out, ASTM A888-2013a.

3. Joints:

a. Standard duty stainless steel couplings for vent piping: mechanical compression type with neoprene collars conforming to ASTM C564-2012, type 301 or 304 stainless steel construction with shields (minimum 36 ga), bands, clamps, and screws. Couplings shall conform to CISPI 310-2012 for 60 lbf·in torque and a maximum pressure test 6.0 psig.

1) Manufacturer: Ideal Standard, or Mission No-Hub Coupling.

b. Medium duty stainless steel couplings for drainage piping 1.5" to 8": mechanical compression type with neoprene collars conforming to ASTM C564-2012, type 304 stainless steel construction with shields (minimum 34 ga), bands, clamps, and screws. Couplings shall conform to FM 1680-1989, Class 1 for 80 lbf·in torque and a minimum pressure test of 15 psig.

1) Manufacturer: Husky 2000, or Tyler WB.

c. Heavy duty stainless steel couplings for rainwater and secondary rainwater piping 1.5" to 15": mechanical compression type with neoprene collars conforming to ASTM C564-2012, type 304 stainless steel construction with shields (minimum 28 ga), bands, clamps, and screws. Couplings shall conform to FM 1680-1989, Class 1 for 80 lbf·in torque and a minimum pressure test of 15 psig.

1) Manufacturer: Clamp-All 80, or Husky 4000.

D. Concealed fixture drain connections from lavatories to cast iron:

1. Piping: copper tubing, type DWV, hard drawn, ASTM B306-2013.

2. Fittings: drainage pattern DWV wrought copper, ASME B16.29-2012.

3. Joints: soldered with 95/5 tin/silver using a compatible flux, ASTM B813-2010 and NSF 61-2013.

E. Indirect drain, 1" and smaller:

1. Piping: copper tubing, type M, hard drawn, ASTM B306-2009.

2. Fittings: wrought copper, ASME B16.22-2013.

3. Joints: soldered with 95/5 tin/silver using a compatible flux, ASTM B813-2010 and NSF 61-2013.

F. Indirect drain, 1.25" and larger:

1. Piping: copper tubing, type DWV, hard drawn, ASTM B306-2013.

2. Fittings: drainage pattern DWV, ASME B16.29-2012.

3. Joints: soldered with 95/5 tin/silver using a compatible flux, ASTM B813-2010 and NSF 61-2013.

2.02 SPECIALTY PIPING JOINTS

A. Unions:

1. For copper piping 2" and smaller: cast bronze or cast copper with copper soldered or threaded connections.

2. For piping of dissimilar metals 2" and smaller: provide dielectric unions with solder or threaded connections, nylon insulators, minimum 600 V no flashover, and EPDM gaskets.

B. Flanges:

1. For piping larger than 2": flange and gasket type. Flanges shall match connection flanges in style, material, and pressure rating.

2. For piping of dissimilar metals larger than 2": provide dielectric flanges with solder or threaded pipe connections, EPDM gaskets. Flanges shall match connection flanges in style, material, and pressure rating.

2.03 P-TRAPS

A. For floor drains: provide cast iron with trap primer connection if not provided on drain body.

B. Exposed: provide with cleanout plugs.

C. For plumbing fixtures: as specified in Section 224200, Plumbing Fixtures.

2.04 CLEANOUTS

A. General:

1. Provide cleanout outlets as follows:

a. Floors above grade: no-hub, push-on or inside caulk.

b. Floors on grade: push-on or inside caulk.

2. For exterior piping: cast iron with adjustable housing, bronze cleanout plug, and round heavy duty scoriated cast iron tractor top, with "C.O." cast in and securing screws.

3. Manufacturer: Josam 56040, Smith 4245, Wade 6000-Z, or Zurn Z-1400-HD-IC.

B. For concealed piping in finished area floors: cast iron with internal cleanout plug, adjustable housing, and round polished nickel-bronze top with securing screws. For cleanouts in floors above grade, provide with flashing clamp.

1. Manufacturer: Josam 55000-I, Smith 4025, Wade 6000IC, or Zurn ZN-1400-ZN-IC.

C. For concealed piping in mechanical floors: cast iron with internal cleanout plug, adjustable housing, and nickel-bronze top. For cleanouts in floors above grade, provide with flange.

1. Manufacturer: Josam 56040, Smith 4105, Wade 6000IC-Z-1, or Zurn ZN-1400-HD-IC.

D. For concealed piping in wall construction: no-hub cleanout tee and tapped bronze cleanout plug, with a stainless steel wall access cover.

1. Manufacturer: Josam 58600-COT, Smith 4532-Y, Wade 8560E+8480R, or Zurn Z-1446-BP-NH.

2.05 DRAINS

A. General:

1. Outlets shall be same size as the drainage pipe.

2. Drains shall be from the same manufacturer, unless otherwise indicated.

3. Provide drain outlets as follows:

a. Drains in roofs and floors above grade: no-hub, push-on, or inside caulk.

b. Drains in floors on grade: push-on, or inside caulk.

B. Finished Area Drains:

1. D1: cast iron body, trimmed with adjustable 6" round nickel-bronze grate with vandal resistant screws, and reversible flashing collar.

a. Manufacturer: Josam 30000X-A, Smith 2010A, Wade 1100 STD, or Zurn ZN415-B.

C. Mechanical Room Drains:

1. D2: cast iron body, trimmed with 12" square rim, less grate, deep chemical resistant coated interior, dome bottom strainer, flashing clamp, and anchor flange.

a. Manufacturer: Josam 49060AS, Smith 3160, Wade 9150, or Zurn ZN-1902-K.

D. Roof Drains:

1. D3A: cast iron body, trimmed with 11" round cast iron dome, combined flashing clamp and gravel stop, adjustable solid insulation extension, and under deck clamp.

   a. Manufacturer: Josam 21000X, Smith 1015, Wade 3000AE, or Zurn Z100-EA.

2. D3B: cast iron body, trimmed with 11" round cast iron dome, combination flashing clamp and gravel stop, solid insulation extension, 2" high exterior water dam, and under deck clamp.

   a. Manufacturer: Josam 21500-AE-SD, Smith 1045, Wade 3000-AE-D, or Zurn Z-100-89-EA.

3. D4: coated cast iron body, trimmed with 7" round solid water dam with cast iron dome bottom strainer, flashing clamp, insulation extension, and under deck clamp.

   a. Manufacturer: Josam 25540X, Smith 3960, Wade 3220RS, or Zurn Z-127.

2.06 ACCESSORIES

A. Bolts and nuts: ASTM A307-2012, Grade B.

B. Downspout nozzles: cast bronze body with threaded female pipe connection, and wall flange.

1. Manufacturer: Josam 25010, Smith 1770, Wade 3940, or Zurn ZANB-199.

C. Stack sleeves: coated cast iron stack sleeve, with caulking recess, flashing flange, nonpuncturing flashing clamp ring, and pressure ring.

1. Manufacturer: Josam 26450, Smith 1720, Wade 3630, or Zurn Z-195.

D. Trap seal protection devices: ASSE 1072-2007, elastomeric barrier-type designed for use with a floor drain.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION

A. General:

1. Piping shall be cut to measurements established at the site and worked into place without springing or forcing.

2. Use concentric reducing fittings between different size pipe.

3. Ream steel, and copper pipe after cutting, turn on end and knock loose dirt, scale, and filings from interior of pipe.

4. Install horizontal drainage piping 3" and smaller with a slope of 0.25" per foot, and piping 4" and larger with a slope of 0.125" per foot unless otherwise noted on the Drawings.

5. Pitch/grade: piping shall be installed with sufficient pitch to ensure drainage and venting.

6. Install sway bracing and anchorage for piping as required by International Plumbing Code-2012.

B. Underground Piping:

1. Install drainage piping outside the building in trenches separate from water piping.

2. Excavation and backfill: as specified in Section 220010, Plumbing General.

3. Underground piping shall be connected to the exterior service lines, or capped or plugged if the exterior service is not in place.

4. Piping installed below the level of footings shall be installed 12" horizontally from the footing for each 12" of depth below the footing.

C. Piping Joints:

1. Make changes in the horizontal direction of gravity drainage piping with drainage pattern fittings.

2. Solder joint connections shall be cut, deburred, cleaned and assembled in accordance with ASTM B828-2002 (2010).

3. Threaded connections: screw-thread joints shall be made with cut tapered threads. Joints shall be made tight with Teflon tape. Not more than 2 threads shall show after the joint is made tight, except no threads shall show in exposed chromium-plated piping.

4. Flanged joints: at connections to equipment, flanged joints shall be made with ring type gaskets, extending to inside of bolt holes. Flanged connections to equipment shall be made with full-face gaskets to match flanges on equipment.

5. Mechanical couplings on drainage piping: during the torque process, if any one band of the coupling breaks, replace the entire coupling.

6. Isolate joints between dissimilar metals and connections to tanks with dielectric fittings.

7. Provide adapters where copper or steel pipes connect to cast iron pipe.

8. Provide adapters where cast iron pipe connects to plastic, ductile iron, concrete, or clay pipe, or where field cuts are made in vitrified earthenware or concrete piping. Adapters shall be sized to fit into the bell of pipes with hubs, or over the barrel of pipes without hubs.

D. Coordination:

1. Pipes shall be installed to permit free expansion and contraction without damage to joints, hangers, or the building. Arrange piping to minimize stresses caused by expansion and contraction.

2. Install piping so as to preserve access to valves and equipment and to provide the maximum headroom possible.

3. Provide offsets as required to maintain ceiling height and to coordinate with other trades.

4. Install exposed piping such that when insulation is applied it will not come in contact with adjacent surfaces.

5. Provide flanges or unions at connections to valves and apparatus.

6. Piping to fixtures and equipment shall be braced so that there is no horizontal or vertical movement in the piping.

7. Pipe supports shall be isolated from copper tubing with rubber sleeves.

3.02 PIPING, FITTINGS, AND JOINTS

A. Hub and Spigot Cast Iron Pipe and Fittings:

1. Do not use tee fittings in horizontal drainage piping.

2. Install with hubs upstream.

3. Extend vent piping 12" above the roof.

B. No-Hub Cast Iron Pipe and Fittings:

1. Do not use tee fittings in horizontal drainage piping.
2. Extend vent piping 12" above the roof.
3. Torque coupling bolts in accordance with manufacturer's recommendations.
4. Where extra heavy duty couplings are required for underground connections, coat the stainless steel bolts with asphaltic paint sealer.
5. Install pull-out restraints on no-hub sanitary and waste drainage, and rainwater piping and fittings 5" and larger, at changes in direction and changes in pipe size greater than 2 pipe diameters, in accordance with the International Plumbing Code-2012. Provide the restraints with a minimum of 50' of thrust resistance.

C. Copper Tubing and Fittings:

1. Uninsulated piping installed in masonry construction shall be painted with 2 coats of asphaltum paint.
2. Clean, prime, and paint exposed uninsulated piping with 2 coats of glossy silver paint.

3.03 SPECIALTY PIPING JOINTS

A. Unions

1. Provide in each connection to each piece of equipment, except where flanges are used, so the units may be removed.

3.04 P-TRAPS

A. Set traps true and level.

3.05 CLEANOUTS

A. General:

1. Locate cleanouts so that they are accessible and in compliance with codes.
2. Install floor cleanouts flush and level with the finished floor.

B. Provide cleanouts in drainage piping as indicated on the Drawings, and as follows:

1. At the bottom of each exposed fixture trap which is not integral with the fixture.
2. At the beginning of each branch drainage line.
3. At each change of a horizontal direction greater than 45º.
4. At the foot of each stack.
5. In horizontal drain lines at intervals of not more than 50' for inside piping and 100' for outside piping.

C. Cleanouts outside the building shall extend up to grade and be set flush with finished grade in a 18" x 18" x 8" thick concrete pad.

D. Cleanouts for horizontal piping above grade located above the ceiling shall extend through the floor above, and shall be set flush with that finished floor.

E. Sanitary cleanouts shall not be installed in return air plenums.

3.06 DRAINS

A. General:

1. Cover the grate of each drain during construction to prevent entry of foreign matter. The covering shall not deface the grate's finish.

2. Remove and clean drain grate, set-screws, insides of drain bodies, and sediment buckets before substantial completion.

3. Drains shall not be field modified.

4. Where waterproof liners are used in the building construction, secure the liners to drain bodies with clamping rings, making watertight connections.

5. Provide trap seal protection for each drain, except shower drains and equipment/fixture drains.

B. Floor Drains:

1. Set top of floor drains flush and level with the finished floor, unless noted otherwise on the Drawings.

2. Install drains with recessed grates and anti-splash rims, with the rims flush with the finished floor.

3. Omit grates of drains receiving piped discharge from mechanical equipment so pipes can turn down into basket, unless provided otherwise.

4. Set square drainage grates with sides parallel to the adjacent walls.

5. Where drains are installed in a sloping floor, install at low point.

C. Roof Drains:

1. Provide for each roof drain a sheet of 4 psf lead flashing extending at least 8" from the clamping ring in all directions.

3.07 ROOF PENETRATIONS

A. Roof Drains:

1. Plastic membrane roofs: flashed and sealed watertight by the membrane installer. Ensure the membrane opening inside the drain is cut large enough to allow for proper water flow and roof drainage.

3.08 PIPING AND JOINTS TESTS

A. Piping and piping joints shall be leak free.

B. Test soil, waste, vent, and rainwater systems piping and joints by capping or plugging all openings, and filling each system with a 10' head of water, then allowing to stand filled for 1 hour without any leak down. Where a system is tested in sections, each section shall be subjected to the same test.

C. General:

1. Test piping and joints under floor slabs before slabs are poured.

2. Tests shall be made while piping and joints are exposed to view.

3. Submit a statement certifying that piping and joints are tight and have passed the specified test.

D. Leakage Requirements:

1. Screwed and flanged joints that leak shall be taken apart and reassembled.
2. Soldered joints that leak shall be cut-out and replaced.
3. Cast iron hub and spigot joints that leak shall be taken apart and reassembled with new joining materials.
4. Cast iron no-hub joints that leak shall be taken apart and reassembled with new couplings.

E. Flow Test:

1. Ensure a smooth and nonobstructed flow of liquid for every drainage pipe, free from construction or natural sediment debris that may have entered during construction.
2. Route clean and flush with clear water piping having an obstruction.

END OF SECTION 224300

SECTION 224400

WATER SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and other plumbing systems are specified in other Sections of Division 22.

B. This Section covers plumbing water systems and equipment.

C. See Section 224200, Plumbing Fixtures for fixtures and trim.

D. See Section 224300, Drainage Systems for drainage, waste, and vent systems.

E. This Section includes responsibilities and obligations in support of the performance verification specified in Section 220090, Plumbing Performance Verification.

1.02 QUALITY ASSURANCE

A. Conform to the following:

1. ICC A117.1-2009.

2. International Energy Conservation Code-2009 with Georgia State Amendments-2012.

3. International Plumbing Code-2012 with Georgia State Amendments-2014.

B. Plumbing work in right-of-ways shall conform to Georgia Department of Transportation Standard Specifications for Construction of Roads and Bridges, 2008.

C. Wetted components in the potable water system, where the water is anticipated for human consumption, shall comply with the Reduction of Lead in Drinking Water Act-2011.

PART 2 - PRODUCTS

2.01 PIPING, FITTINGS, AND JOINTS

A. General:

1. Piping and fitting sizes listed are nominal inside diameter.

B. Cold water, hot water, hot water circulating, relief valve discharge, tempered water, above grade, 0.5" to 2.5", except chromium-plated piping at fixtures:

1. Piping: copper tubing, type L, hard temper, ASTM B88-2009.

2. Fittings: wrought copper and/or cast bronze socket fittings, 0.5" to 2.5", ASME B16.22-2013.

3. Joints:

a. Soldered with 95/5 tin/silver type, with a compatible flux designed to be cold water flushable in potable water systems, ASTM B813-2010 and NSF 61-2013.

2.02 SPECIALTY PIPING JOINTS

A. Unions:

1. For copper piping 2" or smaller: cast bronze with copper soldered connections.

B. Ball Joints:

1. Flexible ball joints less than 2.5" diameter shall be manufactured with ductile iron casings and balls. Ball joints shall permit 360° rotation and 28° minimum total angular flex.

2. Seals shall consist of inner and outer precision molded rings designed for system fluid, temperature, and pressure, without the use of additional packings or sealants. Seals shall be factory-seated with 50 psig saturated steam or equivalent thermal conditions.

3. Ball joints shall be FM approved or UL listed.

4. Manufacturer: Hyspan-Barco.

2.03 VALVES

A. General:

1. Valves shall be of the same manufacturer, except where a specific product is not available.

2. Stem packing: asbestos-free.

B. Globe Valves:

1. Globe valves 2.5" and smaller: class 125, bronze body with rising stem, threaded bonnet, integral seat, renewable bronze seat and disc, 200 psig wog.

a. Manufacturer (solder ends): Apollo 121S-LF, Hammond UP418, or Milwaukee UP1502.

b. Manufacturer (threaded ends): Apollo 121T-LF, Hammond UP440, or Milwaukee UP502.

C. Ball Valves:

1. For copper piping, 2" and smaller: 2-piece bronze or bronze alloy body, full port, with blowout-proof stem, rated for 600 psig wog. Valves shall have a chromium-plated or stainless steel vented ball, reinforced seat, stuffing box ring, and lever handle. Valves in insulated piping shall have 1.25" extended stems.

a. Manufacturer (soldered ends): Apollo 77CLF-200, Hammond UP8311A, Milwaukee UPBA450, or NIBCO S-585-80-LF.

b. Manufacturer (threaded ends): Apollo 77CLF-100, Hammond UP8301A, Milwaukee UPBA400, or NIBCO T-585-80-LF.

D. Check Valves:

1. Check valves 2.5" and smaller: class 125, bronze body, Y-pattern horizontal swing with renewable bronze disc and seat, screw cap, 200 psig non-shock cwp.

a. Manufacturer (solder ends): Apollo 161S-LF, Milwaukee UP1509, or NIBCO S-413-Y-LF.

b. Manufacturer (threaded ends): Apollo 161T-LF, Milwaukee UP509, or NIBCO T-413-Y-LF.

2.04 STRAINERS

A. Strainers 2.5" and smaller: class 125, bronze body, Y-pattern, with a 20 mesh type 304 stainless steel screen, threaded cap, 200 psig non-shock cwp.

1. Manufacturer (solder ends): Apollo 59LF-300, or Wilkins YBXLC.

2. Manufacturer (threaded ends): Apollo 59LF-000, or Wilkins YBXL.

2.05 HYDRANTS

A. Wall Hydrants:

1. Non-freeze type with bronze body and casing, 0.75" threaded inlet, 0.75" hose thread outlet, integral vacuum breaker, key handle, adjustable wall clamp, recessed box with hinged locking cover with the word WATER cast in, and nickel bronze finish.

a. Manufacturer: Josam 71000, Smith 5509 QT, Wade 8600-175, or Zurn Z-1300.

2.06 WATER HAMMER ARRESTERS

A. Enclosed piston type with copper tubing enclosure, FDA approved double O-ring seals, threaded connections, ASSE 1010-2004 certified.

1. Manufacturer: Precision Plumbing Products SC series, Sioux Chief 650 series, Smith 5200 series, Watts LF15M2 series, or Wilkins 1250XL.

2.07 THERMOMETERS

A. Blue- or green-reading organic-filled every-angle, industrial type with aluminum case, glass lens, 9" scale length, and accuracy rating of ± one scale division. Thermometers installed in insulated piping shall have 6" stems with brass thermowell, filled with heat transfer medium, and extension.

B. Scale range: 30°F to 240°F.

C. Manufacturer: Trerice BX9-SPB, Weiss A9VU, Weksler EG5L-9, or Winters 9IT.

2.08 TEMPERATURE MAINTENANCE CABLE

A. Self-Regulating Cable - Freeze Protection:

1. General: UL listed self-regulating heating cable with connections, and electronic controls for maintaining the system temperature above freezing. Cable and components shall have a minimum 10 year warranty, and comply with IEEE 515.1-2012.

2. Cable: self-regulating heating type, manufactured for use with a controller for temperature setting of 40°F, and having a draw of 5 W/ft at full power. The cable shall consist of 2 minimum #16 AWG copper bus wires embedded in a radiation cross-linked conductive polymer core that varies its power output to respond to temperature changes along its length. The cable shall be covered by an inner jacket, a tinned-copper braid, a color coded polyolefin outer jacket, and be field cut-to-length type with no damage to the cable or its function.

a. Manufacturer: Nelson Type CLT, Raychem XL-Trace, or Thermon FLX.

3. Accessories: power connections, splices, end caps, binding tape, and identification labels reading, "HEAT TRACED", as required.

4. Controllers: UL listed electronic control and monitoring system, housed in a NEMA 4X coated steel rated enclosure, and capable of providing temperature control, cable monitoring and outgoing communications. Controllers shall have on/off control, ambient sensing thermostat, display screen, panel indicator lights (power on, heater on, system failure) system test, local alarm with silence, over temperature protection set at 5°F above the system temperature, communications port with contacts and software to communicate with the building automation system for cable on, high/low temperature, cable trouble, and controller trouble.

a. Manufacturer: Nelson Type AP, Raychem EC-TS, or Thermon PDMP series.

2.09 HOT WATER CIRCULATING PUMPS

A. Single-stage bronze inline cartridge type, fluid lubricated, with spherical rotor impeller, and magnetic drive.

1. Manufacturer: Armstrong NBF series, Bell & Gossett NBF series, or Grundfos Circulator series.

2.10 HOT WATER CIRCULATING PUMP TIMERS

A. Digital time switch with 7 day programmable on/off settings, permanent power failure schedule retention, and manual override.

B. Provide with a NEMA 1 enclosure, 0.5" and 0.75" knockouts on bottom, sides and back, and provisions for locking or sealing.

C. Manufacturer: Intermatic ET1700 series, or Tork EW series.

2.11 MIXING VALVES

A. Single fixture mixing valves MV-1: thermostatic type mixing valve with bronze or brass body, lockable temperature setting, 0.375" compression inlets with integral check valves, 0.5 gpm minimum flow, and conforming to ASSE 1070-2004.

1. Manufacturer: Leonard 170 LF, Power LF e480, or Symmons 7-210.

2.12 ACCESSORIES

A. Gaskets in water piping: 0.063" thick red rubber or asbestos-free composition sheet type, selected for the pressure, temperature and service of the specific joint.

B. Bolts and nuts: ASTM A307-2012, Grade B.

PART 3 - EXECUTION

3.01 GENERAL PIPING INSTALLATION

A. General:

1. Piping shall be cut to measurements established at the site and worked into place without springing or forcing.

2. Use concentric reducing fittings between different size pipes.

3. Ream steel, brass and copper pipe after cutting, turn on end and knock loose dirt, scale, and filings from interior of pipe.

4. Slope water piping to drain back to the mains.

B. Aboveground:

1. Piping shall be installed to permit free expansion and contraction, as controlled by pipe anchors where indicated, without damage to joints, hangers, or the building. Arrange piping to minimize stresses caused by expansion and contraction.

2. Group exposed pipe together and arrange control valves at fixtures for ease of operation.

3. Install piping so as to preserve access to valves and equipment and to provide the maximum headroom possible.

4. Provide offsets to maintain ceiling height and to coordinate with other trades.

5. Install exposed piping such that when insulation is applied it will not come in contact with adjacent surfaces.

C. Piping Joints:

1. General:

a. Isolate joints between dissimilar metals and connections to tanks with dielectric fittings.

b. Provide flanges, grooved couplings, or unions at connections to equipment.

2. Solder joints: pipe ends shall be cut square, deburred, cleaned and assembled in accordance with ASTM B828-2002 (2010).

3. Threaded joints: screw-thread joints shall be made with cut tapered threads. Joints shall be made tight with Teflon tape. Not more than 2 threads shall show after the joint is made tight, except no threads shall show in exposed chromium-plated piping.

4. Flanged joints: except at connections to equipment, flanged joints shall be made with ring type gaskets, extending to inside of bolt holes. Flanged connections to equipment shall be made with full-face gaskets to match flanges on equipment.

3.02 PIPING, FITTINGS AND JOINTS

A. Copper Tubing:

1. Noninsulated piping installed in masonry construction shall be painted 2 coats of asphaltum paint.

2. Clean, prime, and paint exposed non-insulated piping with 2 coats of glossy silver paint.

3.03 SPECIALTY PIPING JOINTS

A. Unions:

1. Provide in each piping connection to each piece of equipment where equipment may be removed.

2. Unions are not required where flanges or roll-grooved mechanical joint couplings are provided.

B. Ball Joints:

1. Ball joints shall be installed in accordance with manufacturer's recommendations.

2. Where ball joints are used across building seismic joints, they shall be installed in accordance with manufacturer's recommendations and SMACNA Seismic Restraint Manual: Guidelines for Mechanical Systems-2008.

3.04 VALVES

A. General:

1. Provide a valve in each water supply connection to hose bibs, wall hydrants and water using equipment.

2. Install valves in clear locations so that handles and hand wheels are easily accessible for opening and closing of the valves.

B. Globe Valves:

1. Provide globe valves in each water supply connection to sinks, water coolers, and any fixture provided by others, except where globe type stop valves are furnished with fixtures.

3.05 STRAINERS

A. Install in the inlet to each pump, pressure reducing valve, flow control valve, thermostatic mixing valve, backflow preventer, and as indicated on the Drawings or specified herein.

3.06 HYDRANTS

A. General:

1. Provide Owner with a loose key for each hydrant and obtain a receipt listing quantity and type of hydrant keys.

B. Wall Hydrants:

1. Install 18" above finished grade, except where building conditions and/or grade prevents the installation. Modify installation height as required, up to 36" above finished grade, where 18" will not work.

3.07 WATER HAMMER ARRESTERS

A. Install water hammer arresters in accordance with PDI WH 201-2010.

3.08 THERMOMETERS

A. Thermometer stems shall be installed in pipe tees with the stem in the water way flow stream. Thermometers shall be located so as to be easily read from 4.5' above the floor.

3.09 TEMPERATURE MAINTENANCE CABLE

A. General:

1. Install cables, controllers, and components in accordance with manufacturer's instructions.

2. Test cables and electronics prior to installing piping insulation.

3. Secure cable to piping with manufacture recommended tape on 10" centers.

4. Install power connections, splices, and end caps under the piping insulation.

5. Route power connections to a junction box located outside the piping insulation.

6. Install "Heat Trace" identification signs a maximum of 10' apart.

7. Provide 30 mA ground-fault protection for each cable circuit.

B. Installation Locations:

1. Install on the water piping where indicated on the Drawings for protection against freezing.

3.10 WATER HEATERS

A. Install heaters level and stable.

3.11 HOT WATER CIRCULATING PUMP TIMERS

A. Set to turn the circulating pump on at 5:00 am and run for 16 hours.

B. Coordinate the programmable schedule with the Owner.

3.12 THERMAL EXPANSION TANKS

A. Support tanks with hangers independently from adjacent piping.

3.13 MIXING VALVES

A. Connect mixing valves to the piping systems per the manufacturer's published installation recommendations.

B. Secure each mixing valve to the wall.

3.14 PIPING AND JOINT PRESSURE TESTING

A. General:

1. Test piping and joints under floor slabs before slabs are poured.

2. Tests shall be made while piping and joints are exposed to view.

3. Screwed and flanged joints that leak shall be taken apart and reassembled.

4. Soldered and brazed joints that leak shall be cut out and replaced.

5. Submit a statement certifying that piping and joints are tight and have passed the specified test.

B. Piping Systems:

1. Test cold water, hot water, and tempered water systems piping and joints by capping all openings and applying a hydrostatic pressure of 125 psig for 1 hour without any drop in pressure. Disconnect the pump source prior to and during testing. Where a system is tested in sections, each section shall be subjected to the same test.

3.15 PIPING SYSTEM TEMPERATURE TESTING

A. Hot Water Systems:

1. Following the installation of the piping systems, energize the water heaters and bring the piping systems up to operating temperatures.

2. Flow the hot water systems then allow the systems to stand for one hour before beginning testing.

3. Perform hot water temperature checks at each fixture, and verify that the correct water temperature, as indicated on the Drawings, is flowing from each hot water outlet.

4. Where any fixture's hot water temperature is incorrect, make adjustments as required to the water heaters and mixing valves.

B. Tempered Water Systems:

1. Following the installation of the piping systems and energizing of the water heaters, flow the tempered water system and test that the correct water temperature, as indicated on the Drawings, is flowing from each outlet.

2. Make adjustments as required to the water heaters and mixing valves.

3.16 CLEANING AND DISINFECTION

A. Domestic Water Piping:

1. Clean and disinfect inside water piping prior to placing the system in operation.

2. Purge domestic cold water, hot water, and tempered water piping, including heaters, pumps, tanks, and fixtures.

3. Flush the piping systems with potable water from the municipal supply system until water runs clear.

4. Fill the system with clean water with a water/chlorine solution containing a minimum 50 ppm chlorine. Isolate the piping systems and allow to stand for 24 hours.
5. Drain the systems and refill with a water/chlorine solution containing a minimum 200 ppm chlorine. Isolate the piping systems and allow to stand for 3 hours.
6. Flush the systems with clean, potable water from the municipal supply system until the chlorine in the system is the same level as the municipal supply system.
7. Submit water samples for biological examination by laboratories approved by the local health authority. Samples shall be taken in the presence of the Owner.
8. Repeat the procedures and resubmit water samples as required to pass the biological test. Minimum acceptance test results shall be 0.0 colonies of coliform bacteria.
9. Provide results of tests.
10. Materials and test methods shall comply with AWWA C651-2005.

B. Strainers: after final flushing of the water system, remove strainer baskets for cleaning and disinfection. Reinstall baskets and ensure that caps are leak tight.

END OF SECTION 224400

SECTION 230010

HVAC GENERAL

PART 1 - GENERAL

1.01 DESCRIPTION

A. These heating, ventilating and air conditioning (HVAC) provisions specified herein apply to all Sections of Division 23.

B. Refer to the General and Supplementary Conditions and Division 01 for special requirements and conditions which apply to all Sections of Division 23.

C. This Section includes responsibilities and obligations in support of the performance verification specified in Section 230090, HVAC Performance Verification.

1.02 QUALITY ASSURANCE

A. Conform to the following:

1. International Energy Conservation Code-2009 with Georgia State Amendments-2012.

2. International Mechanical Code-2012 with Georgia State Amendments-2014.

3. NFPA 90A-2012.

B. Codes, standards and regulations specified herein refer to the edition date. Revisions and addenda to these codes, standards and regulations shall be part of these specifications. Provisions of referenced codes, standards, and regulations do not create duty or responsibility by the Architect or the Owner, unless otherwise specified herein.

C. Codes, standards and regulations referred to are minimum standards. Where the requirements of these specifications or drawings exceed those of the codes, standards and regulations, the drawings or specifications shall govern.

D. HVAC/Electrical Design Coordination:

1. The power ratings of motors and other HVAC equipment and the electrical characteristics of electrical systems serving them, as specified herein and indicated on the Drawings, have been established as minimums which will allow that equipment to satisfactorily function while producing the required capacities. These power ratings include a safety factor deemed appropriate to accommodate common differences between design parameters and field construction practices. Under no circumstances shall equipment with power ratings less than those indicated on the Drawings or specified herein be provided.

2. Reasonable efforts have been made to coordinate the electrical requirements of the HVAC equipment with the electrical systems serving that equipment. Differences among manufacturers of HVAC equipment make it impossible to produce a single electrical design which will satisfy the varying electrical requirements of those manufacturers. Consequently, the Contractor shall coordinate the electrical requirements of the HVAC equipment actually furnished on this Project and provide the electrical systems required by that equipment. This coordination effort shall be completed prior to the installation of either the HVAC equipment or the electrical systems serving that equipment. Electrical system revisions required to coordinate with the HVAC equipment actually furnished shall be provided at no additional cost to the Owner.

E. Adhesives and Sealants:

1. Adhesives, sealants, and sealant primers used inside the building (defined as inside the weatherproofing envelope and applied on site) shall comply with SCAQMD Rule 1168-2005 for volatile organic compound content limits.

2. Aerosol adhesives shall comply with GS 36-2013 for volatile organic compound content limits.

F. Paints and Coatings:

1. Anticorrosive and antirust paints applied to interior ferrous metal shall not exceed a volatile organic compound content limit of 250 g/L per GS 11-2013.

1.03 SPACE CONDITIONS

A. Drawings are diagrammatic in nature and, unless explicitly dimensioned, indicate approximate locations of apparatus, equipment, ductwork and piping. Changes in the location, and offsets, of same which are not shown on the Drawings but are necessary in order to accommodate building conditions and coordination with the work of other trades, shall be made during the preparation of coordination drawings and prior to initial installation, without additional cost to the Owner.

B. Provide access to equipment and apparatus requiring operation, service or maintenance throughout the life of the system.

C. Piping, equipment, or ductwork shall not be installed in electrical equipment rooms, elevator equipment rooms, or elevator shafts unless specifically indicated on the Drawings. In addition, piping, ductwork, or mechanical equipment shall not be installed in the space equal to the width and depth of switchgear, switchboards, panelboards, and motor control centers from floor to structure above nor within the working space in front, rear and/or side (where rear and/or side access is required to work on equipment) of electrical equipment (switchgear, switchboards, panelboards, motor control centers, variable frequency drives, transformers, and starters). Dimensions of the working space shall be a minimum depth of 42" horizontally, the width of the equipment or 30", whichever is greater, and the height of the equipment or 78", whichever is greater. Minimum depth shall be increased to 60" for equipment rated over 600 V.

1.04 ASBESTOS MATERIALS

A. Materials containing asbestos or any trace of asbestos related materials shall not be used on this Project.

1.05 DEFINITIONS

A. Exposed piping, conduit, or ductwork is that which can be seen when the building is complete without opening or removing access doors or panels or accessible ceiling components.

B. Other piping, conduit, and ductwork is considered to be concealed.

1.06 CONTINUITY OF EXISTING SERVICE AND SYSTEMS

A. Schedule work so existing systems will not be interrupted when they are required for normal usage of the existing building. Obtain approval from the Owner and Architect at least 7 days prior to any utility interruption or connection.

B. Perform work at such time and in such manner as to cause minimum inconvenience to the Owner and as approved by the Architect. No allowance will be made for lack of knowledge of existing conditions.

1.07 RELATED WORK DESCRIBED IN OTHER DIVISIONS

A. Installation of access panels in wall and ceiling construction.

B. Cutting, coring, waterproofing, and patching of walls, floors, ceilings, roofs and structure of existing buildings.

C. Painting, except as specified herein.

D. Electric power, interlock, and control wiring, except as specified herein.

E. Installation of starters, contactors, thermal overload switches, and remote push buttons, except as specified herein.

F. Fire alarm initiating devices, control modules, and monitoring modules.

G. Curbs, flashing, and pitch pockets for equipment on roof, except as specified herein.

1.08 SUBMITTALS

A. Within 15 days after notice to proceed, submit a schedule indicating the proposed submission date of each submittal specified herein. Schedule shall anticipate the submittal review time, the possible need for resubmittals, and the time required for fabrication, shipping and integration into the construction sequence. Architect will advise of any conflicts in reviewing submittals that the proposed schedule presents.

B. Submittals shall be prepared in a line-by-line format corresponding to these Specifications and shall indicate compliance with each requirement specified herein and indicated on the Drawings.

1. In addition to any other transmittals or cover sheets used, fill out and attach to each individual submittal a copy of the Cover Sheet for Submittals to Newcomb & Boyd included at the end of this Section.

2. Indicate manufacturer's installation instructions.

3. Indicate deviations, if any, including any from the manufacturer's installation instructions.

4. Reproductions or electronic versions of design drawings shall not be used in the preparation of shop drawings.

5. Resubmittals that are required to address review comments shall include a cover transmittal with a written explanation of how each review comment has been addressed.

6. Submittals not specifically required, or not complying with the format requirements, will be returned unreviewed.

7. Shop drawings shall be provided in AutoCAD 2013 format.

8. Submittals in 3-ring binders shall include an index of contents and divider tabs.

C. Shop drawings shall include the following:

1. Trade shop drawings (i.e., HVAC equipment room drawings, HVAC piping system drawings, HVAC sheet metal system drawings, and electrical main feeder raceway drawings) shall be submitted within 30 days after award of contract.

2. Approved trade shop drawings shall be utilized as the basis for the coordination drawings. Coordination drawings shall be submitted within 30 days after approval of trade shop drawings.

3. Coordination drawings shall utilize either manual or electronic means of analyzing the work of each trade in spatial relationship with other trades. Locations of conflicts between

trades, and the proposed resolution for each conflict, shall be noted on the coordination drawings submitted.

4. No work shall be fabricated and/or installed prior to receipt by the Contractor of approved trade shop drawings and approved coordination drawings without specific written authorization from the Architect. No change orders will be approved or design assistance provided for remedial field coordination activities for work fabricated and/or installed prior to receipt by the Contractor of approved trade shop drawings and approved coordination drawings.

D. HVAC submittals shall include the following:

1. Performance Verification Supervisor qualifications.
2. Coordination drawings, with dimensions and elevations, of HVAC work, including ductwork, equipment, piping with fittings, valves, dampers, accessories and sleeves coordinated with the work of other trades, including plumbing, fire suppression, electrical, structural, and architectural, minimum 1/4" = 1'-0" scale.
3. Insulation.
4. Roof top air conditioning units with coil, fan, and filter data, and fan curves.
5. Combination fire/smoke dampers, including static pressure drop for each damper.
6. Dampers.
7. Fans and fan curves.
8. Filters.
9. Gravity roof ventilators.
10. Piping system drawings, showing equipment, piping, fittings, elevations, dimensions, valves, sleeves and accessories, coordinated with ductwork, building conditions, and other trades, minimum 1/4" = 1'-0" scale.
11. Split system air conditioning units.
12. Terminal units.
13. Unit heaters.
14. Variable frequency drives.

1.09 EQUIPMENT AND INSTALLATION REQUIREMENTS

A. Equipment and materials shall, unless otherwise specified herein, be new and shall be of the customary standard and quality furnished by the designated manufacturer for that catalogue number.

B. Materials and equipment shall be UL listed, and shall bear the UL listing mark on products for which standards have been established and for which listing is regularly furnished by UL.

C. Mechanical equipment that is not covered by NAECA-2001 shall carry a permanent label installed by the manufacturer stating that the equipment complies with the requirements of ASHRAE/IESNA 90.1-2010.

PART 2 - PRODUCTS

2.01 HANGERS AND SUPPORTS

A. Hangers:

1. General: complete with rods and supports proportioned to the size of piping or equipment to be supported.
2. For steel pipe: steel or malleable iron, unless specified otherwise herein.
3. For hot water piping 3" and larger: Anvil 171, B-Line B3114, or ERICO 605 roll type with Anvil 160, B-Line B3160, or ERICO 630 pipe covering protection saddles.
4. For copper piping 4" and smaller: copper-plated; Anvil CT-69, B-Line B3170 CT, or ERICO 101.
5. For black steel piping 2" and smaller: Anvil 69, B-Line 200, or ERICO 115.
6. For copper piping over 4": copper-plated; Anvil CT-65, B-Line B3104 CT, or ERICO 401.
7. For chilled water piping 3"and larger, and piping insulated to prevent sweating: galvanized; Anvil 260, B-Line B3100, or ERICO 401.

B. Hanger Rods:

1. One-piece steel type, threaded as required.
2. Sizes, unless specified otherwise herein, shall be as follows:

Pipe Size	Rod Diameter
2" and smaller	0.375"
2.5" and 3"	0.5"
4"	0.625"
6"	0.75"
8" and larger	0.875"

3. Sizes for gang or multiple hangers: calculated for the combined weight of the piping and accessories.
4. Sizes for equipment hangers: calculated for the weight of the equipment supported.

C. Inserts:

1. Adjustable type: Anvil 282, B-Line B3014, or ERICO 355.
2. Continuous type: Anvil PS-5000, B-Line B32I, or ERICO CON.

D. Clamps for piping in bar joist construction: Anvil 92 or 93, B-Line B3031 or B3033, or ERICO 300.

E. Insulation protectors: Anvil 167, B-Line B3151, or ERICO 125.

F. Channel strut systems: 14 gauge minimum galvanized steel, with factory-punched attachment holes. Straps shall be designed so that the attachment nut is captive on the shoulder of the strap when tightened. Attachment nuts shall be designed to provide a surface on the turned down edge while making positive contact with the side walls of the channel. Nuts, bolts, straps, and accessories shall be protected with same finish as channels.

1. Manufacturer: B-Line, Kindorf, Midland-Ross, or Unistrut.

2.02 VALVE TAGS

A. Minimum 19 gauge polished brass, 1.5" minimum size. Tags shall be square. Stamped numbers and letters shall be not less than 0.75" high, and filled with black paint.

2.03 IDENTIFICATION MATERIALS

A. Pipe identification shall be 5 mil thick, self-adhering vinyl plastic tape. Tape and legend shall be as follows:

Diameter (Including Insulation)	Width	Size of Legend Letters
0.75" to 1.25"	8"	0.5"
1.5" to 2"	8"	0.75"
2.5" to 6"	12"	1.25"
8" to 10"	24"	2.5"
Over 10"	32"	3.5"

1. Legends shall be in full or abbreviated form, in contrasting color to background color.

B. Nameplates and signs: laminated plastic, engraved with white letters. Background color shall be:

System	Color
Equipment served by emergency power	Red
Other equipment	Black

C. Duct identification shall be strap-on type vinyl markers, minimum size 32" x 6" with minimum 3.5" lettering.

2.04 SLEEVES

A. Sleeves shall be standard weight steel pipe except sleeves for concealed piping through floors not in structural members, and through interior drywall construction may be formed from 26 gauge galvanized sheet metal lapped and pop riveted.

2.05 PENETRATION SEALS

A. Firestops:

1. Firestops shall consist of an asbestos-free fill material, forming/backing/damming materials, and accessories needed to complete a UL classified through-penetration firestopping system. Fill material shall not slump or sag and shall be the required thickness in the fully cured state.

2. Firestops shall be designed to seal through-penetrations against flame, heat, smoke and water in compliance with ASTM E84-2013a, ASTM E119-2012a, ASTM E814-2013, and UL 723-2008.

3. Firestops shall be specifically designed and rated for the individual application, including movement, materials, moisture, penetrating item material, and fire and smoke ratings of the penetrated construction.

4. Manufacturer: 3M, GE, Flammadur, Hilti, Nelson, Rectorseal, or Thomas & Betts.

B. Expansion Seals:

1. Waterproof, modular, mechanical expansion type consisting of synthetic rubber grommets or interlocking links shaped to continuously fill the annular space between the penetrating item and the opening. Sizing of links and sleeve shall be determined by the manufacturer.

2. Manufacturer: Calpico Pipe Linx, Metraflex MetraSeal, or Thunderline Link Seal.

2.06 MOTORS

A. General:

1. Motors shall be dripproof, unless otherwise specified herein or indicated on the Drawings, and in compliance with NEMA MG 1-2011. Refer to Electrical Drawings for exact characteristics of motors. Dripproof and totally enclosed fan-cooled motors shall be rated on a 50°C and 55°C temperature rise basis, respectively, unless otherwise specified herein.

2. Dripproof and totally enclosed: 1800 rpm, induction type with a 1.15 service factor, unless otherwise specified herein.

3. With shaft grounding rings and designed in accordance with Part 31 of NEMA MG 1-2011 for use with variable frequency drives for equipment as indicated on the Drawings.

4. NEMA premium efficiency type, in accordance with NEMA MG 1-2011, for heating, ventilating, and air conditioning equipment 1 hp and larger.

5. Motors not furnished with equipment shall be by: Baldor, Century, Delco, GE, Marathon, Reliance, or Siemens.

2.07 STARTERS

A. General:

1. Manual reset, Class 20, thermal type overload protection for each phase, in accordance with NEMA ICS 2-2000 (R2005).

2. NEMA 3R enclosures for exterior application.

3. Equipment furnished with factory-installed starters shall also be equipped with individual motor disconnect and thermal magnetic circuit breakers or fuses as specified herein with lugs sized to receive a feeder as indicated on the Electrical Drawings.

4. 120 V secondary control power transformer with fused primary and secondary circuit in the enclosure.

5. Unused auxiliary contacts (installed on each contactor): 1 normally open, and 1 normally closed.

6. Starters and contactors not furnished with equipment shall be provided by: ABB, Allen-Bradley, Crouse-Hinds, Cutler-Hammer, GE, Square D, Furnas, Joslyn Clark, or Siemens-ITE.

B. For 3-phase motors, unless otherwise specified herein:

1. Combination magnetic type and fused disconnect switch with:

a. Fuses having type and UL class rating as specified in Division 26, providing Type 2 protection.

b. External operating handle capable of being locked in the off or open position.

c. Hand-off-automatic switch on the face for each fan and pump, except those manually controlled.

C. For 1-phase, unless otherwise specified herein:

1. Manual starting switch with thermal overload protection and pilot light.

2. Hand-off-automatic switch, except for manually controlled equipment.

2.08 VARIABLE FREQUENCY DRIVES

A. Variable frequency AC motor controllers shall be designed for use with motors as specified in Paragraph 2.06, Motors.

B. Variable frequency drives in air handling units mounted on the roof shall be installed in accordance with the manufacturer's recommendations and shall include provisions for removing excess heat. Manufacturer shall fully warrant the installation as specified herein and indicated on the Drawings. Coordinate with the air handling unit manufacturer.

C. Controllers:

1. NEMA 3R enclosure, wall- or floor-mounted, UL 508C-2012 listed, with integral power disconnect with door interlock, completely factory-wired, ready for field connection of incoming and outgoing power, and control signal, in compliance with NEMA ICS 1-2000 (R2005, R2008), NEMA ICS 6-1993 (R2001, R2006), and NEMA ICS 7.1-2006. Drives shall be rated a minimum of 100,000 A RMS symmetrical AIC.

2. Controllers shall be of the pulse width modulation type, and shall have the following features and functions contained in the cabinets unless otherwise specified herein:

a. Current limiting fuses or semi-conductor protection on the incoming line side.

b. Speed regulation within 3% accuracy.

c. Integral manual bypass complete with interlocked contactors to completely isolate the controller when in the bypass mode, face-mounted controller-off-bypass switch with pilot lights, solid state motor overload relays with phase loss protection for motor protection in both the controller and bypass modes, auxiliary relays to allow remote start-stop commands in both modes, and door interlocked lockable disconnect switch to provide means of disconnecting power to both bypass circuitry and controller. Manual bypass components shall mount within the controller enclosure or enclosure extension. A separate starter shall not be required to operate the motor in the bypass mode. Power supply to the bypass contactors and relays shall be provided by a single-phase power conditioner with sufficient rating and capacity to prevent contactor dropout during power sags.

d. Interface connections for remote controls shall be wired to terminal strips as follows:

1) Dry contacts for remote enable/disable.

2) Process transducers for 4-20 mA speed adjustment signal.

3) Terminals for connection of normally closed remote safety devices.

4) Dry contact for external alarm, to open on internal drive fault, power supply fault, process transducer signal fault, or operation of remote safety devices.

3. Where specified herein, controllers shall be provided with damped low pass DV/DT drive output filters. Filters shall have K-rated line reactor, gapped iron core, inductor, copper windings and 40ºC ambient temperature rating with a 155ºC maximum operating temperature. Filters shall allow mounting of variable frequency drives up to 3000' from motor loads by filtering voltage spikes.

4. Controllers shall have the following internal protective functions for the protection of the controller modules and motors:
   a. DV/DT (voltage transient) and DI/DT (short circuit) protection.
   b. Inverse time overcurrent protection.
   c. Full time current limit to limit maximum speed for prevention of overload.
   d. Phase sequence (if phase sensitive), phase loss, overvoltage, undervoltage, electronic thermal overload, abnormal temperature, DC overvoltage, and internal fault protection.
   e. Motor winding ground fault.
   f. Motor and variable frequency drive overtemperature protection.
   g. Input power line surge protective device.
5. Integral EMI/RFI filter. Controllers shall be designed to avoid RF interference with other electronic equipment internal or external to the building.
6. Diagnostic module shall identify faults as they occur, storing them in nonvolatile memory for recall, including:
   a. Overcurrent.
   b. Overvoltage.
   c. Undervoltage.
   d. Ground fault.
   e. Electronic motor overload, UL listed for this function.
7. Operator panels shall include digital display and keyboard for entry of set-up parameters, recall of faults from diagnostic module, and display of current operating values including:
   a. Output frequency.
   b. Motor speed.
   c. Motor current.
   d. Output voltage.
   e. Analog input values.
   f. Digital input status.
   g. Elapsed time meter.
   h. Power on indication.
8. Provide nameplate engraved with system identification and hand-off-automatic switch. The hand position shall start the drive and shall have a manual means of speed adjustment. In the automatic position, the drive shall be started and adjusted remotely.
9. Controller design shall permit operation at full load with ambient conditions between 0°C and 40°C, with capacity to handle 110% overload torque for 1 minute. Printed circuit boards shall be tested under full rated load at 10°C above rated ambient temperature for at least 20 hours, and failures corrected prior to shipment.

10. When enabled by remote controls, controller shall start at zero speed and ramp to the current speed setting. Speed range shall be adjustable between 0 Hz and 66 Hz, with separately adjustable maximum and minimum speeds, and adjustable rate of acceleration and deceleration. Provide at least 2 lockout speed ranges with adjustable minimum and maximum speed settings to prevent operation at driven equipment resonant vibration frequencies.

11. Controllers shall restart automatically upon restoration of stable electric service after power supply faults, with adjustable time delay before restart. Operating parameters shall be stored in nonvolatile memory. Controllers shall continue to operate at the minimum speed setpoint on loss of remote control signal, and activate the remote alarm contact.

12. Variable frequency drives shall be designed for starting into a spinning motor. The variable frequency drive shall be able to determine the motor speed in any direction and resume operation without tripping. If the motor is spinning in the reverse direction, the variable frequency drive shall start into the motor in the reverse direction, bring the motor to a controlled stop, and then accelerate the motor to the preset speed.

13. Drive displacement power factor shall be between 0.95 and 1.0 lagging over the entire operating speed range.

14. Drive efficiency shall be greater than 96% at 100% speed full load.

D. Start-up service: as specified in Section 230090, HVAC Performance Verification.

E. Service: manufacturer shall maintain a parts and service facility within 8 hours of this Project, which shall have inventory to cover not less than 80% parts service within 24 hours, and 95% within 48 hours. Further, the facility shall have a factory-trained service representative to furnish installation, test, and start-up supervision necessary for final approval and acceptance, as well as to perform maintenance and repairs on components.

F. Warranty: in addition to other warranties specified herein, equipment shall be guaranteed against defective parts and workmanship under terms of the manufacturer's standard warranty, but in no event shall it be for a period of less than 2 years from date of initial start-up of the system and shall include labor and travel time.

G. Manufacturer: ABB, AC Tech, Allen-Bradley, Baldor, Danfoss, Eaton, Emerson, Fuji, GE, Hitachi, Johnson Controls/York, Siemens, Square D, Toshiba, Trane, US Drives, or Yaskawa.

2.09 CONCRETE

A. Normal weight concrete (145 pcf) using Type I Portland Cement, 1" maximum size coarse aggregate to provide a minimum 28 day compressive strength of 3000 psi.

2.10 GROUT

A. Nonshrink type, conforming to ASTM C1107/C1107M-2013 when tested at fluid consistency. Grout shall exhibit zero bleeding at every age when mixed to fluid consistency. Minimum 28 day compressive strength, when mixed to fluid consistency, shall be 7000 psi.

B. Manufacturer: Cormix, or Master Builders.

2.11 ESCUTCHEONS

A. Split hinged type, constructed of chromium-plated steel or cast brass, sized to fit over insulation and to cover sleeve.

PART 3 - EXECUTION

3.01 PROTECTION OF EQUIPMENT AND MATERIALS DURING CONSTRUCTION

A. Provide protective covers, skids, plugs or caps to protect equipment and materials from damage or deterioration during construction.

B. Store equipment and material under cover, and off the ground or floors exposed to rain.

C. For outdoor storage, protective covers of 10 mil thick black sheet plastic shall be fitted over equipment and materials. Covers shall be reinforced to withstand wind and precipitation. Set equipment and material on skids or platforms of height to avoid damage or deterioration from spattering and ground water.

D. Protect coils against damage by installing temporary closure panels over exposed coil faces. Panels shall be minimum 24 gauge sheet metal or 0.375" plywood.

E. Close open ends of fans, terminal units, air handling units, and ductwork with temporary closures of sheet plastic taped in place.

F. Plug ends of pipes when work is stopped to prevent debris from entering the pipes.

G. Provide dust and debris protection for ductwork, coils, fans, equipment, motors, and bearings operated during construction up to date of substantial completion.

H. Cover open ends of exhaust and return ducts with temporary filter media while fan systems are operating.

3.02 EXISTING EQUIPMENT AND SYSTEMS

A. The existing installation shall remain as is except as otherwise indicated on the Drawings or specified herein. Connect the new work with the existing work and adapt the existing work to the changes in the building and systems.

B. Coordinate the installation of new ductwork, piping and other equipment with existing equipment which is to remain operational to avoid conflict with operating performance and working clearances.

C. Remove piping and ductwork rendered useless due to changes. Plug outlets in piping. Blank-off openings in ductwork and seal airtight.

D. Relocate concealed piping which is exposed by the removal of walls and reconnect.

E. Sleeves left open by removal of piping shall be cut flush with the finished slab, and filled with grout flush with both sides of slab.

F. Material and equipment which has been removed and not accepted by the Owner shall become the property of the Contractor and shall be removed from the site.

G. Material and equipment which has been removed shall not be used in the new work, except as specified herein.

H. Where existing piping, ductwork and equipment is indicated on the Drawings, its size and location shall be verified.

I. Coordinate water treatment chemicals with chemicals used in existing systems prior to connection of new and existing piping.

J. Utilize service procedures to maximize recycling, and prohibit venting, of chlorofluorocarbons and hydrochlorofluorocarbons during servicing, removal, and disposal of equipment containing refrigerants, in accordance with the Clean Air Act Amendments-1990, Title VI.

3.03 EQUIPMENT AND INSTALLATION REQUIREMENTS

A. Air systems shall operate without aerodynamic noise generated from the faulty installation of ductwork or any component of the air distribution system.

B. Equipment shall be installed and connected as specified herein or indicated on the Drawings in accordance with the manufacturers' instructions and recommendations for this Project. Furnish and install auxiliary piping, water seals, valves, and electrical connections recommended by the manufacturer for operation.

C. Motor quantities, sizes and equipment wattage ratings specified herein or indicated on the Drawings are the minimum requirements, unless noted otherwise. Motor quantities, sizes and equipment wattage ratings less than those specified herein or indicated on the Drawings are not acceptable. Larger motor sizes and equipment wattage ratings may only be provided if necessary to meet the prescriptive requirements specified herein or indicated on the Drawings. Where multiple motors or motor sizes or equipment wattage ratings larger than specified herein or indicated on the Drawings are furnished, provide and coordinate the corresponding increased number or capacity of feeders and other electrical equipment serving them, at no additional cost to the Owner.

D. Fans, drive sheaves, motors, and pumps shall be statically and dynamically balanced and shall have steady state radial vibration levels which do not exceed the following:

Equipment	Peak-to-Peak Displacement (mils)
Fans, drive sheaves, and motors	
under 600 rpm	4
600 to 1000 rpm	3
1000 to 2000 rpm	2
over 2000 rpm	1
Pumps and motors	
over 1800 rpm	1
under 1800 rpm	2

E. Field-installed equipment controls or sensor wiring shall be installed in conduit. Low voltage control and sensor wiring shall be installed in conduits separate from line voltage control wiring and power wiring.

F. Where water connection sizes at equipment vary from the pipe size indicated on the Drawings, provide appropriate reducers/increasers directly adjacent to the pipe-equipment unions. Unless otherwise specified herein or indicated on the Drawings, the size of the valves and accessories dedicated to the equipment shall not be less than the pipe size to which they are connected.

3.04 HANGERS AND SUPPORTS

A. Where several pipes run parallel and in the same plane:

1. 2.5" and smaller: may be supported on gang or multiple hangers. Separate copper tubing from ferrous supports with copper-plated steel or 4 psf sheet lead.

2. 3" and larger: support independently, parallel, and equally spaced.

B. Supports for steel pipe and for copper tubing shall not be more than 10' apart. Supports for copper tubing 1" and smaller shall be not more than 5' apart. Pipes shall be supported within 1' of each elbow and tee, and for piping 2.5" and larger at each valve and strainer or each close-coupled group of valves, and strainers.

C. Install a 4 psf lead saddle at each hanger on uninsulated copper piping 4" and larger.

D. Hangers and supports for insulated piping shall bear on outside of insulation. Hangers shall be sized for uncompressed insulation thickness.

E. Provide insulation protectors.

F. Support piping independently of equipment.

G. Adjust hangers and supports so that loading is uniform.

H. Hanger rods shall be suspended from the structure. Do not suspend from other piping, equipment, or ductwork.

I. Inserts:

1. Use for piping 2.5" and larger in new concrete construction.

2. Where the weight to be supported by an insert exceeds 50% of its rated load, install 2 No. 3 reinforcing rods, 3' long through each yoke of insert.

3.05 SLEEVES

A. Provide where pipes pass through walls, floors and roofs, except in the following circumstances:

1. Concealed wall openings of the required diameter in non fire- or smoke-rated construction, unless specified herein to have voids packed with fiberglass and caulking.

2. Concealed floor openings formed by the use of plastic forming devices providing a circular opening of the required diameter.

3. Core drilled concealed openings. Openings in roofs shall not be core drilled. Obtain written permission prior to core drilling.

4. Openings in concrete floor slabs on grade.

B. Sleeves shall be placed into position prior to wall, floor, or roof construction. Sleeves shall be tight-fitting and cut smooth.

C. Floor sleeves shall be cast in place, shall be watertight, and shall extend from the bottom of the slab to 2" above the finished floor.

D. Wall sleeves shall extend 1" on each side of walls.

E. Make sleeves through outside walls above and below grade watertight.

F. Size sleeves for insulated pipes penetrating nonrated construction to allow full thickness insulation.

G. Sleeves in nonrated construction shall be sized to provide clearance all around pipe, including insulation, to accommodate thermal movement. Clearance shall be minimum 0.75".

H. Furnish 4 psf lead flashing for sleeves through flat built-up roofs extending at least 8" from the sleeve in all directions.

I. For piping designed for future upward extension, provide steel pipe sleeves in the roof slab accurately aligned for future extension of these lines. Fill these sleeves with a removable insulating material and coordinate sealing of sleeve tops with the roofing system.

3.06 PENETRATION SEALS

A. General:

1. Install in accordance with the manufacturer's published instructions to achieve ratings and classifications specified herein. A copy of these instructions shall be maintained and available on site.

B. Exterior Wall Seals:

1. Piping without insulation: use expansion seals between pipes and sleeves. Where walls exceed the width of expansion seals, use two seals, one being flush with the inside sleeve face and the second with the outside sleeve face. Fill the annular void space between the two seals.

2. Piping with insulation: pack center annular space between the insulation and the sleeve with fiberglass, then caulk 1" deep from each face to the fiberglass with nonhardening sealant. Smooth sealant with face of sleeve.

3.07 IDENTIFICATION OF PIPING

A. Identify piping specified under this Division in accordance with ASME A13.1-2007.

B. Legends shall be on the lower quarters of the pipe except where such location would be obscured. Arrow tape shall be wrapped completely around the pipe at each end of the legend with arrows pointing in the direction of flow.

C. Locate pipe identification as follows:

1. Piping concealed in chases or shafts:

a. Each pipe visible through an access door or panel.

2. Piping exposed in rooms other than mechanical equipment areas:

a. Omit identification of piping 0.5" and smaller exposed at connections to equipment.

b. With the above exception, identify at not less than 1 point each piping run visible in each room with identification on not over 20' intervals.

D. Schedule of Piping Identification:

Piping System and Contents	Tape Color	Legend	Abbreviated Legend
Chilled Water	Green	Chilled Water	CHS & CHR
Hot Water	Yellow	Hot Water	HWS & HWR

E. Piping with temperature maintenance cable shall be labeled Electronically Traced on the outside of the insulation jacket.

3.08 VALVE TAGS AND SCHEDULES

A. Provide numbered brass tags on valves except at unit heaters, fan-coil units and terminal unit coils. Attach tags to valve stems with brass S-hooks or brass chain.

B. Tags on new valves shall continue the numbering sequence of existing valves.

C. Provide for each system a typewritten schedule of valves giving number, location (room number), and function of each with a small scale diagram outlining general piping layout and location of each numbered valves.

3.09 IDENTIFICATION OF EQUIPMENT

A. Identify equipment. Identification shall consist of upper case letters.

B. Each starter, variable frequency drive, contactor, push button station, control switch, disconnect, and thermal overload switch shall be appropriately identified by nameplates with 0.25" high letters.

1. Identification shall include the equipment designation and device function, e.g., CT-1 Water Level Control Disable.

C. Each piece of equipment and access door shall be stenciled with its equipment number in a prominent location with minimum 2" high letters.

D. Access panels and doors in ductwork and plenums shall be stenciled with minimum 1" high letters to indicate the type of devices accessible therein and the system or fan identification number associated with that ductwork or plenum.

E. Access panels in grease ductwork shall be labeled "Access Panel – Do Not Obstruct".

3.10 IDENTIFICATION OF DUCTWORK

A. Markers shall be secured to ductwork with draw bands.

B. Legends shall be on the underside of the duct except where such location would be obscured. Legends shall include name of air handling unit or fan system and arrows pointing in the direction of flow.

C. Concealed ductwork shall be labeled with identification materials specified herein. Exposed ductwork shall be stenciled with minimum 3.5" uppercase letters.

D. Supply ductwork downstream of terminal units shall not be labeled.

E. Schedule of Ductwork Identification:

Duct System and Contents	Background Color	Legend	Legend Color
Outside Air	Green	Outside Air	White
Supply Air	Blue	Supply Air	White
Return Air	Red	Return Air	White
Relief Air	Red	Relief Air	White

3.11 MOTORS

A. Provide motors for equipment covered in Division 23 unless otherwise specified herein. Select motors for operation not exceeding a 1.0 service factor and within the nameplate amperage and nominal power rating.

3.12 STARTERS

A. Provide starters, push buttons, thermal overload switches, and contactors for equipment covered in Division 23 unless otherwise specified herein. Installation of starters, push buttons, and thermal overload switches, not factory installed, is specified under Division 26.

B. Provide 120 V secondary control power transformers for control circuits where equipment is served at 208 V or higher.

3.13 FUSES

A. Provide fuses in equipment furnished under this Division of the specifications.

B. Provide 3 spare fuses of each size, UL class, and voltage rating furnished under this Division of the specifications and turn over to the Owner. Obtain a receipt for same.

3.14 VARIABLE FREQUENCY DRIVES

A. Installation is specified under Division 26.

B. Start-up shall be performed under the supervision of a technical service employee of the manufacturer. Set minimum speed at 20%, and calibrate the control input to match the operating conditions and the automatic temperature control system. Submit written certification, upon completion, that components have been installed correctly in accordance with the manufacturer's recommendations, are operating correctly, and that operation and set-up has been coordinated with the automatic temperature control systems.

C. Test each fan from minimum to maximum speed to determine the resonant frequencies. Once the resonant speeds have been determined, adjust the frequency lock-out feature to eliminate fan operation at those speeds.

D. Install DV/DT drive output filters where load lead length is 50' and greater.

3.15 VIBRATION ISOLATION

A. General:

1. Vibration isolators shall be installed and connected as specified herein or indicated on the Drawings in accordance with the manufacturer's written instructions and certified submittal data.

B. Equipment Isolation:

1. Isolated equipment mounting systems shall permit equipment motion in all directions.

2. Mount fans, as indicated on the Drawings, on structural steel vibration bases common to both fan and motor.

3. Chilled Water Piping:

a. Horizontal

1) Pipe stand supports shall be supported on Type FS isolators. Isolators shall have a minimum 1" static deflection.

3.16 EQUIPMENT AND EQUIPMENT ROOMS

A. Remove dust, dirt, rust, stains, and temporary covers.

B. Foreign matter shall be blown, vacuumed, flushed, or cleaned out of and from new equipment, piping, ductwork, pumps, fans, motors, bearings, devices, switches, controls, and panels.

C. Clean and polish identification plates.

D. In equipment rooms, clean equipment, ductwork, insulation, piping, conduit, and room surfaces from dust and dirt and maintain in a clean condition from date of substantial completion until final completion of work and corrective work.

E. Remove excess material from the Project site.

3.17 FOUNDATIONS

A. Provide concrete foundations for the following floor-mounted equipment:

Equipment	Foundation
Air-cooled condensing units	4" high pad

B. Foundations shall be continuous and shall have beveled edges and smooth float finish. Foundations shall be reinforced with No. 3 bars a maximum of 12" on center each way, and held in place with dowel rods at each corner anchored in the slab. Dowel rods shall not penetrate through the slab.

C. Roughen and clean exposed slabs before pouring foundations. Apply bonding agent to surfaces in contact.

D. Foundations shall extend a minimum of 6" beyond the equipment footprint in all directions, including appurtenances, vibration isolators, base elbow supports, and motors.

E. Equipment attached directly to foundations or inertia bases; bases provided with grout holes; and bases consisting of a structural frame shall have voids filled with grout after attachment to foundation.

3.18 SUBWAY GRATING

A. Entire assembly shall be galvanized.

3.19 ACCESS PANELS - BUILDING

A. Where HVAC work is concealed by walls or ceilings, or is inaccessible, provide an access panel to provide access for service and maintenance.

B. HVAC work located above ceilings is considered accessible if the ceiling is the accessible type and is arranged for access to the equipment.

C. Fire-rated access panels shall be provided in fire barriers with ratings to match the construction fire rating.

D. Access doors providing access to ductwork access doors shall allow for service and maintenance of the intended equipment.

E. Installation of access panels is specified under another Division.

3.20 ESCUTCHEONS

A. Provide escutcheons where exposed piping passes through walls, floors and ceilings in finished areas.

3.21 PAINTING

A. Except where otherwise specified herein, painting shall be done under another Division. Surfaces shall be left clean and free from oil.

B. Equipment factory finishes damaged or deteriorated during construction shall be repaired to match original finish.

C. Where galvanizing is broken during fabrication or installation, recoat exposed areas with zinc-rich paint.

D. Ductwork, conduits, insulation, pipe and structure visible through grilles, registers and diffusers shall be painted flat black.

3.22 COORDINATION

A. Provide offsets, transitions, and fittings to coordinate the work of each trade with that of other trades, including plumbing, fire protection, electrical, structural, and architectural.

3.23 OPERATION AND MAINTENANCE MANUALS

A. These operation and maintenance manual requirements supplement operation and maintenance manual documentation requirements of other Sections of these specifications.

B. Operation and maintenance documentation, in hardback 3-ring loose-leaf binders except full size drawings and CDs, shall cover the HVAC and automatic temperature control systems. Documentation shall include an operations and maintenance documentation directory, emergency information, operating manual, maintenance manual, test reports, and construction documents.

C. The operation and maintenance documentation package shall be submitted as one comprehensive package to the Owner 1 months before systems start-up, and shall be updated, revised and completed at completion of construction.

D. Compile and coordinate the documentation for equipment and systems installed. Documentation shall be typewritten and shall contain, at a minimum, the following information.

1. Introduction:

   a. Project name, contractors' and subcontractors' names, addresses, and telephone and facsimile numbers. Indicate the portion of the work for which each subcontractor was responsible.

   b. Index.

2. Operation and Maintenance Documentation Directory:

   a. Explanation of the identification system used, including lists of systems, equipment, and component identifiers and names.

3. Emergency Information:

   a. Information for technical and nontechnical personnel about actions recommended during emergency situations to protect life and property and to minimize disruption to the building occupants. Emergencies shall, at a minimum, include:

      1) Fire.

      2) Power failure.

4. Operation Manual:

   a. General Information:

      1) Building function.

      2) Building description.

      3) Operating standards and logs.

   b. Technical Information:

      1) System description.

      2) Operating routines and procedures.

      3) Seasonal start-up and shutdown.

      4) Special procedures.

      5) Basic troubleshooting.

5. Maintenance Manual:

   a. Descriptions (specifications) of the equipment and components.

   b. Description of function, as applicable: the function of the equipment, procedures before start-up, functional parameters (input, output) at the design load and at part loads, and performance verification procedures.

   c. Recommended maintenance and lubrication procedures and their recommended frequency for this Project.

   d. Recommended list of spare parts, part numbers, and the place(s) from which they can be obtained.

   e. Original purchase order number; date of purchase; name, address, and the telephone number of the vendor; and warranty information.

f. Name and address of at least one service agency capable of providing maintenance.

g. Installation information.

h. Other information needed for the preparation of documents supporting the management of operation and maintenance programs.

6. Construction Documents:

a. Record drawings.

b. Approved submittals, including revised shop drawings indicating as-installed conditions.

c. Equipment identification charts and schedules.

d. Warranty certificates.

e. Inspection certificates.

f. Test, adjust and balance report.

g. Performance verification report.

E. Submit a receipt signed by the Owner acknowledging receipt of the operation and maintenance documentation package.

3.24 RECORD DRAWINGS

A. Refer to Section 017839, Project Record Documents.

B. Upon completion of the Project, submit marked-up design drawings indicating field and as-installed conditions, and shop drawings incorporating changes made during construction for piping and equipment. Submit the following:

1. 2 Sets of bound prints.

2. Full size PDFs on CDs.

3.25 MAINTENANCE

A. Equipment operated prior to the date of substantial completion shall be maintained in accordance with manufacturer's recommendations. In addition, provide complete water treatment for hydronic systems operated prior to date of substantial completion.

B. Prepare and submit a lubrication chart listing for each piece of equipment:

1. Points requiring lubrication.

2. Recommendations for a single manufacturer's lubricants with brand name and designation.

3. Frequency of lubrication required.

C. Lubricate each item of apparatus requiring lubrication prior to start-up in accordance with the manufacturer's recommendations.

END OF SECTION 230010

COVER SHEET FOR
SUBMITTALS TO NEWCOMB & BOYD

Project: _____ Date: _____

Item: _____ Submittal Number: _____

Manufacturer: _____ Model: _____

Specification Paragraph and/or Drawing Number: _____

Capacity: _____

Electrical Characteristics (including identification of all separate connections or services required): _____

_____

_____

_____

Accessories: _____

_____

_____

_____

Options: _____

_____

_____

_____

Deviations (if any; if none, state so): _____

_____

General Contractor Approval: _____

SECTION 230090

HVAC PERFORMANCE VERIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and other HVAC systems are specified in other Sections of Division 23.

B. Performance verification is ongoing process and shall be performed throughout construction. Performance verification verifies that systems are operating in a manner consistent with the Construction Documents.

C. This Section covers HVAC systems performance verification, as required to demonstrate that the equipment and systems of Division 23 are ready for safe and satisfactory operation, as defined by the Construction Documents. Performance verification shall include, but shall not be limited to, identification of piping and equipment, cleaning, lubrication, start-up, check-out, and testing, adjusting, and balancing of systems, preparation of equipment and systems documentation and of maintenance and operation manuals, Owner training, and preparation of record drawings.

D. Performance verification shall conclude with the completion of required deferred testing, training, and system documentation as specified herein and required to demonstrate the proper operation of the HVAC equipment and systems provided by this Division.

E. Verify, at a minimum, the performance of the following systems and equipment and witness the following tests:

1. Section 230010, HVAC General:
   a. Variable frequency drives.
   b. Vibration isolation.
2. Section 231000, Piping, Valves and Accessories:
   a. Automatic air vents.
3. Section 236000, Equipment:
   a. Rooftop air conditioning units.
   b. Split system air conditioning units.
   c. Ductless split system units.
   d. Terminal units.
   e. Electric horizontal unit heaters.
4. Section 237000, Air Distribution:
   a. Centrifugal fans.
5. Section 238000, Automatic Temperature Controls:
   a. BCS.
   b. BCS acceptance.
   c. BCS start-up and checkout.
   d. BCS training.

1.02 QUALITY ASSURANCE

A. Provide a HVAC Performance Verification Supervisor with ten years experience in HVAC contracting. The HVAC Performance Verification Supervisor shall become familiar with the Owner's project requirements and the requirements of the performance verification process as defined in this Section. The HVAC Performance Verification Supervisor shall coordinate and execute the required performance verification activities.

B. The HVAC Performance Verification Supervisor shall review submittal data for conformance with the requirements of the Project, shall monitor compliance with the requirements specified herein for storage and protection of equipment during construction, shall authorize the initial starting of equipment and systems in a manner to avoid damage to equipment, shall oversee start-up, testing and balancing, and shall document that the scheduled and specified performance requirements of each system have been accomplished.

C. Refer to ASHRAE Guideline 0-2013, The Commissioning Process, ASHRAE Guideline 1.1-2007, The HVAC+R Technical Requirements for the Commissioning Process, and Guideline 4-2008 (RA 2013), Preparation of Operating and Maintenance Documentation for Building Systems.

1.03 PERFORMANCE VERIFICATION RESPONSIBILITIES

A. The HVAC Performance Verification Supervisor shall be responsible for scheduling, supervising, and coordinating and executing the start-up, testing, and performance verification activities as specified herein. Include and itemize the cost of performance verification in the contract price, and in each purchase order or subcontract written, include requirements for submittal data, performance verification efforts and documentation, operations and maintenance data, and training as specified herein.

B. HVAC Performance Verification shall take place in three phases. Performance verification requirements for each phase are as follows:

1. Construction Phase:

a. Attend a performance verification scoping meeting and additional such meetings, initially scheduled monthly until prefunctional testing of equipment and systems begins, and weekly thereafter during the construction phase to facilitate the performance verification process. The HVAC Performance Verification Supervisor shall coordinate meeting attendance.

b. Report in writing to the Architect, at least as often as performance verification meetings are scheduled, concerning the status of mechanical activities as they affect the performance verification process, the status of each discrepancy identified the prefunctional and functional testing process, explanations of any disagreements with the identified deficiencies, and the proposed resolution and schedule for correction of the deficiency.

c. Provide documentation of installed systems and equipment, and develop functional testing procedures. This documentation shall include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures; full details of any Owner-contracted tests; fan and pump curves; full factory testing reports, if any; and full warranty information, including responsibilities of the Owner to keep the warranty in force. In addition, the installation, start-up and check-out materials that are actually shipped inside the equipment and the actual field check-out sheet forms to be used by the factory or field technicians shall be submitted to the Owner.

d. Develop and submit to the Architect for review and comment, prior to equipment or system start-up, a complete start-up and initial check-out plan using manufacturer's start-up procedures and prefunctional checklists for the performance of the equipment to be verified.

e. Assist in clarifying the proposed operation and control of equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

f. Prepare the specific functional test procedures as specified herein and review the proposed functional test procedures to ensure feasibility, safety, and equipment protection, and provide necessary written alarm limits to be used during the tests. Obtain Owner approval for proposed functional test procedures.

2. Prepare a preliminary schedule for performance verification activities, including pipe and duct system pressure and leakage testing, flushing and cleaning, equipment start-up, and testing, adjusting and balancing start and completion, and update the schedule during the construction period, as appropriate. Notify the Owner immediately when the performance verification activities not yet performed or not yet scheduled will delay construction.

3. HVAC equipment start-up shall not be initiated until completion of pressure and leakage testing and cleaning as specified in other Sections of Division 23.

4. Provide start-up and prefunctional testing for equipment, including the building automation control system, and execute the HVAC-related portions of the prefunctional checklists for the verification of the performance of all the equipment during the start-up and initial check-out process.

5. Perform and document start-up and system operational check-out procedures, providing a copy to the Owner.

6. Correct noncompliance items before beginning functional performance testing. Air and water testing, adjusting and balancing shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.

C. Acceptance Phase:

1. Place equipment and systems into operation and continue their operation during each working day of the testing, adjusting and balancing, and performance verification activities, as required.

2. For each system or area, have required prefunctional checklists, calibrations, start-up and prefunctional tests of the mechanical systems and associated controls completed prior to beginning the testing, adjusting and balancing process.

3. Provide sheaves and belts as required to achieve required equipment performance, as measured by the testing, adjusting and balancing work.

4. Provide skilled technicians to execute starting and prefunctional testing of equipment and to execute the functional tests for each individual piece of equipment and system. Technicians shall be available and present during the agreed upon scheduled tests and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

5. Perform functional testing for specified equipment and interpret the test data, as necessary.

6. Correct deficiencies (differences between specified and observed performance) as identified by the HVAC Performance Verification Supervisor and interpreted by the Architect and retest the equipment, as required to demonstrate proper operation and performance.

7. Prepare operation and maintenance manuals as specified herein, including clarifying and updating the original sequences of operation to as-built conditions.
8. Maintain marked-up record drawings and produce final record drawings of Project drawings and contractor-generated coordination drawings. List and identify on these record drawings the locations of control system components, airflow stations, and sensor installations that are not equipment mounted.
9. Provide specified training of the Owner's operating personnel.
10. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

D. Warranty Period:

1. Execute seasonal or deferred functional testing.
2. Correct deficiencies and make necessary adjustments to operations and maintenance manuals and as-built drawings system or equipment modifications made during the warranty period and those identified in any deferred functional performance testing.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Standard testing equipment required to perform start-up, initial check-out, prefunctional, and required functional testing shall be provided for the equipment or system being tested.

B. Test equipment shall be of the quality and accuracy required to test and/or measure system performance with the tolerances specified and shall have been calibrated within the last 12 months, or as specified herein. Equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates available on request.

1. Temperature sensors and digital thermometers shall have a certified calibration within the past 12 months and a resolution of ±0.1ºF. Accuracy of temperature test equipment shall be at least twice that of the instrumentation being tested.
2. Humidity sensors shall have a certified calibration within the past 6 months and a resolution of ±1%. Accuracy of humidity test equipment shall be at least twice that of the instrumentation being tested.
3. Pressure sensors shall have a certified calibration within the 12 months and a resolution of 0.05% of sensor range. Accuracy of pressure test equipment shall be at least twice that of the instrumentation being tested.
4. Accuracy of other sensors shall be at least twice that of the instrumentation being tested.

PART 3 - EXECUTION

3.01 SUBMITTALS

A. Submit additional documentation as required to support the performance verification process. This additional submittal documentation shall include, at a minimum, the proposed start-up and initial check-out procedures, and prefunctional checklists.

3.02 START-UP PLAN AND PREFUNCTIONAL TESTING

A. Prefunctional testing shall be required for each piece of equipment to ensure that the equipment and systems are properly installed and ready for operation, so that functional testing may proceed without delays. Follow the approved start-up, initial check-out, and prefunctional testing procedures.

Sampling strategies shall not be used for prefunctional testing. The prefunctional testing for equipment and subsystems of a given system shall be successfully completed and documented prior to functional testing of the system.

B. Procedures for performance verification shall include:

1. Start-up and initial check-out plan: develop the detailed start-up and prefunctional testing plans for equipment and systems that are to be performance verified, as specified herein. Review the proposed procedures and prefunctional testing documentation to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed.

2. The start-up and initial check-out plan shall consist, as a minimum, of the following:

   a. The manufacturer’s standard written start-up and check-out procedures copied from the installation manuals and manufacturer's normally used field check-out sheets. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.

3. First-run checklist for equipment, including:

   a. Equipment properly set.

   b. Alignment of shafts and couplings.

   c. Adjustment of vibration isolators.

   d. Piping and equipment properly connected.

   e. Completion of initial lubrication procedures.

   f. Clean filters in place, as appropriate.

   g. Wiring properly connected.

   h. Electrical overload relays appropriate for load.

   i. Electrical accessories properly installed and adjusted.

   j. Controls, safeties, and time switches properly set.

   k. Verification of direction of motor rotation after final electrical connections by jogging motor.

   l. Verification of proper belt tension.

   m. Measurement of ampere draw of electric motors and comparison with nameplate rating and with overload heater ratings.

   n. Monitoring of temperature build-up in motors and bearings.

4. Contractor-developed prefunctional checklists.

5. Identify which trade is responsible for executing and documenting each of the line item tasks and note that trade on the form. Each form may have more than one trade responsible for its execution.

C. Four weeks prior to start-up, schedule equipment and systems start-up and check-out and notify the Owner in writing. The execution of the prefunctional checklists, start-up and check-out shall be directed and performed by the Contractor, in accordance with manufacturer's published procedures. The Owner shall be present for the start-up, check-out, and prefunctional testing of the first unit of each type of equipment, and any other tests he designates.

D. Sensor calibration: calibration of sensors associated with a given piece of equipment or system shall be included as part of the prefunctional testing and listed on the appropriate test checklists and reports for the system. This requirement may be met during the prefunctional testing of the temperature control or automation system, but shall also be documented with the functional testing procedures.

E. Completed start-up, check-out, and prefunctional test forms shall be completed and submitted to the Owner for review. List outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies shall be provided to the Owner within 2 days of test completion. The Owner shall review the Contractor's start-up and prefunctional testing reports and shall submit either a noncompliance report or an approval form to the Contractor. The Contractor shall correct items that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the Owner as soon as outstanding items have been corrected and resubmit an updated start-up report and a statement of correction on the original noncompliance report. When requirements are completed, the Owner shall recommend approval of the start-up and prefunctional testing of each system and schedule the functional testing of the equipment or system.

F. Complete start-up and prefunctional testing for a system before functional test of that system may proceed.

G. Do not operate HVAC systems in a mode that would induce unconditioned, humid outside air into the building.

3.03 RETESTING OF EQUIPMENT AND/OR SYSTEMS

A. Provide labor and materials required for retesting of any functional test found to be deficient.

B. Prior to retesting, submit required data indicating that the deficient items have been completed and/or corrected to the Owner for approval and rescheduling of the functional test. If during the retesting it becomes apparent that the deficient items have not been completed and/or corrected as indicated in the data provided by the Contractor, the retesting shall be stopped. Costs for the design team to further supervise the retesting of a functional test shall be the responsibility of the Contractor.

3.04 DEFERRED TESTING

A. Schedule and coordinate, with the approval of the Owner, any required seasonal testing, tests delayed until building construction is completed, required building occupancy or loading, weather, or other conditions are suitable for the demonstration of equipment or system's performance, as specified herein. Deferred testing shall be executed, documented, and deficiencies corrected as specified herein for functional testing. Adjustments or corrections to the operations and maintenance manuals and as-built documents required by the results of the testing shall be made before the seasonal testing process is considered complete.

3.05 SEASONAL ADJUSTMENTS

A. The HVAC Performance Verification Supervisor shall schedule, coordinate and complete the seasonal adjustment process. During this effort the HVAC Performance Verification Supervisor shall:

1. Check and verify the calibration of temperature control devices and thermostats. Test and verify control sequences for proper operation for the season.

2. Check the operation, performance, and balance of air and hydronic systems to provide uniform distribution and comfort conditions.

B. Where deficient operation or defective equipment is discovered, provide corrective measures.

3.06 TESTING DOCUMENTATION, NONCONFORMANCE, AND APPROVALS

A. List outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the functional test procedure forms or on an attached sheet. The functional test procedure forms and any outstanding deficiencies shall be provided to the Owner within 2 days of test completion. The Owner shall review the Contractor's start-up and prefunctional testing documentation and shall submit either a noncompliance report or an approval form to the Contractor. Work with the Owner to correct and retest deficiencies or uncompleted items. Correct items that are deficient or incomplete in a timely manner, and notify the Owner as soon as outstanding items have been corrected and resubmit an updated start-up report and a statement of correction on the original noncompliance report. When requirements are completed, schedule the functional testing of the equipment or system.

B. As functional performance testing progresses and deficiencies are identified, work with the Owner to resolve the issues.

3.07 OPERATION AND MAINTENANCE MANUALS

A. The HVAC Performance Verification Supervisor shall compile and prepare documentation for equipment and systems covered in Division 23 and deliver this documentation for inclusion in the operation and maintenance manuals prior to the training of the Owner's personnel.

3.08 INSTRUCTION OF OPERATING PERSONNEL

A. The HVAC Performance Verification Supervisor shall schedule, coordinate and assemble, and deliver the documentation of training required by Division 23.

3.09 FUNCTIONAL TESTS

A. Functional test requirements for the demonstration of proper system and equipment operation shall be defined by the HVAC Performance Verification Supervisor. Execution of these test and demonstration of the required performance shall be the responsibility of the Contractor.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or subsystems at the discretion of the Owner. Beginning system testing before full completion of construction shall not relieve the Contractor from fully completing the system, including prefunctional checklists.

C. Functional testing shall be completed and test documentation approved by the Owner before the Project will be considered substantially complete.

END OF SECTION 230090

SECTION 230095

TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and other mechanical systems are specified in other Sections of Division 23.

B. This Section covers testing, adjusting, and balancing work specified herein, and also indicated on the Drawings, and is defined to include, but is not limited to, air distribution systems, hydronic distribution systems, and associated equipment and apparatus of the new and existing HVAC work. The work consists of setting speed and flow, adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as indicated on the Drawings or specified herein.

C. Component types of testing, adjusting, and balancing specified in this Section include the following as applied to HVAC equipment:

1. Rooftop air conditioning units.
2. Fans.
3. Grilles, registers, and diffusers.
4. Piping systems.
5. Terminal units.

D. This Section includes responsibilities and obligations in support of performance verification specified in Section 230090, HVAC Performance Verification.

1.02 QUALITY ASSURANCE

A. Work shall be performed by a firm certified by the National Environmental Balancing Bureau (NEBB), or the Associated Air Balance Council (AABC) in testing and balancing for this type of project. Work shall be performed under the direction of an Engineer licensed in the State of Georgia.

B. Conform to:

1. NEBB-2005, Procedural Standards for Testing, Adjusting, and Balancing of Environment Systems, or AABC MN-1-2002, as applicable to mechanical air and hydronic distribution systems and associated equipment and apparatus.
2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise specified herein.

1.03 SUBMITTALS

A. Within 30 days after the award of the contract, submit an organizational chart and proof of current certification identifying current certified supervisors in the trade that they are certified.

B. Immediately upon award of the contract, review the construction documents to determine that:

1. The required testing, adjusting, and balancing devices, e.g., balancing dampers and balancing valves, are included.
2. The design intent of the systems and their operation to the extent necessary to perform the work is clear.

3. The systems are capable of being tested, adjusted, and balanced as designed.

Upon completion of the review, submit a report summarizing the findings, and including any recommendations.

C. Submit a balancing plan that provides a detailed description of the methodology that will be implemented to accomplish the testing, adjusting, and balancing for this Project. Include:

1. Schedule for the Project, with timeline.
2. Instruments that will be used and copy of their latest certification.
3. Sample testing, adjusting, and balancing report forms for each system.
4. Single-line schematic flow diagram for each system.
5. Proposed pitot tube traverse locations.

D. Submit certified test reports signed by the supervisor who performed the testing, adjusting, and balancing work, complying with the requirements of this Section and Section 230090, HVAC Performance Verification.

1. Include identification and types of instruments used, their most recent calibration dates, and methods of testing and balancing each system and piece of equipment.
2. A final test and balance report including all "shall" and "should" requirements of the NEBB TAB Procedural Standards, Chapter 5, Standards for Reports and Forms.
3. Include AABC or NEBB test forms containing installation data, design data, equipment data, and operating data for systems and equipment, including air handling unit pressure profiles for each unit and duct traverse forms showing all measurements taken at traverse locations.
4. Include copies of readings, with piping layouts and duct layouts showing where readings were taken.
5. Identification of the index device for each air and hydronic system and documentation of the minimum pressure setpoint required at this device to achieve the flows reported.
6. Include terminal unit correction factors and BCS controller calibration constants for terminal devices and flow measuring installations.

1.04 PROJECT CONDITIONS

A. Do not proceed with adjusting and balancing work until:

1. Deficiencies in the systems and controls that would prevent complete and accurate testing, adjusting and balancing have been corrected.
2. Work is complete and systems, including automatic temperature controls, are operable.
3. Cleaning, flushing, lubrication, and start-up specified in other Sections has been accomplished.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS

A. Instrument test ports: as specified in Section 237000, Air Distribution.

PART 3 - EXECUTION

3.01 TESTING, ADJUSTING AND BALANCING

A. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Submit a detailed report documenting deficiencies of systems and controls that prevent complete testing, adjusting and balancing. Do not proceed with adjusting and balancing work until unsatisfactory conditions have been corrected.

B. Provide materials, equipment, labor, and power to test, adjust, and proportionally balance new and existing heating, ventilating, refrigeration, and air conditioning systems and components as indicated on the Drawings and as specified herein. Verify functioning of operating devices and equipment.

1. Air Systems Balancing, General:

a. Test, adjust, and balance systems to achieve operation and design air quantity, temperature differential, and pressure drop through ductwork, equipment, and components.

b. Variable frequency drives for fans shall be set up so that a 100% input signal to the variable frequency drive does not overload the fan motor and produces the design fan total static pressure at design airflow. If necessary, fan total static pressure shall be simulated. Adjustment of design airflow shall be accomplished by providing the proper motor sheave.

c. Balance air handling unit fans that are controlled in parallel such that the fan inlet static pressures and fan discharge static pressures are the same for each air handling unit. The smoke dampers and outside air dampers associated with each unit shall be adjusted to equalize those pressures.

d. Balance air handling units such that duct static pressures are maintained as low as possible while maintaining minimum inlet static pressure and airflow requirements at each terminal unit.

e. Total supply, return and outside air airflow for each air handling unit shall be measured using pitot tube duct traverses. Where the outside air inlet configuration is insufficient for a pitot tube duct traverse, the outside air shall be calculated as the difference between the supply and return.

f. For systems with diversity, with the fan under control and loads nearest the fan closed off to simulate diversity, verify design flow through each terminal unit. Diversity shall be calculated as the ratio of the total system capacity to the total connected load.

g. Adjust pattern adjustment devices in diffusers for horizontal discharge, unless otherwise indicated on the Drawings.

h. Calibration of BCS flow elements shall be verified through the use of duct traverses or flow hoods, as appropriate for the device being calibrated. BCS flow elements shall not be used for balance adjustments prior to the verification of their calibration.

i. Test, adjust and balance minimum outside air and return dampers to produce the quantity of minimum outside air indicated on the Drawings when the air handling unit is operating at its maximum air quantity. Return air dampers shall be adjusted to a less than fully open position only if required to achieve the minimum outside air quantity indicated on the Drawings. Return and minimum outside air damper linkages shall be adjusted to position their respective dampers at full stroke. Permanently mark damper linkage adjustments. Measure, record and adjust the mixing plenum static pressure controller to the static pressure necessary to achieve the minimum outside air quantity.

j. Balance existing air and hydronic systems to produce the flow rates indicated on the Drawings.

k. Balance and adjust systems to pressurize the entire building, and to minimize stack effect during the winter.

2. Hydronic Systems Balancing, General:

a. Test, adjust, and balance systems to achieve operation and design flow, pressure, temperature differential, and pressure drop through equipment, piping and components.

3. Hydrostatic Pressure Testing:

a. Test piping systems in accordance with the ASME standards specified in Section 231000, Piping, Valves and Accessories.

b. Test shall be held for 4 hours, minimum, with compensation made for temperature change.

c. No pressure change allowed.

d. Submit report of system deficiencies, leaks, or defects that must be corrected to successfully pass tests.

C. Patch holes in insulation, vapor barriers, ductwork, and housings, which have been cut or drilled for test purposes.

D. Position and secure memory stops on valves used for balancing.

E. Mark equipment settings, including damper control positions, valve indicators, memory stop positions, and controls and devices, to show final settings at completion of testing, adjusting, and balancing work. Provide markings with paint or permanent identification materials.

3.02 SEASONAL ADJUSTMENTS

A. Assist the HVAC Performance Verification Supervisor with the seasonal adjustment process. During this effort the HVAC Performance Verification Supervisor will:

1. Check the operation, performance, and balance of air and hydronic systems to provide uniform distribution and comfort conditions.

2. Where deficient operation or defective equipment is discovered, Contractor shall provide corrective measures as required by the warranty provisions of these specifications and shall assist the Performance Verification Supervisor in the correction of these deficiencies.

END OF SECTION 230095

SECTION 231000

PIPING, VALVES AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and other mechanical systems are specified in other Sections of Division 23.

B. This Section covers piping, fittings, valves and accessories for heating, ventilating, and air conditioning systems, and, except as otherwise specified herein, does not cover fuel, plumbing, or fire protection systems.

C. Testing, adjusting, and balancing is specified in Section 230095, Testing, Adjusting and Balancing.

D. This Section includes responsibilities and obligations in support of performance verification specified in Section 230090, HVAC Performance Verification.

1.02 QUALITY ASSURANCE

A. Piping systems shall meet ASME B31.9-2011, Building Services Piping.

B. Components of the same type shall be products of the same manufacturer.

C. Welder certification: welders shall be certified under the rules of the National Certified Pipe Welding Bureau and qualified by either the National Certified Pipe Welding Bureau or an independent testing laboratory for the procedures used on this Project.

D. Welding procedures: in accordance with ASME B31.9-2011. Welds shall be full penetration type, accomplished by proper beveling and spacing of pipe ends. Where backing rings are specified herein, root pass shall penetrate into the backing ring.

E. Pressure/temperature ratings of components and accessories shall meet or exceed design conditions for the system in which they are installed. Components and accessory items shall be designed for operating conditions of not less than:

System	Rating
Chilled and hot water	125 psig and 200ºF
Other services	125 psig and 200ºF

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. Pipe:

Service	Joints	Material
Chilled, and hot water, 2.5" through 10"	Welded	Black steel, schedule 40, ASTM A53/A53M-2012
Chilled and hot water, 2" and smaller	Soldered	Copper tubing, type L, hard drawn ASTM B88-2009
Refrigerant	Brazed	Copper tubing, type L, hard

Service	Joints	Material
		drawn, ASTM B280-2013
Miscellaneous drains, overflows, and vents	Soldered	Copper tubing, type L, hard drawn, ASTM B88-2009
Coil condensate drain	Soldered	Copper tubing, type L, hard drawn, ASTM B88-2009

B. Fittings for type L copper 2" and smaller shall be wrought copper, solder joint fittings, ASME B16.22-2012.

1. Solder joint fitting manufacturer: Elkhart, Mueller, or NIBCO.

2. Press joint fitting manufacturer: NIBCO Press, Victaulic Vic Press, or Viega Pro Press.

C. Fittings for black steel schedule 40 pipe, 2" and smaller, shall be standard weight black malleable iron. Fittings for black steel schedule 80 pipe.

D. Fittings for black steel pipe 2.5" and larger shall be black steel ASTM A234/A234M-2007 Grade WPB of a service class to match the adjacent pipe, except that connections to valves and equipment shall be made with ASTM A105/A105M-2013 flat face welding neck flanges.

E. Branch connections: forged steel, welding nipple type.

1. Manufacturer: Bonney Forge, Capital, or WFI.

F. Elbows: long radius type, except where space conditions do not permit.

G. Solder: 95/5 tin/silver or tin/antimony alloy type.

H. Flux: ASTM B813-2010.

I. Refrigerant Pipe and Accessories:

1. Fittings: sweat type, wrought copper.

2. Stop valves: up to 3.125" od, ball type, designed for refrigerant service, with seal caps; above 3.125" od, globe type, back-seating, with seal caps.

a. Manufacturer: Alco, Henry, Kerotest, or Watsco.

3. Test valves: 0.25" male flare globe type, back-seating with seal caps.

4. Expansion valves: thermostatic, pressure balanced type with external equalizer connections.

a. Manufacturer: Alco, Parker, or Sporlan.

5. Filter-dryers: molded porous core type, serviceable for systems 10 tons and larger and nonserviceable for systems smaller than 10 tons.

a. Manufacturer: Alco, Parker, or Sporlan.

6. Moisture and liquid indicators: Alco, Henry, Parker, or Sporlan.

J. Brazing Alloys:

1. For copper-to-copper joints: AWS A5.8/A5.8M-2011, Classification BCuP-5, 15% silver brazing alloy with a melting point range of 1300ºF to 1500ºF.

2. For dissimilar metal joints: AWS A5.8/A5.8M-2011, Classification BAG-1, 45% silver brazing alloy with a melting point of 1145ºF to 1400ºF.

3. Flux: approved by brazing alloy manufacturer.

4. Manufacturer: Airco, Handy & Harman, or Harris.

2.02 VALVES AND STRAINERS

A. Body construction, unless specified otherwise herein:

1. 125 psig service and lower: cast iron.

B. Gate valves: solid wedge-disc type, conforming to ASME B16.34-2013. Valves 2" and smaller shall be threaded bronze body with nonrising stem, union bonnet, conforming to MSS SP-80-2013. Valves 2.5" and larger shall be flanged body with bronze mountings, outside screw and yoke with bolted bonnets, conforming to MSS SP-70-2011.

1. Manufacturer: Crane, Jenkins, or Stockham.

C. Globe valves: straight or angle type as indicated on the Drawings, with teflon or composition discs. Valves 2" and smaller shall be threaded bronze body with union bonnet conforming to MSS SP-80-2013. Valves 2.5" and larger shall be flanged body with bronze mountings, outside screw and yoke with bolted bonnets, conforming to MSS SP-85-2011. Valves shall have 500 Brinnell hardness plug discs and seat rings.

1. Manufacturer: Crane, Kitz, NIBCO, or Stockham.

D. Butterfly valves: lug type with cast or ductile iron body, EPT (EPDM) seat designed for service at 200ºF, type 304, 316, or 416 stainless steel stem, and conforming to MSS SP-67-2011. Shaft bushings shall be permanently lubricated bronze, TFE-coated stainless steel, or acetal. Operators shall be the lever and quadrant type with memory stops for valves 6" and smaller and valves used for balancing. Operators shall be the manual handwheel gear type for valves 8" and above. Butterfly valves shall be factory hydrostatically tested at 150% of the pressure rating specified herein, and shall be factory-tested bubbletight at 150 psi disc differential and shall be designed for dead-end service without a back-up flange. Butterfly valves shall be 2.5" size and larger.

1. Manufacturer: Apollo, Bray, Crane, Jenkins, Keystone, Kitz, NIBCO, or Stockham.

E. Ball valves: bronze body, full port, chromium-plated brass ball, TFE seals and seats, blowout-proof stem, and soldered or threaded ends. Ball valves shall be 2" size and smaller. Ball valves in insulated piping shall be provided with extended lever or stem. Ball valves used for balancing shall have memory stops.

1. Manufacturer: Apollo, Crane, Jenkins, Kitz, NIBCO, or Stockham.

F. Check valves: spring-loaded silent-type. Seats, discs, and guides shall be bronze with stainless steel return spring. Disc shall be fully guided top and bottom. Valves shall have an open area equal to 10% more than the related pipe size area. Valves 2" and smaller shall be threaded bronze body. Valves 2.5" and larger shall be flanged.

1. Manufacturer: APCO, Hammond, Jenkins, Kitz, NIBCO, or Wheatley.

G. Control valves: as specified in Section 238000, Automatic Temperature Controls.

H. Strainers: Y-type, flanged body with removable type 316 stainless steel or monel screens. Strainers 2.5" and larger shall be provided with a plugged gate valve and nipple the full size of the strainer blowdown outlet. Strainers 2" and smaller shall be threaded, bronze body type. Strainers 2.5" and larger shall be flanged.

I. Water Service:

Pipe Size	Strainer Perforation Size
0.75" to 1.5"	20 mesh
2" to 3"	0.062"

J. Balancing valves: plug, nonlubricated type with resilient coated plugs, or lubricated type with nonresilient coated plugs. Port area shall not be less than 80% of full pipe area. Body and plug shall be semi-steel. Valves 6" and smaller shall be wrench operated with memory stops. Valves 8" and larger shall be gear operated. Valves 2" and smaller shall be threaded. Valves 2.5" and larger shall be flanged. Provide wrench set for each valve size and turn over to the Owner.

1. Manufacturer: Resun, or Xomox.

2.03 ACCESSORIES

A. Unions:

1. Unions in black steel piping 2" and smaller, except as specified herein, shall be black malleable iron, ground joints, bronze seated of the service class to match the adjacent piping, with screwed end connections.

2. Unions in copper piping shall be cast brass or bronze with copper soldered connections.

B. Dielectric fittings: threaded, flanged, brazed, or soldered to match adjacent piping. Metal parts of the union shall be separated so that the electrical current is below 1% of the galvanic current which would exist with metal-to-metal contact.

1. Manufacturer: Bolt-Pak, Epco (with high temperature gasket), Perfection Clearflow, or Watts.

C. Automatic air vents: float-operated automatic type with cast iron body, stainless steel trim, 0.75" piping connections, and minimum 175 psig water working pressure.

1. Manufacturer: Anderson, Armstrong, or Hoffman.

D. Needle valves: brass with 0.25" connection.

E. Dial thermometers: bimetallic element, dial type with minimum 3" dials, stainless steel case, angle or straight as required. Thermometers installed in uninsulated piping shall have 4" stems with brass separable sockets. Thermometers installed in insulated piping shall have 6" stem with brass separable socket with extension neck equal to thickness of insulation. Thermometers installed in ducts shall have 6" stems with duct mounting flanges.

Service	Range
Chilled water	0º/150ºF
Condenser water	30º/130ºF
Hot water	0º/250ºF

1. Manufacturer: Ashcroft, Marsh, Palmer, Taylor, Trerice, Weiss, or Weksler.

F. Thermometer test wells: brass construction with brass plug and chain, designed for use with partial immersion laboratory type test thermometers. Test wells in insulated piping shall have an extension neck equal to thickness of insulation.

1. Manufacturer: Ashcroft, Moeller, Taylor, Trerice, Weiss, or Weksler.

G. Manual Flow Control Valves:

1. Valves 2" and smaller shall have soldered or threaded ends with brass or bronze body; and 2.5" and larger shall have flanged ends with iron body. Valves shall have brass or bronze ball, Teflon or carbon-filled TFE seats, memory stop, meter connections with built-in check valves or pressure/temperature test plugs, and shall be designed for balancing and positive shut off.

2. Valves shall have calibrated orifice or venturi. Provide flow capacity characteristic curves or tables for each valve size. Calibrated orifice devices shall have integral pointer and calibrated nameplate.

3. Provide one portable meter set, including checking hoses, check seal and carrying case. Wetted parts of the meter shall be corrosion resistant. Meter shall be diaphragm type with variable pulsation damping control, zero adjustment control, and bleed valves. Meter shall be designed for system velocities and temperatures.

4. Manufacturer: Bell & Gossett, Flow Design, Gerand, MEPCO, Taco, or Tour & Andersson.

H. Automatic Flow Control Valves:

1. Valves 2" and smaller shall have soldered or threaded ends with brass or bronze body; and 2.5" and larger shall have flanged ends with iron body. Valves shall have pressure/temperature test plugs for verifying the pressure differential across the assembly and system temperature.

2. Valves shall automatically control flow rates within ±5% accuracy over an operating pressure differential range of at least 14 times the minimum required for control. At least 2 operating pressure ranges shall be available with the minimum range requiring less than 3 psig to activate the mechanism. Provide flow capacity characteristic curves or tables for each valve size.

3. Valve internal control mechanisms shall consist of a corrosion resistant cartridge with segmented port design and full travel linear coil spring. Valves shall have Y-body housing or other means to provide access to internal control mechanism without removing the valve.

4. Manufacturer shall provide certified independent laboratory test verifying accuracy of performance.

5. Provide one portable meter set, including checking hoses, check seal and carrying case. Wetted parts of the meter shall be corrosion resistant. Meter shall be diaphragm type with variable pulsation damping control, zero adjustment control, and bleed valves. Meter shall be designed for system velocities and temperatures.

6. Manufacturer: Flow Design, Griswold, or Kates.

I. Combination Pressure and Temperature Test Plugs:

1. Combination pressure and temperature test plugs may, at the Contractor's option, be used on pipe sizes 2" and smaller, for maximum 150 psig service, in lieu of the needle valves and thermometer test wells specified herein or indicated on the Drawings. Plugs shall not be used at locations specified herein or indicated on the Drawings to have a pressure gauge or thermometer permanently installed. Plugs shall have brass bodies, and internal valve seat material designed for specific system operating temperature and pressure. Plugs shall be provided with adaptors to connect pressure gauges or thermometers identical to those used elsewhere on the Project.

2. Manufacturer: Fairfax, Flow Design, Peterson, or SISCO.

J. Temperature Maintenance Cable:

1. Self-Regulating Heating Cable:

a. Cable shall consist of 2 #16 AWG nickel-copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature along its length. Cable shall be covered by a crosslinked, modified polyolefin dielectric jacket. Cable shall have a braid of tinned-copper and an outer jacket.

b. Cable components shall be UL listed to provide freeze protection as required.

c. System shall be controlled by an ambient sensing thermostat set at 40ºF, either directly or through a contactor.

d. Manufacturer: Brisk-Heat SL series, Chromalox, Easy Heat, Nelson Electric, Raychem XL-Trace, or Thermon.

K. Gaskets: 0.063" thick, conforming to ASME B16.5-2009, asbestos-free, selected for the pressure, temperature and service of the specific joint.

1. For other services: composition sheet type.

L. Bolting Materials:

1. For maximum system ratings of 250ºF and 160 psig:

a. Bolts and studs: ASTM A307-2012, Grade B, zinc-plated.

b. Nuts: ASTM A563-2007a, Grade A, heavy hex, zinc-plated.

c. Washers: ASTM F436-2011, zinc-plated.

M. Pipe Alignment Guides:

1. For steel piping: bolted 2-section outer cylinder type, with a 2-section guiding spider.

a. Manufacturer: Anvil 255, Elcen 411A, or ERICO 650.

2. For copper tubing: same as for steel piping but with a copper spider.

3. Guides and spiders shall be designed to clear pipe insulation and to prevent overtravel.

2.04 HOT TAPS AND LINE STOPS

A. Products and services shall be by the same company.

B. Valves: gate type, as specified in Paragraph 2.02.

C. Fittings: tees shall be the weld-on split type with flanged side outlet. Fittings used for line stopping shall have inside threads on the flanged outlet to permit recovery of the valve after the line stopping tool is removed.

D. Manufacturer: Furmanite, or T.D. Williamson.

PART 3 - EXECUTION

3.01 GENERAL

A. Before erection, clean interior and exterior of pipe and fittings of slag, spatter, rust, dirt and debris by wire brushing and swabbing.

B. Workmanship: pipe shall be cut to measurements established at the Project site and worked into place without springing or forcing. Pipes shall be installed to permit free expansion and contraction without damage to joints, hangers, or the building.

C. Changes in direction shall be made with fittings, except where branches are two or more sizes less than the size of the main, the branch may be made using branch connections, weldolets, threadolets, latrolets, sweepolets, and elbolets.

D. Pitch/grade: piping shall be installed with sufficient pitch to ensure drainage and venting.

E. Solder joint connections shall be cut, deburred, cleaned and assembled in accordance with ASTM B828-2002 (2010).

F. Threaded connections: screw-thread joints shall be made with cut tapered threads. Joints shall be made tight with Teflon tape unless otherwise specified herein. Not more than 2 threads shall show after the joint is made tight. Pipes shall have burrs removed by reaming cut end.

G. Welding:

1. Mitering or notching pipe to form elbows and tees will not be permitted. Field and shop bevels shall be in accordance with the standards specified herein and shall be done by mechanical means or flame cutting. Where beveling is done by flame cutting, surfaces shall be cleaned of slag, scale and oxidation prior to welding. Before welding, the component parts to be welded shall be aligned so no strain is placed on the weld when finally positioned. Height shall be aligned so that no part of the pipe wall is offset by more than 20% of the wall thickness. Flanges and branches shall be set true. This alignment shall be preserved during the welding operations. Connections larger than 6" shall be made with backing rings at welds.

2. Where the temperature of the component parts being welded reaches 32ºF or lower, the material shall be heated to approximately 100ºF for a distance of 3' on each side of the weld before welding, and the weld shall be finished before the material cools to 32ºF.

3. Welders shall stamp each weld with their personal symbol or code number.

4. Current welder certifications for welders performing welding on this Project (on or off-site) shall be maintained at the Contractor's site office and shall be readily available for review.

5. A random sample of completed pipe welds may be chosen by the Engineer for visual testing by an independent testing agency, not to exceed 5% of the total welds on the Project. Costs for testing shall be borne by the Contractor. Acceptance criteria shall be as specified by ASME B31.9-2011. If any of the tested welds are unsatisfactory, additional welds may be chosen for testing at the Contractor's expense.

6. Defective welds shall either be cut out and rewelded or ground down to base metal and rewelded. Reworked welds shall be tested as specified herein.

H. Flanged joints in water piping shall be made with ring type gaskets, extending to inside of bolt holes. Flanged connections to equipment shall be made with full face gaskets to match flanges on equipment.

I. Install piping so as to preserve access to valves, air vents, and equipment requiring access, and to provide the maximum headroom.

J. Provide offsets to maintain ceiling height and to coordinate with other trades.

K. Install piping such that when insulation is applied it will not come in contact with adjacent surfaces.

1. Provide reducing fittings for changes in pipe sizes.
2. Provide extra heavy pipe for nipples: where unthreaded portion of pipe is less than 1.5" long, and where size is less than 0.75" x 6".
3. Dirt pockets: line size, 4" long minimum. Terminate with threaded cap or blind flange, and provide clearance for access to cap or flange.
4. Perform pressure tests required by Section 230095, Testing, Adjusting and Balancing before work is concealed or buried.
5. Piping failing the tests specified in Section 230095, Testing, Adjusting and Balancing shall be repaired until satisfactory.

3.02 VALVES AND STRAINERS

A. Valves in horizontal piping shall be installed with stems at or above the pipe centerline.

B. Butterfly valves may be used in lieu of the gate and balancing valves.

C. Ball valves may be used in lieu of the gate and balancing valves indicated on the Drawings.

D. Butterfly valves adjacent to equipment shall be functional when equipment is removed.

E. Control valves: install in accessible locations, with room for actuator removal and service. Adjust the actuators to provide tight closure. Provide valve stem travel indicators and adjust to indicate proper travel. Where butterfly valves are used, permanently mark the end of the valve shafts to indicate valve position.

F. Strainers in water piping shall be installed with blowdown outlets at the low point.

3.03 ACCESSORIES

A. Needle valves: install as indicated on the Drawings, unless otherwise specified herein.

B. Dial thermometers: install as indicated on the Drawings, unless otherwise specified herein.

C. Thermometer test wells: install as indicated on the Drawings, unless otherwise specified herein. Fill with a thermally conductive material.

D. Thermometers and thermometer test wells shall be installed on a 45° angle in vertical piping and vertically in horizontal piping.

E. Thermometers, needle valves, pressure gauges, and thermometer test wells shall be installed so as to not be obscured by piping, building structure, or equipment.

F. Manual flow control valves may be used in lieu of balancing valves indicated on the Drawings but the flow control valve meter connections may not be a substitute for pressure gauges or needle valves indicated on the Drawings.

G. Install control valves, thermometers, and valved pressure taps provided under Section 238000, Automatic Temperature Controls.

H. Temperature Maintenance Cable:

1. Install and test before insulation is applied, in accordance with manufacturer's recommendations.
2. Install on exterior condenser water supply and return piping, and cooling tower drain piping through valve.
3. Secure cable to the piping with cable ties or fiberglass tape.
4. Do not cross cable with itself.

5. Hard wire power connections to junction box.

I. Bolting Materials:

1. Lubricate bolt and stud threads with molybdenum disulfide anti-seize compound.
2. Bolts and studs, when installed, shall extend not less than 2 full threads through nuts when tightened to the required torque.
3. Install washers under bolt heads and nuts.

J. Pipe Alignment Guides:

1. Pipe alignment guides shall be bolted to piping and the spiders shall be fully insulated.
2. Bolt outer housings of guides to the structure.

3.04 UNIONS AND FLANGES

A. Provide unions or flanges for disconnecting pipe from valves and equipment, and as indicated on the Drawings.

B. Dielectric fittings shall be used for connections between ferrous piping or equipment and nonferrous piping or equipment, except that brass and bronze valves shall not be isolated in predominantly steel piping systems.

3.05 WATER SUPPLY AND RETURN PIPING

A. Arrange piping for the venting of air and for drainage of the entire system.

B. Changes in size of vertical piping shall be made with concentric reducers, and in horizontal piping shall be made with eccentric reducers to maintain uniform top elevation of pipe.

C. At each low point of the system, provide a 0.75" drain valve with hose thread, and at each high point and in every drop in the direction of flow of supply and return mains provide an automatic air vent valve, unless otherwise indicated on the Drawings or specified herein.

D. Provide 1.5" fill and drain valves at each connection of new water piping to existing water piping. Locate fill valves on top of new supply pipe and drain valves at bottom of new return pipe.

E. Provide crossover connections and valves as required in order to perform cleaning as specified in Paragraph 3.06, Cleaning.

3.06 CLEANING

A. Chilled and Hot Water Piping:

1. Fill and flush with clean water.
2. Refill with clean water, then add cleaning/degreasing detergent.
   a. Approved by local, state and federal authorities for the intended use.
   b. With nonfoaming wetting agent.
   c. Concentration of the detergent shall be 2% of the active ingredients of the chemicals used for cleaning.
   d. Supplied and supervised by water treatment company.
3. Circulate water, using temporary pumps as required, in each system at respective design flow rates, minimum, for three 8 hour periods.
   a. At the end of each 8 hour period: remove and clean strainers. Blow-off low points.

4. Refill systems with clean water and circulate for an additional 8 hour period. Remove and clean strainers. Drain and refill with clear water. Continue to circulate water.
5. Test for alkalinity, not more than 200 ppm in excess of alkalinity of rinsing water.
6. Repeat process described above until 200 ppm in excess of alkalinity of rinsing water, or less is maintained for 10 days.
7. Protect against damage from freeze-up or discharge of water.
8. When cleaning is completed, fill systems with clear water, and circulate with appropriate water treatment chemicals to protect pipe and equipment until the date of substantial completion.
9. Immediately prior to the date of substantial completion, remove and clean strainers.
10. Use and disposal of chemicals shall comply with local, state, and federal regulations.

3.07 PIPING SYSTEMS

A. Manually operate relief valves and verify that discharge openings and piping are clear and free flowing.

B. Open air vents until air is removed from the systems.

3.08 HOT TAPS AND LINE STOPS

A. Work shall be performed while the systems remain under pressure. Schedule work so that the existing systems shall not be interrupted.

B. Line stopping shall block 100% of the line flow by mechanically inserting a stopping head through a hot tap valve and into the active line. Provide supplemental containment to prevent dripping onto adjacent equipment. Temporary valves shall be recovered after the line stopping tool is removed.

C. Tees used for size-on-size hot taps and line stops shall be the weld-on split type.

END OF SECTION 231000

SECTION 232500

HVAC INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and other HVAC systems are specified in other Sections of Division 23.

B. This Section covers thermal insulation for equipment, ductwork and piping specified in Division 23.

C. This Section includes responsibilities and obligations in support of the performance verification specified in Section 230090, HVAC Performance Verification.

1.02 DEFINITIONS

A. Exterior piping, ductwork, or equipment is exposed to outdoor temperature.

1.03 QUALITY ASSURANCE

A. Conform to the following:

1. International Energy Conservation Code-2009 with Georgia State Amendments-2012.

2. International Mechanical Code-2012 with Georgia State Amendments-2014.

3. NFPA 90A-2012.

B. Products of the manufacturers listed will be acceptable for use for the specific functions specified herein. Materials shall be compatible with the materials to which they are applied, and shall not corrode, soften or otherwise attack such material in either the wet or dry state.

C. Materials shall be applied subject to their temperature limits. Methods of application of insulating materials or finishes not specified in detail herein shall be in accordance with the particular manufacturer's published recommendations.

D. Insulation shall be applied by experienced workers regularly employed for this type of work.

1.04 RATINGS

A. Insulation and accessories, unless specifically excepted herein, shall have a maximum composite flame spread rating of 25 and a maximum smoke developed rating of 50. Materials that are factory-applied shall be tested as assembled. Materials which are field-applied may be tested individually. No fugitive or corrosive treatments shall be employed to impart flame resistance.

B. Flame spread and smoke developed ratings shall be in accordance with ASTM E84-2013a. Products or their shipping cartons shall bear a label indicating flame spread and smoke developed ratings.

C. Treatment of pipe jackets and duct facings to impart flame and smoke safety shall be permanent. The use of water-soluble treatments is prohibited.

D. Vapor retarders shall have a maximum permeance of 0.02 perm at 73.4°F.

1.05 ALTERNATE THICKNESSES

A. Specified thicknesses may be increased or reduced for insulation materials having thermal resistivity, K-values, different from those listed. Submit calculations in accordance with ASHRAE/IESNA 90.1-2013, and documentation of product performance.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fiberglass Pipe, Duct and Equipment Insulation:

1. Maximum K-value for preformed pipe insulation: 0.23 Btu·in/(h·ft²·°F) at 75°F.
2. Maximum K-value for blanket and board insulation: 0.28 Btu·in/(h·ft²·°F) at 75°F.
3. Pipe and board insulation for hot equipment and hot water piping except low temperature hot water shall have maximum service temperature of 850°F. Insulation for other services shall have maximum service temperature not less than 450°F.
4. Pipe and board insulation for hot equipment shall be designed for operating temperatures up to 850°F.
5. Manufacturer: CertainTeed, Johns Manville, Knauf, or Owens Corning.

B. Adhesives and Mastics:

1. Manufacturer: Aeroflex, Armacell, Childers, Epolux, Foster, Marathon, Pittsburg Corning PC 88, Pittsburgh Corning Pittcote 300 (interior) or 404 (exterior), or Vimasco.

C. Preformed Fittings:

1. Equal thickness and composition to adjacent pipe insulation.
2. Manufacturer: Extol, Performance Insulation Fabricators, or Specialty Products & Insulation.

D. Insulating Cement:

1. Mineral wool type, asbestos free, maximum K-value of 0.20 Btu·in/(h·ft²·°F) at 75°F.
2. Manufacturer: Industrial Insulation Group CalCoat-127, or Ramco Ramcote 1200.

E. Cellular Glass:

1. Maximum K-value: 0.29 Btu·in/(h·ft²·°F) at 75°F.
2. Manufacturer: Pittsburgh Corning Foamglas.

F. Cellular Glass Joint Sealant:

1. Manufacturer: Blackhawk Seal-Kote, or Pittsburgh Corning Pittseal.

G. Flexible Elastomeric Sheet, Tubing and Tape:

1. Closed-cell.
2. Maximum K-value: 0.25 Btu·in/(h·ft²·°F) at 75°F.
3. Manufacturer: Aeroflex Aerocel, Armacell AP Armaflex, or K-flex.

H. Phenolic:

1. Maximum K-value: 0.15 Btu·in/(h·ft²·°F) at 75°F.
2. Minimum density: 2.5 pcf.
3. Manufacturer: ITW Trymer Supercel, or Resolco International Insul-phen.

I. Glass fabric: 10 x 10 construction white fiberglass scrim fabric.

J. Tape: pressure sensitive, foil-scrim-kraft backed.

K. Staples: outward clinching type.

L. Rigid inserts: cellular glass or 5 pcf phenolic. Rigid inserts shall be same length as insulation protectors, 360° pipe coverage, and same thickness as adjacent insulation. Where polyisocyanurate is specified herein, rigid inserts may be polyisocyanurate, minimum 2 pcf for piping 6" and smaller and minimum 3 pcf for pipe 8" and larger. Where fiberglass is specified herein, rigid inserts may be premolded minimum 20 pcf fiberglass blocks with 180° pipe coverage. Where flexible elastomeric is specified herein, rigid inserts may be rigid foam designed for the supported weight without compression. Provide jacketing, joint sealing, and weatherproofing as specified for the pipe service. Fiberglass inserts shall be selected for a maximum 10% compression when loaded. Polyisocyanurate inserts shall be selected such that compressive load does not exceed 33% of the compressive strength of the insert.

PART 3 - EXECUTION

3.01 GENERAL

A. Surfaces to be insulated shall be clean, dry, and free of foreign material, rust, scale and dirt when insulation is applied. Perform pressure and leakage tests and submit results required by other Sections before applying insulation.

B. Where existing insulation is damaged due to the new work, repair damage to match existing work or replace damaged portion with insulation specified for new work.

3.02 MATERIAL SELECTIONS

A. Where multiple insulation materials are specified herein for the same service, one of the specified materials shall be applied and used consistently throughout the project, subject to the requirements of these specifications.

3.03 INSULATION FOR HOT PIPE

A. Insulate the following pipe with preformed fiberglass pipe insulation of the thickness indicated, and white all service jacket with self-sealing lap:

		Insulation Thickness, Inches	
	Fluid Design Operating Temperature Range, ºF	Pipe Sizes: Less than 1.5"	Pipe Sizes: 1.5" and over
Heating			
Hot water	through 200	1.5	2

1. Install insulation with jacket drawn tight and side laps and end joint butt strips secured. End joint butt strips shall be minimum 3" wide and of material identical to jacket.

B. Insulate strainers and valves in piping larger than 1" and fittings and flanges with preformed or mitered fiberglass fittings. Wire fittings in place and cover with a smoothing coat of insulating cement. Finish with glass fabric embedded between 2 coats of white breather mastic. Glass fabric shall overlap adjoining insulation at least 2".

3.04 INSULATION FOR COLD PIPE

A. Insulate the following pipe with preformed phenolic pipe insulation of the thickness indicated with a vapor retarder and all service jacket with self-sealing lap:

Insulation Thickness, Inches

	Pipe Sizes	
	Through 1.25"	1.5"
Chilled water supply and return and condensate drain	1	1.5

1. Seal longitudinal and end joints with sealant and mastic as recommended by the manufacturer to achieve the permeance rating specified herein. Install insulation with jacket drawn tight with side-laps and end joint butt strips secured. End joint butt strips shall be same material as jacket, not less than 3" wide.

2. Insulate fittings, flanges, strainers, unions, and valves with preformed or mitered phenolic fitting sections. Secure fittings in place, seal joints and contour mitered sections with insulating cement, and finish with a layer of glass fabric embedded between 2 coats of vapor barrier mastic. Glass fabric shall overlap adjoining insulation at least 2".

3. Where temperature maintenance cable is specified herein or indicated on the Drawings, piping shall be insulated after application of temperature maintenance cable.

4. Provide vapor stops consisting of glass fabric and vapor barrier mastic over the entire end of butt joints at control valves, strainers, and equipment requiring access.

B. Insulate the following pipe with preformed flexible elastomeric insulation, 1.5" thickness:

Refrigerant suction.
Refrigerant liquid.

1. Insulation shall be slipped on before pipe joints are completed. Hold back from hot joints until cool. Cement insulation joints with adhesive applied to both ends.

2. Insulate fittings, flanges, unions, and valves with fabricated fittings, same thickness as piping.

3.05 INSULATION FOR DUCT SYSTEMS

A. Insulate the following duct systems with flexible, fiberglass insulation, 2" thick, with foil-scrim-kraft facing:

Supply ductwork and plenums.
Return ductwork.
Relief ductwork between the exterior and 18" past relief damper assemblies.

1. Overlap edges 3" and secure 12" on center with copper-clad, stainless steel or galvanized steel wire.

2. Seal joints, breaks, and punctures with tape.

3. On ducts over 36" wide, insulation shall be secured to the underside with mechanical fasteners maximum 18" on center each way.

3.06 INSTALLATION

A. Insulation shall be clean and dry during installation and during application of any finish.

B. Provide removable and replaceable covers on pumps, equipment, and removable ends of strainers requiring insulation that must be opened periodically for inspection, cleaning, or repair.

C. Install insulation materials with smooth and even surfaces, jackets drawn tight and cemented down smoothly at longitudinal and end laps. Do not use scrap pieces of insulation where a full length section will fit.

D. Install insulation, jackets and coatings continuous through openings and sleeves in nonrated construction. For penetrations of fire- or smoke-rated construction, insulation shall be butted tightly against firestops specified in Section 230010, HVAC General. Tape and seal butt joints.

E. Banding wires shall have the twisted terminals turned down toward the insulation without damaging the vapor barrier.

F. Finish open ends of pipe insulation as specified herein for fittings.

G. Provide rigid inserts at each insulation protector location for piping 1.5" and larger.

H. Fill hollow steel pipe covering protection saddles with fiberglass insulation.

I. Lined Ductwork:

1. Where ductwork and plenums are lined, no external thermal insulation is required.

2. Where lining is interrupted at dampers and heating coils, insulate ductwork.

3. Where unlined duct and lined duct connect, the insulation shall overlap lined section at least 4".

J. Insulation and vapor barrier shall be continuous around and under standoff brackets used for mounting balancing and control devices on ductwork.

K. Where equipment is furnished with other components and adjoining piping factory-assembled on a skid or other common platform, such equipment and piping shall be insulated as specified herein.

3.07 WEATHERPROOFING

A. Protect exterior flexible elastomeric insulation with UV resistant white acrylic latex coating.

END OF SECTION 232500

SECTION 236000

EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and other HVAC systems are specified in other Sections of Division 23.

B. This Section covers HVAC systems and equipment.

C. Testing, adjusting and balancing is specified in Section 230095, Testing, Adjusting and Balancing.

D. This Section includes responsibilities and obligations in support of performance verification specified in Section 230090, HVAC Performance Verification.

E. QUALITY ASSURANCE

F. Conform to the following:

G. International Energy Conservation Code-2009 with Georgia State Amendments-2012.

H. International Mechanical Code-2012 with Georgia State Amendments-2014.

I. NFPA 90A-2012.

J. Pressure/temperature ratings of components and accessories shall meet or exceed design conditions for the system in which they are installed. Refer to Section 231000, Piping, Valves and Accessories, and requirements specified herein.

PART 2 - PRODUCTS

2.01 COILS

A. Copper tubes, and nonferrous fins with belled collars mechanically bonded to the tubes.

B. Cooling coils: 0.024" wall thickness and 0.009" fin thickness, designed for counterflow of water to air.

C. Multirow hot water coils: designed for parallel flow of water to air.

D. Supply and return connections shall be on the same end.

E. Performance shall be in accordance with AHRI 410-2001 (with Addendum).

F. Minimum working pressure rating shall be equal to that specified herein for the piping system in which the coil is installed. Coils shall be tested at the rated working pressure plus 50%.

2.02 TERMINAL UNITS

A. Casings:

1. Minimum 24 gauge galvanized steel.

2. Acoustical lining: minimum 0.5" thick, 1.5 pcf density coated fiberglass. Lining shall meet erosion test method described in UL 181-2013 and shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50 in accordance with NFPA 90A-2012.

3. Access doors: sealed, flush type for access to internal parts for service or maintenance.

4. Enclosure: removable type for control components.

5. Casing leakage rate of less than 3% at 4" wg.
6. Inlet velocity shall not exceed 2200 fpm.

B. Control Motors:
1. Factory-installed on units by unit manufacturer.
2. Coordinated with automatic control system manufacturer; see Section 238000, Automatic Temperature Controls.

C. Airflow sensors: averaging multipoint type, with taps for field calibration, minimum ±5% accuracy with 90° elbow at inlet.

D. Volume Regulators:
1. Factory preset: minimum and maximum air quantity. Air volumes and unit size shall be indicated on the regulator.
2. Gauge taps and calibrated means of adjustment to permit field adjustment of air quantities without unit disassembly.
3. Pressure independent, capable of maintaining constant volume, ±5%, up to 4" wg inlet air pressure.
4. Factory-mounted.
5. Removable.

E. Depth of units: 20" maximum.

F. Moving parts designed for minimum of 300000 cycles.

G. Heating coils: hot water type, as specified in Paragraph 2.01, Coils.

H. Variable Volume Units:
1. Complete with:
a. Air valve assembly.
b. Variable air volume from maximum of 100% to minimum of approximately 0%.

I. Manufacturer: Carnes, Carrier, Enviro-Tec, Johnson Controls YVS, Krueger, Metal*Aire, Nailor, Price, Titus ESV, TQS or TQP, Trane, or Tuttle & Bailey.

2.03 SPLIT SYSTEM AIR CONDITIONING UNITS

A. Condensing units: complete with hermetic or semi-hermetic compressors, compressor sump heaters, refrigerant line filter-driers, low ambient controls, refrigerant pressure taps, and condenser fans. For unit sizes larger than 5 tons, coils shall have copper tubes. Units shall include compressor safeties, internal overload protection, internal pressure relief valve and factory-wired controls with 24 V control transformer and weatherproof electrical enclosure. Units shall be furnished with factory refrigerant precharge. Units shall be UL listed and rated in accordance with AHRI 210/240-2008 Addendum 1 and 2.
1. Unit casing and coils with copper tubes shall be protected with a flexible epoxy coating.

B. Indoor units: insulated cabinet type designed for horizontal airflow, end return and side access. Units shall contain multispeed centrifugal fans, direct-expansion coil, expansion valve, condensate drain pan, filters and filter rack, and electric heat. Coils shall have copper tubes.

C. Filters: throw away type, as specified in Section 237000, Air Distribution.

D. Heating coils: electric type, as specified in Paragraph 2.06, Electric Heating Coils.

E. Controls: automatic changeover heating/cooling thermostat with 2-stage heating control, and thermostat subbase. Heating coil controls shall be incorporated with unit controls. Control relays, and contactors shall be provided.

F. Manufacturer: Carrier, Johnson Controls/York, Lennox, or Trane.

2.04 DUCTLESS SPLIT SYSTEMS

A. Systems shall be commercial grade equipment, complete with an outdoor condensing unit, indoor fan-coil unit, refrigerant piping, and controls. Units shall be rated in accordance with AHRI 210/240-2008 Addendum 1 and 2. Units shall be factory-charged with refrigerant R-410A. Systems shall operate as cooling only and/or heat pump systems as indicated on the Drawings.

B. Outdoor condensing units: factory-assembled, complete with compressors, condenser fans, condenser coils, motors, low ambient controls, electronic expansion valves, solenoid valves, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, refrigerant regulators, and controls.

1. Compressors shall be variable speed scroll type. Compressor speed shall be varied between 5% to 100% speed in response to load variation. Compressors shall be equipped with crankcase heaters, high pressure safety switches, and internal thermal overload protection.

2. Condenser fans shall be propeller type with variable speed digitally commutating motors.

3. Condenser coils shall have copper tubes, and aluminum fins.

4. Controls: microprocessor-based.

5. Electric connections: single point 208 V, 3-phase.

C. Indoor Fan-Coil Units:

1. Ductless wall- ceiling-mounted type, factory-assembled complete with cabinet, fan, coil, air filter, condensate pan, 15' total head condensate pump, and controls. Units shall be provided with supply and return grilles and shall be designed for installation on wall in a conditioned space.

2. Filters: throw away type, as specified in Section 237000, Air Distribution.

3. Controls: microprocessor-based.

4. Electric connections: each fan-coil unit shall be single point connection.

D. Refrigerant Piping:

1. As specified in Section 231000, Piping, Valves and Accessories.

E. Wall-mounted space temperature sensors: provide for all indoor fan-coil units with the following features:

1. Thermistor type temperature sensor.

2. Setpoint adjustment buttons.

3. Backlit LCD display in English.

4. Display of sensed room and set point temperatures.

5. Buttons shall be capable of being disabled by maintenance personnel.

F. Manufacturer: Carrier, Daikin, Friedrich, JCI/York, LG, Mitsubishi, or Panasonic.

2.05 CUSTOM, OUTDOOR, ROOF-MOUNTED (RMUs)

A. Performance Requirements:

1. Wind-Restraint Performance:

a. Basic Wind Speed: 150 mph.

b. Minimum 10 lb/sq. ft multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

B. Warranty:

1. Manufacturer's standard form in which manufacturer agrees to replace components of custom, outdoor, central-station air-handlers that fails in materials or workmanship within specified warranty period.

a. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three years from date of Substantial Completion.

b. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

C. Extra Materials:

1. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

a. Filters: as specified in Section 237000, Air Distribution.

D. Manufacturers:

1. HJAIA's standard for custom, outdoor roof mounted units is Buffalo Air Handling. This is due to the majority of units at the CPTC being manufacturer by Buffalo and the need to maintain this manufacturer due to the servicing and repair needs at HJAIA. No substitutions permitted.

E. Casing:

1. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed. Unit casing for all sections shall be minimum two inch (2") thick double wall design with minimum 22 ga. aluminum inner skin, minimum 22 ga. aluminum outer skin and two (2") thick injected foam insulation having density of two point five (2.5) pounds per cubic foot having a minimum R value of 12. Insulation and adhesives shall meet requirements of NFPA 90A and UL listed Class 1 polyurethane foam. Perimeter channel shall overlap the roof curb for water seal. Panels shall be secured to framework with cadmium plated screws on ten inch (10") centers.

2. Exterior Casing Material: Aluminum 22 ga. with factory-painted finish, with pitched roof panels and lifting lugs. Casing shall be designed for structural rigidity, air tightness, and maximum static pressure at six inches (6") wg with a maximum ½% leakage at 1.5 times the operating static and a maximum casing deflection of L/250 at +/- 10” static. Calculations are required to support the fact that the unit will not condense moisture on a 95°Fdb / 78°F wb design day with a 50°Fdb / 50°F wb interior temperature. Casing shall be rated for the following sound transmission loss in db, through solid double walls.

a. Exterior Casing Thickness: minimum 22 gauge thick.

b. Sound Transmission (in accordance with ASTME90-70 and E413-70):

FREQUENCY - Hz	125	250	500	1000	2000	4000
TRANSMISSION LOSS	14	18	22	24	27	45

3. Unit Base - The entire unit shall be supported on an 8” – 8.2 lb/ft welded structural steel or equivalent aluminum channel base around the perimeter of each major section with intermediate cross members to support major interior components. Standard structural members shall be used in providing the support base. For spans greater than twelve (12) feet, structural reinforcement will be required to provide structural rigidity. The underside of the floor sheet shall be insulated with a 3” thick sprayed in place closed cell polyurethane foam type insulation with a density of 2.5 pounds per cubic foot and R value of 19. All structural members shall be coated with two (2) coats of DuPont submarine iron oxide zinc chromate phenolic resin primer. Provide heavy welded steel lifting lugs at the corners of each shipping section, minimum of four (4) per module section. Provide continuously welded drain pan floor design under all cooling coils sections or where otherwise noted. Each drain pan section shall have two inch (2") drain connections on each side of the unit. Isolate dissimilar metal that are in contact to prevent galvanic reaction.

4. Inner floor shall be constructed of 3/16” aluminum safety tread plate with 2” turned up lip, floor drains and continuously welded seams. Floor shall slope to 4” deep recessed floor drain locations. Floor drains shall be installed in plenums upstream and downstream of coils, in outside air intake section and unit vestibule. Drains shall be routed to the exterior of the unit. Drain line termination shall be a threaded cap for removal during drain down. Insulation shall be applied to the entire underside of the walking surface.

5. Any large pipe or duct openings in the casing floor shall be protected with subway grating to prevent falls into unprotected openings. Grating shall fit around pipe and ductwork, be constructed of 1.25” by 0.125” bars on 1.188” on center in the narrow direction and 0.75” x 0.125” bars on 4” centers in the long direction. Grating shall sit in a frame constructed of 1.5” x 1.5” x 0.25 “angles with mitred and welded corners.

6. Inner Casing Fabrication Requirements:

   a. Inside Casing: 0.040 inch thick, smooth aluminum.

7. Casing Insulation: Comply with NFPA 90A or NFPA 90B.

   a. Materials: ASTM C 1071, Type I and U.L. Class 1 Polyurethane foam

   b. Thickness: 2 inch.

8. Condensate Drain Pans: Formed sections of stainless-steel sheet, a minimum of 6 inches deep, and complying with ASHRAE 62.1-2004.

   a. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.

   b. Drain Connections: Threaded nipple both sides of drain pan.

   c. Pan-Top Surface Coating: Corrosion-resistant compound.

   d. Drain pan shall extend 6” before the cooling coil and 24” beyond cooling coil.

9. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

10. Access Doors:

    a. Exterior: Unit shall be provided with double wall insulated access doors designed for flush mounting on the units gasketed to provide positive seal and furnished with continuous stainless steel piano hinge and a minimum of two (2) Ventlok 260/310 handles and locking latches. Locking latch shall be designed to accept a “third party” padlock type device. Access door frames shall be extruded aluminum and have replaceable bulb seals. All access doors shall open against the pressure.

    b. Interior: Doors shall be double wall insulated doors designed for flush mounting on the units gasketed to provide positive seal and furnished with continuous stainless steel piano hinge and a minimum of two (2) Ventlok 260/310 handles and latches. Access doors to fan section shall be provided with a micro time delay door switches and field interlocked to fan motor starter by the control contractor. Access door frames shall be extruded aluminum and have replaceable bulb seals. All access doors shall open against the pressure.

11. Marine Lights and Power Receptacle - Provide a vapor proof epoxy coated and guarded incandescent 150 watt marine light mounted and wired in heavy aluminum conduit to a switch and pilot light at the vestibule entryway. Provide a waterproof epoxy coated 120V/1phase power receptacle adjacent to one (1) access door inside unit.

12. Vestibule – Not Required.

13. Piping enclosure: unit shall be provided with piping enclosure as part of the unit. Enclosure shall have access door, power receptacle, and light, as specified herein.

14. Unit exterior final color shall be selected by Architect following coordination with AATC/DOA Engineering for approval. Paint chip will be provided for color match.

15. If necessary for shipping and handling, multiple sections can be used but each section shall be engineered for field assembly and testing. Full length perimeter angles located inside at the splits shall allow for in-the-field bolting and reassembly. All necessary hardware, tape, sealing gaskets and caulk required for reassembly shall be provided within the sections. The perimeter angles shall be included on all mating frames, shall be drilled with reassembly clearance holes and fully gasketed for the specified leakage.

16. Weather hoods shall be furnished for outside air and exhaust air openings. Hoods shall be aluminum matching casing material and include an insect screen. Hoods shall overlap opening at least 12" at bottom.

F. Fans:

1. Fans: Plenum type with direct drive motor installed on an adjustable fan base resiliently mounted in the casing. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.

2. Fan Section Design:

    a. The fan shaft shall be solid, cold finished steel, turned ground and polished. The complete rotating assembly shall be designed so that the first critical speed shall be at least 25% greater than the maximum allowable RPM of the fan class specified. The fan shall be statically and dynamically balanced at the factory.

    b. The fan housings shall be a minimum 12 gauge medium open hearth-hot rolled steel, with scroll and sides continuously welded. Fan housing structural members shall be designed to allow removal of fan wheel, shaft and bearings without disturbing the structural integrity of the fan housing.

c. Fan bearings shall be foot-mounted on structural steel frame work integral with the fan housing. Bearings shall be double-row spherical, grease lubricated, roller bearings in horizontally split cast iron pillow blocks. Bearings shall have a minimum L-10 life of 120,000 hours or an average life of 600,000 hours, as defined by ASA and by the Anti-Friction Bearing Manufacturers' Association.

d. The fan motor shall be sized for an increase of 5% in fan RPM without relying on the motor service factor and shall be sized to give non-overloading characteristics throughout the entire performance range.

e. Provide high-efficiency energy saver premium-type motors. V-belt drive shall be a minimum two-groove and shall be selected with a minimum service factor of 1.50 times the motor nameplate horsepower. Drive shall be selected with adjustable motor sheave for 15 HP and smaller motors and fixed pitch sheave for 20 HP and above. Motor electrical characteristics shall be as listed in the electrical documents.

f. The fan and motor shall be integrally mounted on a structural steel isolation base with housed springs for two inch (2") deflection, within the unit casing. The base shall be furnished with motor slide rails for two screw adjustment, with the fan and base isolated from the unit casing. The channel isolation base shall be fabricated of minimum six inch (6") structural channel members, spring isolators. Bases shall be furnished with tie-down bolts for shipment.

G. Coils:

1. Coil section shall be mill galvanized steel or aluminum, sealed by manufactures with blank off sheets as required to prevent air bypass of the coils. Coil drain troughs shall be a minimum of six inch (6") in the direction of air flow. Coils shall be removable through an end panel bolted and gasketed to the unit casing for ease of coil removal. Provide welded steel coil racks for independent coil removal. Cooling coil section shall be sloped and made of 16 ga. 304 stainless steel with a minimum depth of 6” at the drain. Stacked coils shall have sloped 304 stainless steel intermediate drain pan with drain run to the main bottom pan.

2. The cooling and heating coils shall be ARI rated in accordance with standard 410-87 and shall have a maximum face velocity and air friction loss as shown on Contract Documents. Air friction losses shall be for a 100% wet coil.

3. Coils shall consist of 5/8” OD copper tubes with minimum wall thickness of 0.025". Fins shall be aluminum with a minimum fin thickness of 0.0075". The fin spacing shall be as required to meet the capacities listed but not to exceed 12 find per inch. Headers shall be steel barrel type and fully suitable for 250 PSI working pressure. Coil casings shall be a minimum 16 gauge 304 SS for cooling coils and galvanized steel for the heating coils.

H. Air Filtration:

1. Filters: as specified in Section 237000 Air Distribution.

2. Provide complete initial sets of filters for all air handlers and air conditioning units. Air supply systems shall not be operated without the specified air filters in place. Verify available filter types with manufacturer.

I. Dampers:

1. Dampers: as specified in Section 238000 Automatic Temperature Controls.

2. Smoke Dampers: as specified in Section 237000, Air Distribution.

J. Electrical Power Connection:

1. Provide for single connection of power to unit with unit-mounted non-fused disconnect switch accessible from outside unit and control-circuit transformer with built-in over current protection. Provide wiring from the load-side of this main disconnect to the variable speed drive(s) and mini-load center allowing unit to be de-energized while leaving lighting and receptacles active.

2. An "as-built" wiring diagram shall be permanently attached to the unit at a location that is easily read with the control panel access door open. The wiring diagram shall be in addition to the ladder diagram, containing a schematic of the control panel, identifying each individual component and show relative location within the panel. In lieu of the schematic diagram, the control component shall be identified by its tagging stenciled above the component in paint.

K. Lightning Protection:

1. The unit shall be factory supplied with a minimum six (6) attachment points at the roof level for the mounting of lightning protection rods. The attachment points shall consist of an aluminum plate and neoprene rubber isolator. Locate the attachment points at the four corners and equally spaced along the length of the unit. The attachment of the lightning rods shall not compromise the thermal and vapor barriers of the unit casing.

L. Accessories:

1. Duplex, 115-V, ground-fault-interrupter outlet with 15amp overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.

2. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

M. Roof Curbs:

1. Materials: minimum 16 gauge Galvanized steel consistent with the 150 mph wind loading with corrosion-protection coating, watertight gaskets, and factory-installed complying with NRCA standards.

2. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B. Materials: ASTM C 1071, Type I or II. Thickness: 1 inch.

3. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb. Liner Adhesive: Comply with ASTM C 916, Type I. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity. Liner Adhesive: Comply with ASTM C 916, Type I. The base frame shall be provided with removable lifting lugs, a minimum 4 per side. Lugs shall be fabricated from structural steel with rigging hole.

4. Curb Height: minimum 18 inches or higher as scheduled on the Drawings.

5. Wind Restraints: Metal brackets compatible with the curb and casing, painted to match RTU, used to anchor unit to the curb, and designed for loads at Project site. Comply with requirements in Division 15 Section "Vibration Controls for HVAC Piping and Equipment" for wind-load requirements.

2.06 ELECTRIC HORIZONTAL UNIT HEATERS

A. Fans: propeller type with aluminum blades dynamically balanced with single-speed motor and an inlet guard.

B. Motors with contactors shall be wired within the unit to the heating coil power supply. Provide 24 V or 120 V control circuit transformer fused on primary side and grounded.

C. UL listed, with high limit thermal control switch, automatic reset, and integral unit disconnect switch. Elements shall be sheathed type with nickel chrome coiled wire imbedded in magnesium oxide refractory material, enclosed in sheath with spirally wound fins.

D. Enclosures: steel, welded, with baked enamel finish, and adjustable horizontal louvers.

E. Manufacturer: American Stabilis, Berko HUHAA, Brasch BTU or BTUH, Erincraft, INDEECO, Markel 5100, Q-Mark MUH, Raywall, or Trane.

PART 3 - EXECUTION

3.01 TERMINAL UNITS

A. Install terminal units with manufacturer's recommended upstream duct conditions for operation of velocity sensors and volume controls, and required clearances for control panels, coils, and other components.

3.02 CUSTOM OUTDOOR ROOF-MOUNTED UNITS

A. Examination:

1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

2. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

3. Examine roofs for suitable conditions where RTUs will be installed.

4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Factory Testing:

1. The units shall be completely factory assembled and tested. Factory testing shall be performed on one representative unit for quality assurance.

a. The fans shall be factory run tested to ensure structural integrity, sound emittance and proper rpm. All electrical circuits shall be tested to ensure proper operation before shipment of units. All units shall be cleaned and receive the manufacturer’s quality control stamp.

b. Fan wheel and shaft assemblies shall be dynamically analyzed after all components have been assembled within the unit. Vibration measurements shall be taken at each bearing housing in the horizontal, vertical and axial position at fan operational RPM.

c. Air performance of test unit shall be provided in the form of a witnessed factory air performance test of one RTU submitted to the Architect/DOA verifying design air flow, actual performance static pressure, casing air leakage and unit deflection. Manufacturer will provide travel and lodging for no more than two (2) designated witnesses for the testing, (participants to be determined immediate prior to test schedule).

d. Casing shall be leak tested at the unit's operating CFM and static pressure conditions. Leakage shall not exceed a Leakage Class of 9 as defined by ANSI/ASHRAE Standard 111 or 1% of the unit capacity at 1.5 times the operating static pressure.

C. Identification:

1. General:

a. Identification shall consist of upper case letters.

b. Each device, button and/or control switch shall be appropriately identified by nameplates with 0.25" high upper case letters.

c. Identification shall include equipment designation and functional device, e.g. RTU-D1-BL Supply Fan.

d. Each piece shall be stenciled with its equipment number in a prominent location with minimum 2" high upper case letters.

e. Access panels and doors shall be stenciled with minimum 1" high upper case letters to indicate the type of devices accessible therein.

D. Installation:

1. Contractor shall remove all shipping bolts, release spring isolator restraints, check belt tension, assure alignment of fan/motor assembly, gasket/caulk all sections and provide start-up services on all units. He shall install lamps in lighting fixtures, provide and install clean filters as necessary from receipt of air unit until Owner acceptance and during the first year respond to trouble calls to diagnose problems and resolve.

2. Units mounted outdoors shall be provided with a sloped roof design with either upstanding flange "U" strip or watertight blanket installed over roof surface. Doors to the outside shall have drip covers installed over the top edge. Floor insulation shall be protected on the underside of the channel base with a 20 gauge galvanized cover sheet. All exterior panel joints shall be sealed with waterproof silicone sealant.

3. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

4. Unit Support: Install unit level on structural curb. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

5. Install wind restraints according to manufacturer's written instructions.

6. Install pre-filters in units to be used during the construction period. Pre-filters shall be replaced regularly (every fourteen days) during construction to prevent clogging. Prior to test and balance procedure and turn over, replace pre-filters with new ones.

7. Equipment that has been operated prior to the date of substantial completion shall be maintained in accordance with manufacturer's published recommendations.

E. Connections:

1. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

2. Install piping internal to RTUs to allow service and maintenance.

3. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
    a. Install ducts to termination at top of roof curb.
    b. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
    c. Connect supply ducts to RTUs with flexible duct connectors.
    d. Install return-air duct continuously through roof structure.
    e. Install normal-weight, 3000-psi, compressive strength (28-day) concrete mix inside roof curb, 4 inches thick. Concrete, formwork, and reinforcement are specified in Division 3.

F. Field Quality Control:
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
2. Perform tests and inspections and prepare test reports.
    a. Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.
3. Tests and Inspections:
    a. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
    b. Inspect for and remove shipping bolts, blocks, and tie-down straps.
    c. After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
    d. Test and adjust controls and safeties - Replace damaged and malfunctioning controls and equipment.
4. Remove and replace malfunctioning units and retest as specified above.

G. Startup Service:
1. Engage a factory-authorized service representative to perform startup service.
2. Complete installation and startup checks according to manufacturer's written instructions and do the following:
    a. Inspect for visible damage to unit casing.
    b. Inspect for visible damage to furnace combustion chamber.
    c. Inspect for visible damage to coils, and fans.
    d. Inspect internal insulation.
    e. Verify that labels are clearly visible.
    f. Verify that clearances have been provided for servicing.
    g. Verify that controls are connected and operable.

h. Verify that filters are installed.

i. Remove packing from vibration isolators.

j. Verify lubrication on fan and motor bearings.

k. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.

l. Start unit according to manufacturer's written instructions.

1) Complete startup sheets and attach copy with Contractor's startup report.

m. Inspect and record performance of interlocks and protective devices; verify sequences.

n. Operate unit for an initial period as recommended or required by manufacturer.

o. Calibrate thermostats.

p. Adjust and inspect high-temperature limits.

q. Inspect outdoor-air dampers for proper stroke.

r. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.

s. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

1) Supply-air volume.

2) Return-air volume.

3) Relief-air volume.

4) Outdoor-air intake volume.

t. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

1) Low-temperature safety operation.

2) Filter high-pressure differential alarm.

3) Economizer to minimum outdoor-air changeover.

4) Smoke and firestat alarms.

u. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

H. Cleaning and Adjusting:

1. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.

2. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

I. Demonstration:

1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION 236000

SECTION 237000

AIR DISTRIBUTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and other HVAC systems are specified in other Sections of Division 23.

B. This Section covers air distribution systems and equipment.

C. Motorized dampers not furnished with equipment shall be provided under Section 238000, Automatic Temperature Controls.

D. Testing, adjusting and balancing is specified in Section 230095, Testing, Adjusting and Balancing.

E. This Section includes responsibilities and obligations in support of performance verification specified in Section 230090, HVAC Performance Verification.

1.02 QUALITY ASSURANCE

A. Air conditioning systems shall conform to the following:

1. International Energy Conservation Code-2009 with Georgia State Amendments-2012.

2. International Mechanical Code-2012 with Georgia State Amendments-2014.

3. NFPA 90A-2012.

1.03 DEFINITIONS

A. Sizes for lined ductwork indicated on the Drawings are sheet metal sizes.

B. Ductwork shall have the following static pressure classifications, unless otherwise specified herein:

1. From variable volume roof top units to terminal units: 3" wg.

2. From terminal units to grilles, registers and diffusers: 2" wg.

3. Other: 2" wg.

4. Field-fabricated plenums and casings on the suction side of air handling units and fans: -4" wg.

5. Field-fabricated plenums and casings on the discharge side of air handling units and fans: 6" wg.

C. The first 20' of rectangular supply and return ductwork of rooftop unit shall be constructed of 16 gauge sheet metal with a 6" wg static pressure classification for ductwork and transverse joints. The test pressure for duct leakage testing specified in 230095, Testing, Adjusting and Balancing may be equal to that used for downstream ductwork.

PART 2 - PRODUCTS

2.01 SHEET METAL WORK - GENERAL

A. Ductwork, except where otherwise specified herein and apparatus casings shall be constructed of galvanized steel in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.

B. Ductwork, casings, plenums, hangers and accessories associated with shower room exhaust system shall be constructed of aluminum, meeting ASTM B209-2010, in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005. Exposed aluminum ductwork shall have surface finish designed for paint application.

2.02 SHEET METAL WORK - ACCESSORIES

A. Zinc-rich paint: Sherwin-Williams Zinc-Clad Primer, or ZRC Worldwide Galvilite.

B. Weld or mechanical grip pins: AGM, Duro-Dyne, or Erico.

C. Duct sealants: liquid, mastic, gasket, or tape and activator type, asbestos-free, complying with NFPA 90A-2012 and UL 181-2013.

D. Draw bands: nylon type, complying with UL 181-2005, Class 1, and NFPA 90A-2012.

E. Lining adhesive: ASTM C916-1985 (2007).

F. Instrument test ports: flanged base with screw cap and gasket, and flat mounting gasket for flat or round duct. Height shall accommodate duct insulation thickness. Ventlok 699 series.

2.03 DUCT LINING

A. Fibrous:

1. Duct lining shall be coated fiberglass meeting ASTM C1071-2012, Type I. Coating shall not support the growth of fungus or bacteria when tested in accordance with ASTM G21-2009.

2. Density: 1" thick – 1.5 pcf; 2" thick – 1.5 pcf.

3. Lining and accessories shall have a composite flame spread rating of not more than 25 and a smoke developed rating of not more than 50.

4. Manufacturer: CertainTeed ToughGard Duct Liner, Johns Manville Permacote Linacoustic HP, or Owens Corning QuietR Duct Liner.

2.04 FLEXIBLE CONNECTIONS

A. Coated glass fabric not less than 3" 6" active length.

B. Connections shall comply with NFPA 90A-2012, NFPA 701-2010, and shall be asbestos-free and designed for continuous use at 275°F.

C. Manufacturer: Duro-Dyne, or Ventfabrics.

2.05 ACCESS PANELS

A. Tight fitting, hinged, except removable where necessitated by space conditions, double-wall insulated type, manufactured in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.

B. Manufacturer: Air Balance, Krueger, Louvers & Dampers, Nailor, National Controlled Air, Phillips-Aire, Ruskin, or Ventlok.

2.06 ACCESS DOORS

A. Tight fitting, hinged, double-wall insulated type, 24" x 60" clear inside opening.

1. Manufacturer: Air Balance, Louvers & Dampers, National Controlled Air, or Ruskin.

B. Handles, latches and hinges: cadmium-plated steel.

1. Manufacturer: Duro-Dyne, Ventlok, or Young Regulator.

2.07 PRESSURE RELIEF DOORS

A. Galvanized steel, 18" x 18", 12 gauge construction, insulated type with positive latch mechanism, perimeter door gasket, and automatic reset.

B. Doors shall have pressure relief settings equal to 0.5" wg less than the static pressure rating of the duct.

C. Manufacturer: Ruskin PRD18.

2.08 FLEXIBLE DUCTWORK

A. Polyethylene; aluminum foil, fiberglass, and aluminized polyester trilaminate; or coated woven fiberglass cloth, mechanically locked or permanently bonded to a noncorrosive metal helix. Factory-insulated with fiberglass with a protective vapor barrier jacket to achieve an ADC certified minimum R-value of 6.0°F·ft^2·h/Btu at 75°F.

B. Listed under UL 181-2013 as a Class 1 air duct, in compliance with NFPA 90A-2012, and rated for minimum 6" wg positive pressure and 0.75" wg negative pressure.

C. Manufacturer: Flexmaster, or Thermaflex.

2.09 SPIN-IN COLLAR FITTINGS

A. Minimum 26 gauge galvanized steel, with manual damper with locking device, for round duct connection to supply duct.

2.10 HANGERS AND SUPPORTS

A. Duct hangers and supports shall be in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.

2.11 FIRE DAMPERS

A. Factory-built curtain type, except where multiblade type is specified herein. Dampers shall be spring-operated with stainless steel constant tension springs, conforming to requirements of UL 555-2006 for dynamic operation, NFPA 90A-2012, and UL listed.

B. Rating: 1.5 hours, except where 3 hours is indicated on the Drawings.

C. Provide factory-built sleeves of design and length to permit mounting within the opening.

D. Dampers in round ductwork shall be Type C.

E. Dampers in rectangular ductwork with minimum dimension 30" and larger shall be the multiblade type with airfoil shaped blades.

F. Dampers in rectangular ductwork with minimum dimension less than 30" shall be as follows:

1. Dampers in return air openings, in security walls, or behind grilles or registers shall be Type A.

2. For ductwork with a static pressure rating of 2" wg or less, dampers with a minimum dimension of 18" or smaller shall be Type B, and those with a minimum dimension of 19" and larger shall be Type A.

3. For ductwork with a static pressure rating greater than 2" wg, dampers shall be Type C.

G. Fusible links shall have a temperature rating approximately 50°F above the maximum temperature that would normally be encountered with the system in operation or shutdown, but not less than 165°F.

H. Manufacturer: Greenheck, Leader, Nailor, National Controlled Air, Phillips-Aire, Ruskin, or Safe-Air.

2.12 COMBINATION FIRE/SMOKE DAMPERS

A. Factory-fabricated type, complying with UL 555-2006 and UL 555S-2014 at 250°F and a minimum test pressure differential of 4" wg.

1. 1.5 hour rating, with UL fire and leakage classification markings.

2. Dampers in ductwork with a 2" wg and greater static pressure classification: airfoil blade design, Leakage Classification II, maximum rated airflow rate of at least 3000 fpm.

B. Dampers shall have a 212°F thermal device which will close and lock the damper in the closed position. Damper operators shall be factory installed, power open, spring closed, 120 V AC, and shall be rated for 250°F. Damper closure rate, on smoke mode, shall be 15 seconds minimum and 30 seconds maximum.

C. Dampers in round ductwork up to 18" in diameter shall be the single-blade type. Dampers in round ductwork larger than 18" diameter shall be the multiblade type with connector sleeves. Minimum connector sleeve size shall be 2" larger in each dimension than the duct connection.

D. Dampers in rectangular ductwork and in openings shall be multiblade type. Provide connector sleeves.

E. Manufacturer: Air Balance, Greenheck, Leader, Nailor, National Controlled Air, or Ruskin.

2.13 MANUAL DAMPERS

A. Single blade up to 8" high, opposed multiblade over 8" high; minimum 80% free area based on damper frame outside dimensions.

B. Blades: minimum 16 gauge galvanized steel, or airfoil shape extruded aluminum.

1. Pivot rods: steel, minimum 0.5" diameter or hex, with one rod extended 6" to permit operation of damper from outside the duct.

2. Maximum length 42"; maximum width 8".

3. For low leakage applications: at points of contact provide interlocking or overlapping edges, compressible neoprene or extruded vinyl blade seals, and compressible metal side seals, designed for temperature of -40°F to 180°F at leakage rate specified herein.

C. Frames: galvanized steel bar minimum 2" wide x 12 gauge for dampers 10" high or less, and 3.5" x 0.875", 16 gauge galvanized roll-formed channel with double-thickness edges or 5" x 1" x 0.125" extruded aluminum channel for 11" high and larger.

1. Corner bracing.

2. Full size of duct or opening in which installed.

D. Bearings: bronze sleeve, steel ball type, or Cycoloy 800.

1. Vertically-mounted: thrust bearings.

2. Maximum spacing: 42".

E. Quadrants: cadmium-plated steel, with damper locking device, and damper position indicator.

1. Manufacturer: Arrow Q-38, Duro-Dyne KL-7R, or Ventlok 560.

F. Finish on steel parts: galvanized.

G. Operating linkage: factory-assembled, concealed in frame out of airstream, steel construction.

H. For low leakage applications: leakage when closed shall be less than 4 cfm/ft^2 at 1" wg differential static pressure based on a 48" damper width.

2.14 CONTROL DAMPERS

A. As specified in Section 238000, Automatic Temperature Controls.

2.15 GRAVITY ROOF VENTILATORS

A. Galvanized construction with 1" fiberglass insulation, bird screen, removable or hinged hood, reinforcing angles, mounting base, and insulated double-shell curb unit.

B. Manufacturer: Acme IV/EV, Breidert BGH, Carnes GEGB-GEAB/GIGB-GIAB, Cook GR/GI, Greenheck Fabra-Hood, FHI/FHR, JenCo BGH, Louvers & Dampers AGV/SGV or PennBarry Airette AEG.

2.16 GRILLES, REGISTERS AND DIFFUSERS

A. General:

1. Selection of grilles, registers and diffusers shall be based on air introduced at a 20°F temperature differential.

2. Grilles and registers with borders shall have felt or rubber gaskets cemented to the back face and holding screws not over 18" on center around the perimeter.

3. Diffusers in lay-in ceilings shall lay in a nominal 24" x 24" grid opening and shall be furnished without exposed flanges.

4. Diffusers shall be complete with straightening vanes, and opposed or rotating blade volume control dampers. Straightening vanes are not required where diffusers are attached to round flexible ductwork. Volume control dampers are not required where single diffusers are served by branch ducts with dampers at take-offs.

5. Internal parts of diffusers shall be designed so they can be adjusted, removed, and assembled without special tools.

6. Diffusers shall have round necks or shall be provided with square-to-round collars where connected to round or flexible duct.

7. Finishes, unless otherwise specified herein:

a. Steel grilles and registers: white baked enamel.

b. Diffuser faces and frames: white baked enamel.

c. Diffusers interior: same as face and frame.

d. T-bar slot diffusers: flat black.

8. Grilles, registers and diffusers shall be provided with frames, borders, and mounting attachments for installation in the actual wall, soffit, and ceiling construction in which installed.

B. Supply Devices:

1. Type S-PF - Square plate face diffuser type with single square air diffusion panel. Diffusers shall have a 18" x 18" steel face panel mounted on an aerodynamically shaped, one-piece, seamless 24" x 24" backpan. Exposed surfaces of face panels shall be smooth, flat, and free of visible fasteners.

2. Type S-TB - T-bar slot diffuser, 4' long, with two 1" slots, galvanized steel plenum with round neck opening, adjustable volume and air pattern controller, and internal insulation. Pattern controller shall be located below the bottom of the neck opening in position including the vertical position. Self-locking nuts shall be adjusted prior to installation in the

ceiling such that the air pattern will remain in any setting made through the face of the slot.

C. Return and Exhaust Devices:

1. Type R-EG - Eggcrate grille, 0.5" x 0.5" x 0.5" fabricated aluminum eggcrate.

2. Type R-ER - Eggcrate register, 0.5" x 0.5" x 0.5" fabricated aluminum eggcrate with opposed-blade volume damper.

3. Type R-SR – Sidewall register, single-deflection, 35° fixed position, 0.5" on center, horizontal blades with opposed-blade volume damper.

D. Manufacturer, unless otherwise noted: Anemostat, Carnes, Krueger, Metal*Aire, Nailor, E.H. Price, Titus, or Tuttle & Bailey.

2.17 FANS - GENERAL

A. Rated in accordance with AMCA 211-2013, AMCA 300-2008, and ASHRAE 51/AMCA 210-2007.

B. Drives:

1. V-belt type, sized for 140% of motor size.

2. Construction: cast iron. Sheaves for drives 5 hp and larger shall have bushed bores.

3. Motor sheaves: fixed pitch once final balancing and commissioning is completed.

4. Companion sheaves: to maintain belts parallel.

5. Temporary motor sheaves for final balancing and commissioning: variable pitch for motors through 25 hp or fan speeds less than 1000 rpm; fixed pitch for motors over 25 hp or fan speeds over 1000 rpm, and for variable frequency drives.

C. Motors and variable frequency drives: as specified in Section 230010, HVAC General, unless otherwise specified herein.

D. Control circuit transformers: for actuators on fans with 3-phase motors.

E. Wheels and shafts: factory-balanced, both statically and dynamically as an assembly. Fans with variable frequency drives shall be dynamically balanced throughout the complete speed range. Fan wheel rotation for centrifugal fans shall be in same direction as flow in elbows installed within 3 duct diameters of the fan discharge, where discharge from the elbow is perpendicular to the fan shaft.

F. Bearings: ball, roller, or taper roller type. Bearings for cabinet fans, centrifugal inline duct fans, propeller fans, and power roof ventilators shall have an L_{10} life of 50000 hours. Other bearings shall have an L_{10} life of 100000 hours. Bearing life shall be calculated based on the peak operating condition indicated on the Drawings.

1. Fans 27" and larger shall be provided with horizontally split type bearing housings, and pressure type lubricating fittings extended to accessible locations.

G. Fans for variable volume duty shall be capable of operating at 25% of design capacity without surge or pulsation.

H. Fan guards: shall shield the perimeter and face of belt drives, with openings opposite driver and driven shafts to permit use of tachometer. Guards for double-inlet fans shall have face of expanded metal.

2.18 PROPELLER FANS

A. Wall type, steel construction with inlet and outlet guards, as indicated on the Drawings, square mounting plate stiffened by turned up edges or fitted with steel angles, streamline inlet ring, motor, and drive.

B. Fans as indicated on the Drawings shall be equipped with motorized discharge dampers. Dampers shall be heavy duty type with steel damper linkage, motor, and heavy gauge blades. Dampers shall be interlocked to open when the fan is on and to close when the fan is off. A mechanical limit switch shall prove damper open position before starting fan.

C. Manufacturer: Acme, American Coolair, Breidert, Buffalo, Carnes, Cook, Greenheck, JencoFan, or PennBarry.

2.19 CENTRIFUGAL INLINE DUCT FANS

A. Tubular or square inline duct type, steel or aluminum construction, with inlet and outlet flanges, inlet cone, access door, nonoverloading wheel, and mounting brackets.

B. Manufacturer: Acme, American Coolair, Breidert, Carnes, Cook, Greenheck, JencoFan, or PennBarry.

2.20 FILTERS

A. General:

1. MERV ratings shall be based on ASHRAE 52.2-2012.

2. Filters shall be UL 900-2004 Class 2.

B. Temporary Filter Media:

1. 1" thick, dual-density, depth-loading polyester media with a minimum MERV rating of 8.

2. Manufacturer: Fiberbond Dual-Ply Dustlok.

C. Throw Away Filters:

1. 1" thick throw away type with factory-fabricated frames and a MERV rating of 6. Capacity shall be based on 300 fpm face velocity. Initial resistance shall not exceed 0.08" wg.

2. Manufacturer: Airguard F312, American Air Filter 5700, or Farr 20-20.

D. Pleated Filters:

1. 4" thick pleated, disposable type. Each filter shall consist of media and enclosing frame. Media shall be self-supported or shall contain a support grid. Initial resistance shall not exceed 0.27" wg based on 500 fpm face velocity.

2. Filter media shall be reinforced nonwoven cotton fabric type with a minimum MERV rating of 6.

3. The effective filter media shall be not less than 7 ft^2 of media per ft^2 of filter face area.

4. Self-supported media shall be capable of maintaining its shape and pleat spacing during normal use. Filters with self-supported media shall maintain functionality if filter frame is damaged.

5. The media support shall be a welded grid with an effective open area of not less than 96%. The welded wire grid shall be bonded to the filter media to eliminate the possibility of media oscillation and media pullaway. The media support grid shall be formed in such a manner that pleats are rounded, allowing total use of filter media.

6. The enclosing frame shall be constructed of rigid, heavy duty, chipboard with diagonal or longitudinal support members bonded to the air entering and air exit side of each pleat to ensure pleat stability. The inside periphery of the enclosing frame shall be bonded to the filter pack.

7. Housings: factory-fabricated of galvanized steel, double-wall insulated type, with tracks for filters, and side access door with seal. Filter enclosing frames and housing shall form an airtight seal.

8. Manufacturer: Airguard DP, American Air Filter Am-Air 300X PerfectPleat, or Farr 30-30.

E. Cartridge Filters:

1. 12" deep with synthetic media with a minimum MERV rating of 13. Dimensions shall be based on capacities as indicated on the Drawings and a 500 fpm face velocity. Initial pressure drop, including prefilters, shall not exceed 0.95" wg. Provide 4" thick pleated prefilters with a minimum MERV rating of 8.

2. Enclosing frame shall be galvanized steel assembled in a rigid manner. Overall frame dimensions shall be correct to 0.063", and squareness shall be maintained to within 0.125".

3. Housings: factory-fabricated of galvanized steel, double-wall insulated type, with tracks for filters and prefilters, complete with seals and high pressure double-wall access doors, designed and leak tested by the manufacturer to operate at 5" wg positive internal pressure. Access door or panels shall be provided for both sides of filter housings for side removal and access.

4. Manufacturer: Airguard Variflow, American Air Filter Varicel, or Farr Riga-Flo.

2.21 ROOF CURBS AND EQUIPMENT SUPPORT RAILS

A. Prefabricated type, 18 gauge galvanized steel with welded joints, raised cant to match roof deck insulation, and 1.5", 3 pcf fiberglass insulation. Top surfaces shall be level, with construction to fit roof pitch. Minimum height, at the lowest point, shall be 8".

B. Manufacturer: AES Industries, Pate, Penn, Roof Curb Products, Roof Products & Systems, or Thy Curb.

2.22 SIDE TAKEOFF FITTINGS

A. Minimum 26 gauge galvanized steel, designed for minimum pressure drop by an expansion from a rectangular connection to a round duct. The fitting shall include a 1" wide mounting flange with die formed corner clips, prepunched mounting holes, and an adhesive-coated flange gasket. The outlet collar shall be crimped and incorporate a bead.

B. Manufacturer: Crown, or Flexmaster.

2.23 SMOKE DETECTORS

A. As specified in Section 238000, Automatic Temperature Controls.

PART 3 - EXECUTION

3.01 SHEET METAL WORK - GENERAL

A. Unless otherwise specified herein or indicated on the Drawings, construct and install sheet metal work in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.

B. Workmanship, methods of assembly, joint and seam construction, and sealants for sheet metal work shall be designed for the duct leakage classifications specified in Section 230095, Testing, Adjusting and Balancing.

C. Changes in shape, dimension, or direction shall be made with a maximum transition, offset, or combination thereof of 1 to 7.

D. Except where indicated otherwise on the Drawings, use metal hat sections or standoff brackets in lined ductwork to install dampers, turning vanes or coils. Hat sections or standoff brackets shall be the same height as the lining thickness.

E. Openings in plenum casings for access doors shall be 9" above the floor. Hinge doors to close with plenum pressure.

F. Separate galvanized sheet metal from aluminum or copper with lead or felt gaskets.

G. Provide supplemental stiffening and supports to ducts and apparatus casings to prevent drumming, sagging and to provide a structurally sound assembly.

H. Ductwork and sheet metal seams, joints, penetrations, connections and attachments shall be sealed.

1. Sealants shall be applied in accordance with the manufacturer's recommendations for each specific application.

2. Ductwork failing the leakage tests specified in Section 230095, Testing, Adjusting and Balancing shall be repaired, reworked or rebuilt until satisfactory, before additional ductwork is installed and before ductwork is concealed.

I. Entire air system installation shall be rigid, and free from rattles and air noises. Interior of ducts shall be smooth.

J. Provide angle brackets inside ductwork on both sides to support slip-in electric heating coils in vertical ducts over 24" wide.

K. Provide transitions between different size sections of air handling units.

L. Install duct from shower exhaust grilles grading down to the exhaust grille, without traps or dips.

M. Install uninsulated ductwork exposed in finished areas against the ceiling.

N. Provide offsets, elbows, and transitions to coordinate with other work.

O. Provide transitions to connect ductwork to equipment and coils.

P. Elbows:

1. Elbows in round and flat oval ductwork are specified hereinbefore.

2. Radius elbows in rectangular and square ductwork shall have an inside radius equal to the width of the duct, except where space conditions prohibit, in which case a reduced inside radius with full heel radius is permitted. Where the space conditions require the inside radius to be less than 75% of the duct width, provide multiple splitter vanes inside the elbow.

3. Square (mitered) elbows in rectangular and square ductwork shall contain single-thickness turning vanes and shall be limited to 90° turn applications.

a. Vanes shall be parallel to airflow.

b. Vanes exceeding the maximum unsupported length defined by SMACNA shall be divided into multiple sections with intermediate vane rails or shall be braced with

tie rods spanning perpendicularly across the leading edges of the vanes. The tie rods shall be welded to the leading edge of each vane.

4. Turns less than 90° in rectangular and square ductwork shall be made with radius type elbows. Mitered elbows are not permitted.

Q. Seal wall and floor penetrations as specified in Section 230010, HVAC General.

R. Instrument test ports: provide where required for measurements.

3.02 DUCT LINING

A. Line ductwork, as indicated on the Drawings, with duct fibrous lining.

B. Install lining, except where otherwise specified herein, with coated side facing air stream and in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005. Adhere lining to inside of duct with 100% coverage of adhesive. In addition, weld or mechanical grip pins shall be installed with spacing conforming to SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005, for velocities over 2500 fpm. Mechanical fasteners shall not compress the lining more than 0.125". Coat exposed edges and joints with edge sealer. Protect leading edges against flaking by 24 gauge galvanized metal protectors. Butt and seal edges of lining together to form a continuous thermal barrier. Coat field cuts and minor surface damage with edge sealer after lining is installed.

3.03 FLEXIBLE CONNECTIONS

A. Joints and seams shall be sealed airtight.

B. Provide at:

1. Inlet and outlet of fans.

C. Not required at:

1. Power roof ventilators.

2. Air handling units with internally isolated fan, motor and drive.

D. Provide a braided copper bridge strap across flexible connections.

3.04 ACCESS PANELS AND ACCESS DOORS

A. Provide access panels of sufficient size and quantity for access to fire dampers, smoke dampers, controls, coils, duct smoke detectors, and where ductwork covers electrical boxes. Install in appropriate locations to allow cleaning, oiling, inspection, repair and maintenance.

B. Open each to verify that swing space is clear and access into duct or plenum is unobstructed.

3.05 PRESSURE RELIEF DOORS

A. Install vertically with the latch mechanism at the top.

3.06 FLEXIBLE DUCTWORK

A. Install flexible ductwork in a fully extended condition, free of sags and kinks, using the minimum length to make connection. Seal joints as recommended by manufacturer. Maximum length of flexible ducts to diffusers shall be 7'. Maximum length of flexible ducts to terminal units shall be 3'. Use round galvanized duct, same size as flexible duct, for longer runouts.

B. Flexible ductwork shall be fastened to spin-in fittings, collars and transitions by draw bands and duct tape.

C. Size, unless otherwise indicated on the Drawings:

1. For diffusers, same diameter as diffuser neck to which it connects.

2. For terminal units, two sizes larger than the terminal unit inlet.

D. Where size of flexible duct is different than size of collar, make connection with a sheet metal transition.

3.07 SPIN-IN COLLAR FITTINGS

A. Provide for each flexible duct takeoff and for each round sheet metal duct runout to flexible ducts serving diffusers.

3.08 HANGERS AND SUPPORTS

A. Adjust hangers and supports so that loading is uniform.

B. Unless otherwise specified herein or indicated on the Drawings, duct hangers and supports shall be in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.

C. Support horizontal ductwork not more than 8' on center. Ductwork shall be directly suspended from or supported by the building structure, but not from metal deck.

D. Support round ductwork with straps and hangers as recommended by the manufacturer and SMACNA.

E. Where ducts are suspended below ceilings, extend hangers through the ceiling and secure to the structure as specified herein.

F. Support vertical ducts at each floor with a minimum of 2 supports attached to the duct and fastened to the floor or structure.

3.09 FIRE DAMPERS

A. Install within the thickness of the rated construction unless otherwise indicated on the Drawings.

B. Verify accessibility of each fire damper through duct and building access panels, and operation of each fire damper by removing link and operating damper.

3.10 SMOKE DAMPERS

A. Install in accordance with conditions of UL listing.

B. Locate within 24" of the smoke barrier.

C. Install so that blades, when open, are no more than 5° off-axis with airflow.

D. Verify accessibility of each smoke damper through duct and building access panels, and operation of each smoke damper by removing operator and operating damper.

3.11 COMBINATION FIRE/SMOKE DAMPERS

A. Install within the thickness of the rated construction unless otherwise indicated on the Drawings.

B. Install so that blades, when open, are no more than 5° off-axis with airflow.

C. Verify accessibility of each combination fire/smoke damper through duct and building access panels, and operation of each combination fire/smoke damper by removing link and operator and operating damper.

3.12 MANUAL DAMPERS

A. Install dampers in accordance with manufacturer's instructions to operate freely.

B. Provide standoff brackets, sized to clear the insulation thickness, for quadrants installed on insulated ductwork.

3.13 CONTROL DAMPERS

A. Install dampers in accordance with manufacturer's instructions to operate and to obtain leakage rates specified herein. Adjust the damper linkage such that the damper closes before the actuator is fully closed to assure tight closure of the damper.

B. Blank-off and seal around dampers and between dampers and sleeves or frames to eliminate air bypass.

3.14 GRILLES, REGISTERS AND DIFFUSERS

A. Wall return and relief grilles installed above eye level shall be installed with blades angled so the inside of the duct or the adjacent space will not be visible through the grilles.

B. Lengths of linear diffusers indicated on the Drawings are nominal. Coordinate actual lengths required with field conditions and/or the Architectural Drawings.

3.15 FANS - GENERAL

A. Install centrifugal fans with a minimum of 2.5 duct diameters of straight duct at the inlet.

3.16 FILTERS

A. Install filters to be used while the building is under construction. Replace during construction as filters become loaded. Prior to final inspection, remove these filters and replace with new filters.

B. Do not install filters until the building is substantially complete and free of construction debris, and associated duct systems have been cleaned.

3.17 SIDE TAKEOFF FITTINGS

A. Provide for takeoffs from rectangular ductwork to terminal units.

B. Install 45° takeoff fittings to correspond with direction of airflow.

C. Install concentric takeoff fittings where terminal units are connected to the supply duct loop.

3.18 SMOKE DETECTORS

A. Duct-mounted smoke detectors shall be located as follows:

1. On the upstream side and within 36" of its respective smoke damper.
2. Between the smoke damper and any duct opening or connection.
3. In a straight section of duct.
4. To be accessible.

B. Locate remote test and alarm stations near the detector served, and mount approximately 6" below the ceiling.

END OF SECTION 237000

SECTION 238000

AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. General provisions and HVAC systems are specified in other Sections of Division 23.

B. This Section covers automatic temperature control systems and equipment.

C. This Section includes responsibilities and obligations in support of performance verification specified in Section 230090, HVAC Performance Verification.

D. The BCS includes the network of interoperable, stand-alone digital controllers communicating via network devices.

1.02 RELATED WORK

A. The installation of motor starters that are not factory-installed, thermal overload switches, and power wiring to motors, starters, thermal overload switches, and contactors, is specified in another Division. This Section includes the furnishing and installation of controls and wiring for automatic controls, electric damper and valve actuators and motors, terminal unit controllers, interlocks, starting circuits, and 120 V and low voltage power wiring to power consuming control devices.

B. Area smoke detectors are provided, installed and wired under Division 28. Duct smoke detectors shall be installed under Division 23, but furnished and wired into the fire alarm system under Division 28. This Section includes wiring fire alarm signal relays, provided and installed under another Division, to the automatic temperature control systems.

C. The monitoring and data logging capabilities of the BCS shall be available for use in the commissioning process.

1.03 QUALITY ASSURANCE

A. Conform to the following:

1. NFPA 70-2014.

B. Installation shall be by technicians trained by the control manufacturer.

1.04 SOFTWARE LICENSING

A. The BCS software license shall grant use of all programs and application software to the Owner as defined by the manufacturer's license agreement.

1.05 SUBMITTALS

A. Submit a single comprehensive submittal package including the following items. At the Contractor's option, control valves and control dampers may be submitted in a separate submittal in advance of the other items to maintain project schedule.

1. Control valve data: including manufacturer's product data and schedule indicating body type, size, flow rate, pressure drop, actuators and motors, end switches, normal (failure) position, and maximum differential pressure at which valve is capable of full closure for each valve.

2. Control damper data: including manufacturer's product data and schedule indicating damper type, size, flow rate, pressure drop, leakage rate, actuators and motors, actuator torque, end switches and normal (failure) position for each damper.

3. BCS data: including control manufacturer's data sheets on BCS controllers, NACs, workstations, sensors, relays, actuators, motors, terminal unit controllers, protection devices, and other devices specified herein. Include data on software.

4. Network data: including switches, converters, routers, broadcast management devices and cabling, as necessary.

5. Graphics: include illustrations of proposed graphics displays, including a flowchart or site map indicating system navigation links.

6. Diagrams: separate field wiring diagrams for each system, including motor starting and interlock wiring, ladder diagrams, control wiring, interior electrical circuits of control instruments with terminal and control device designations, actuators and motors, colors of wires, locations of instruments and remote elements, interfaces with communications equipment provided with equipment specified in other Sections, and normal position of relays. Each diagram shall have terminals labeled as they will be marked on the installed equipment. Each diagram shall delineate between existing piping, wiring or equipment, and new piping, wiring, and equipment.

7. System architecture: provide a drawing of the proposed system architecture showing configuration and locations for BCS controllers, terminal unit controllers, system servers, control wiring for each device, and hardware and wiring for connections. Indicate the spare capacity and BACnet instance number or network address for each device. Include networking hardware such as switches, converters, routers, and broadcast management devices, and indicate IP addresses. Provide diagrams of the proposed control power infrastructure, including the designation of the electrical panelboards that will be utilized to provide control power, the quantity, configuration, size, and location of controls system transformers, and the distribution wiring to power consuming control devices. Provide floor plans locating equipment coordinated with the work of other trades.

8. Sequences of operation: complete detailed sequences of operation, including a narrative of the system operation and interactions and interlocks with other systems, notations indicating whether interlock or interaction is accomplished through software or hard wired connections, detailed delineation of control between packaged controls and the BCS, and sequences of operation for packaged controlled equipment that interfaces with the BCS.

9. Existing BCS system expansion data: proposed system modifications if any are required to support this addition; complete field wiring diagrams showing interconnection with existing controllers, devices, and server equipment; illustrations of proposed graphics displays if specified herein; and proposed database and software additions or modifications, if required.

1.06 PROJECT CONDITIONS

A. Visit the Project before preparing a bid. Attention is called to the fact that this Project involves modification and reworking of an existing temperature control system. Except as specified herein or indicated otherwise on the Drawings, existing control equipment, where applicable, may be reused after repairing to place in first-class operating condition. Reused instruments shall bear the same warranty as new instruments. Where new controllers are provided, existing panels and devices shall be disconnected and removed, and existing conduit, wiring, piping, tubing, equipment, and devices that are not reused as part of the renovated control system shall be removed.

B. Advise AATC, in writing, of any malfunctions or inoperative control apparatus or instruments that become apparent during the course of the work in portions of the temperature control system that are not directly affected by this Project.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Alerton Controls, Automated Logic, Delta Controls, Johnson Controls, Honeywell, or Siemens.

2.02 SYSTEM ARCHITECTURE

A. This Project involves expansion of an existing BCS including new BCS equipment, software, programming and controls. The new BCS controllers shall be connected to the existing BCS central station. Updates to the existing BCS, including programming and graphics, as required to perform the work specified herein shall be included. This work shall include updates to, building floor plans, and associated links, lists or associated data trees. New system components shall be 100% hardware and software compatible with the existing systems and shall be by an approved manufacturer. Programming logic, database definition, and point identifiers shall conform to, and be a logical extension of, the existing systems.

B. Controls for all new equipment installations and renovations of existing systems shell be BACnet compatible. System shell connect to and be compatible with existing Johnson Controls Metasy's system.

C. Lower level networks serving terminal units, such as BACnet over MS/TP, shall be connected to the associated air handling unit controller. When multiple lower level networks are required for a single air handling unit, those networks shall be divided in an orderly method, such as by floor or wing. Remote sensors shall be wired to the controller associated with that sensor, unless specified otherwise.

2.03 CONTROLLERS

A. Network Area Controllers (NACs):

1. The Contractor shall supply one or more NACs. The quantity and location of NACs is dependent on the type and quantity of control points and devices, and the functionality specified herein, and shall be determined by the Contractor.

2. NACs shall provide the interface between the building's communications system and the BCS control devices, and provide global supervisory control functions over the control devices connected to each NAC. It shall be capable of executing application control programs. It shall perform the following functions:

   a. Integration of BACnet controller data.

   b. Network management functions for control devices.

3. NACs shall have the following hardware features as a minimum:

   a. One ethernet port – 10/100 Mbps.

   b. One RS-485 port.

   c. Battery back-up and flash memory for long term data backup, with minimum 1 gigabyte storage capacity.

4. NACs shall be capable of operating under a temperature range between 32°F to 122°F and a humidity range between 5% to 95% RH, non-condensing, and of being stored under a temperature range between 0°F and 158°F.

5. NACs shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NACs shall be an ODBC-compliant database or shall provide an ODBC data access mechanism to read and write data stored within it.

6. Alarm Notifications and Actions:

   a. NACs shall provide alarm recognition, storage, routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.

   b. NACs shall be able to route any alarm condition to any defined user location whether connected to a local network, or remote via dial-up telephone connection or wide-area network.

B. BCS controllers: field programmable, microprocessor-based type incorporating direct digital control and energy management functions. Each BCS controller shall perform its assigned control and energy management functions as a stand-alone unit and shall comply with FCC Part 15, Subpart B 2013. Provide a communication interface for communication with the BCS. Controls shall be performed in a digital manner using the digital signal from the microprocessor based controller, converted through electronic circuitry for modulation of actuators. Each BCS controller shall be expandable by adding additional input/output modules that operate through the processor of the BCS controller. The master processor in the BCS controller shall be able to manage remote field interface units thereby expanding its control loop and energy management point capacity. Each BCS controller including associated input/output modules shall have a minimum of 10% spare input and output points of each type installed. The BCS controller shall be supplied with a minimum of 8 hours of battery back-up for the clock operation and memory retention with an automatic battery charger. Provide interface for valve and damper actuators. BCS controller hardware shall provide relay or solid state isolation on each contact input circuit and each output circuit to prevent high voltage surges from entering the logic circuits.

   1. Provide a digital display unit, programmed to display analog variables, binary conditions, off-normal conditions and other analog or binary information for analysis and adjustment of the system being controlled. The display unit shall provide visible indication of automatic operation, manual or override operation, a test and associated trouble indication, and alarm indication. The display unit shall include a keyboard containing keys to call-up the described point and type of value to be displayed and several special dedicated keys for such functions as manual-automatic, test and function and value enter, as an aid to the operator. This display unit may be furnished either as an integral component of the BCS controller or as a separate portable unit providing equivalent functions.

   2. Provide manual hand-off-automatic (HOA) override switches and means for manually adjusting the analog output of outputs connected to each BCS controller. HOA switches and manual adjustments shall be either of a key operated design with switches keyed alike and utilizing the same keying system used for other outputs, or otherwise protected from unauthorized access by a key locked enclosure.

   3. BCS controllers shall be arranged and installed to allow controllers to share global data. This global data shall include, but not be limited to: time-of-day, outside air temperature and humidity, and electrical meter and demand information. If BCS controllers are not configured in a communication network to share this data, then each BCS controller shall be provided with sensor inputs to implement sequences indicated on the Drawings when operating in a stand-alone mode.

C. Terminal Unit Controllers:

1. Control of terminal units shall be accomplished by microprocessor-based stand-alone terminal unit controllers utilizing direct digital control. An individual terminal unit controller shall be provided for each terminal unit and shall interface to the BCS. Terminal unit controller components shall be furnished to the terminal unit manufacturer for factory mounting and calibration. Terminal unit controller power shall be 24 V AC. Each terminal unit controller shall contain resident programs which are field-selectable for a specific application. Resident programs shall be contained in nonvolatile memory using EEPROM, EPROM, or RAM. Systems that employ volatile (RAM) memory shall provide 72 hour battery back-up for each terminal unit controller. Temperature setpoints for heating and cooling and night setback shall be independent of each other and shall provide a zero energy band between heating and cooling modes.

2. Each terminal unit controller shall be accessible for purposes of control parameter and setpoint adjustment and monitoring from the BCS. An operator's terminal connected to any BCS controller on the network shall have access to all terminal unit controllers. Terminal unit controllers shall also be accessible through a communications port at the space sensor.

2.04 SERVERS

A. Central Server:

B. The central server is existing and shall be modified to support all NACs and BCS controllers connected to the customer's network whether local or remote.

1. The server shall provide the following functions, at a minimum:

a. Global data access: the server shall provide complete access to distributed data defined anywhere in the system.

b. Distributed control: the server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.

c. The server shall include a master clock service for its subsystems and provide time synchronization for NACs.

d. The server shall accept time synchronization messages from trusted precision atomic clock internet sites and update its master clock based on this data.

e. The server shall provide scheduling for NACs and their underlying field control devices.

f. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of commands issued to NACs.

g. Each NAC supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.

h. The server shall provide central alarm management for NACs supported by the server. Alarm management shall include:

1) Routing of alarms to display, printer, e-mail and pagers.

2) View and acknowledge alarms.

3) Query alarm logs based on user-defined parameters.

i. The server shall provide central management of log data for NACs supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:

1) Viewing and printing log data.

2) Exporting log data to other software applications.

3) Query log data based on user-defined parameters.

2.05 COMMUNICATIONS

A. The BCS communications shall comprise control products, communication media, connectors, repeaters, hubs, and routers. Controller and operator interface communication shall conform to ASHRAE 135-2012. Install new wiring and network devices as required to provide a complete and workable control network. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

B. Each NAC and BCS controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

2.06 SOFTWARE

A. Graphical User Interface (GUI):

1. Real-time displays: GUIs shall, at a minimum, support the following graphical features and functions:

a. Graphic screens shall be capable of being developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be required. In addition to, or in lieu of, a graphic background the GUI shall support the use of scanned pictures.

b. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URLs, and links to other graphic screens.

c. Graphics shall support layering and each graphic object shall be configurable for assignment to a layer. A minimum of 6 layers shall be supported.

d. Modifying common application objects, such as schedules, calendars, and setpoints shall be accomplished in a graphical manner.

1) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.

2) Holidays shall be set by using a graphical calendar without requiring any keyboard entry from the operator.

e. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No text entry shall be required.

f. Adjustments to analog objects, such as setpoints, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No text entry shall be required.

2. System configuration: at a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:

a. Create, delete, or modify control strategies.

b. Add or delete objects to the system.

c. Tune control loops through the adjustment of control loop parameters.

d. Enable or disable control strategies.

e. Generate hard copy records or control strategies on a printer.

f. Select points to be alarmable and define the alarm state.

g. Select points to be trended over a period of time and initiate the recording of values automatically.

3. Security: each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off the system if no keyboard or mouse activity is detected for a specified time. This auto log-off time shall be set per operator password. System security data shall be stored in an encrypted format.

4. System diagnostics: the system shall automatically monitor the operation of workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

5. Alarm Console:

a. The system shall be provided with a dedicated alarm window or console. This window shall notify the operator of an alarm condition and allow the operator to view details of the alarm and acknowledge the alarm. The use of the alarm console may be enabled or disabled by the system administrator.

b. When the alarm console is enabled, a separate alarm notification window will supersede other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and unacknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator are not acceptable.

6. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to set a specific home page for each user. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

7. Graphics: the monitor display format shall be organized to permit the output of displays, and/or summaries specified herein, while concurrently displaying the most recent change-of-state occurrence.

a. The format shall also include in a dedicated and protected area of the viewing screen, the current user of the monitor, date, time, and program day. The monitor shall output advisories in a dedicated and protected area of the viewing screen and an appropriate display in the event of control system hardware malfunction or restoration.

b. Graphic displays for systems and system components shall be provided as indicated in the I/O summaries.

1) The operator shall be capable, upon command entry, of calling for graphic displays of systems or zones.

2) Displays shall contain flow schematics, and schematics of mechanical duct and piping systems, electrical distribution systems, fans, valves, dampers, coils,

smoke detectors, heat detectors, circuit breakers for systems indicated in the I/O summaries to have graphic display.

3) Displays shall include scaled building floor plans with air handling unit and terminal unit temperature control zones identified and space sensors indicated.

4) Displays shall indicate values or status of I/O points associated with that system and those shall be dynamically updated at least once every 10 seconds. Software shall be provided to allow operator modification of graphic displays provided with the system and to allow operator creation and storage of new graphic displays.

5) For each air handling unit provide a tabular graphic summary of that unit and its associated air distribution system. Graphics shall contain, at a minimum, the following information:

   a) Supply fan's current operating speed and setpoint.

   b) Manual adjustment of supply fan speed.

   c) Supply air static pressure and temperature.

   d) For each associated terminal unit, as appropriate:

      (1) Minimum, maximum, and current airflow.

      (2) Current damper position or command.

      (3) Current associated space temperature.

      (4) Current reheat valve position or command.

   e) A commandable override point to place associated terminal units at maximum airflow.

   f) A commandable override point to place associated terminal units at minimum airflow.

6) For each hydronic system, provide a tabular graphic summary of the primary equipment for that system and its associated air distribution system. Graphics shall contain, at a minimum, the following information, as required by the system's I/O summary.

   a) Supply and return water temperatures and flows.

   b) Distribution pump's current operating speed and setpoint.

   c) Distribution system controlling differential pressure.

   d) Manual adjustment of distribution pump's speed.

   e) For each associated air handling unit or consuming equipment, as appropriate:

      (1) Current valve position or command.

      (2) Current associated discharge air temperature.

      (3) A commandable override point to place associated terminal units at maximum reheat flow.

   f) A commandable override point to place associated consuming equipment at full flow.

g) A commandable override point to place associated consuming equipment at no flow.

B. BCS Software:

1. General: provide global synchronization of BCS controller clocks and global coordination of BCS controller activity. Standard utility software packages shall be contained in memory including self-test diagnostics and on-line memory diagnostics. System displays (hard and soft copy) shall be in plain English. Field selected control and monitoring points shall be capable of being described using operator selected menu penetration techniques. Values shall be described in appropriate units. The system shall have at least 3 user access levels. Menus and screens shall be organized to present orderly information. The system shall perform the following functions:

a. Operator communication with any BCS and terminal unit controller including programming and data acquisition.

b. Full English operator display, including appropriate engineering units for variable data.

c. Power Failure and Automatic Restart:

1) Power failure recovery: when recovering from a failure of the normal power supply, the system shall automatically:

a) Initialize the time of day within the real-time operating system.

b) Adjust time dependent parameters within the monitoring and control software.

c) Automatically restart and output a message indicating that a power failure occurred with the time and date of occurrence. A system restart shall initialize processors and communications, update time programs, and reset equipment to the appropriate operating status for the correct time.

d. System displays shall be capable of being randomly configured with any point assigned to any system for display/logging, independent of its hardware location.

e. Remote status to allow the operator to display on the monitor any point noting point description and engineering value.

f. System function to allow operator to update time and date.

g. Upload/download to transfer database to/from disk or diskette storage to/from BCS or terminal unit controller.

h. Edit/create database to configure, edit, create or delete database information in whole or in part.

i. Database error checking to provide a method of detecting and annunciating discrepancies that would prevent the system from full normal operation.

j. Whenever a field point status exceeds preset limits, or there are other indications of system exceptions, alarms, error or failures, there shall be at least the following indications:

1) Audible tone: the system shall have an integral audible tone. The audio tone shall be capable of being enabled or disabled on operator command.

2) Display: the alarm point identification shall appear on the monitor and print out along with individual point alarm messages. Upon operator command, alarms

resident in the CCU shall be hard copy printed along with individual point alarm messages.

3) Automatic dial out: the system shall automatically initiate calls to up to 4 telephone numbers on a rotating basis. Only those alarms selected by the Owner during BCS training shall initiate automatic dial out features.

2. System programming: controller software and custom programming shall be provided to implement control sequences as indicated on the Drawings. Each BCS controller shall contain mathematic, logic, utility functions and standard energy calculations and control functions in ROM to be available in any combination for field programming the unit. These routines shall include but not be limited to:

a. Math Routines:

1) Basic arithmetic.

2) Binary logic.

3) Relational logic.

b. Utility Routines:

1) Process entry and exit.

2) Variable adjustments and output.

3) Alarm indication.

4) Restart.

c. Control Routines:

1) Signal compensation.

2) Loop control.

3) Energy conservation.

4) Timed programming.

d. Energy Management Routines:

1) Scheduled start-stop and holiday programming.

2) Optimal start-stop.

3) Duty cycling.

4) Demand limiting.

5) Day-night setback.

e. Terminal Unit Control:

1) Volume control in response to temperature.

2) Volume flow limits, minimum and maximum.

3) Occupied and unoccupied operation with associated temperature and volume limits.

4) Occupant temperature adjustment.

5) Temperature setpoint override.

6) Occupant override.

7) Global reset of temperature and volume limits.

f. Project tailored programs: the library of routines available in firmware shall be capable of generating additional programs for specific Project requirements. These should include but not be limited to:

1) Supply air temperature control.

2) Variable volume supply fan control.

3) Space temperature control.

4) Fire alarm activated sequences.

5) Totalizing.

6) Event initiated sequences.

3. Each BCS controller shall perform its full control and energy management functions, regardless of the condition of the communications link with other system components. These stand-alone capabilities shall be implemented and shall include, but not be limited to, closed loop control functions (P, PI, PID, incremental, floating) and energy management functions. BCS controllers and terminal unit controllers shall be totally stand-alone and independent of other components of the BCS for control applications specified herein. Failure of other components of the BCS shall in no way inhibit the operation or program execution of BCS controllers and terminal unit controllers.

4. BCS controller control algorithms shall be available and resident in the BCS controller to permit proportional, integral and derivative control modes in any combination to meet the needs of the application. Other control modes, incremental, floating or 2-position, shall be available to adapt to the needs of the Project. Adjustment of control variables shall be available at the BCS controller through the display unit. These adjustments shall include, but not be limited to, proportional gain, integral rate, the velocity and acceleration constants associated with incremental control, and on/off values of 2-position control. Each control loop setpoint and control logic threshold shall be programmed as a variable expressed in the appropriate engineering units and shall be displayable and adjustable through the display unit. Modification of BCS software shall not be required to alter those variables.

5. Software, local variables, and data resident in the BCS controllers shall be resident in nonvolatile memory or shall be down-loadable from the BCS.

C. Energy Management Software:

1. Scheduled start-stop and holiday programs: provide software to start and stop equipment based on the time-of-day for each day-of-week, including holidays. To eliminate power surges and to ensure stable system operation, an operator adjustable time delay shall be provided between consecutive start commands and between consecutive stop commands for electrical loads. Software shall provide for multiple start/stop events scheduled for each output for each day, including holidays.

2. Day-night setback program: provide software to limit the rise or drop of space temperature during unoccupied hours. Whenever the space temperature is above (or below for heating) the operator assigned temperature limit, the system shall be enabled until the temperature is within the assigned temperature limit.

3. Power fail-auto restart: on power failure, the BCS controller shall shutdown without damage to the BCS controller or connected systems, and without loss of programmed information. If power is restored within the time specified herein for battery back-up of BCS controller clock operation, the BCS shall automatically restart, adjust operating parameters according to the proper time of day, and resume full normal operation within no longer than 5 minutes

following restoration of power. Each controlled item of equipment 5 hp or greater shall be sequentially restarted or returned to proper operation as appropriate for the time-of-day.

4. Event initiated sequences: based on programmable values of either digital or analog inputs or outputs, the BCS controller shall be able to open or close any output contacts or combination of contact outputs, and adjust any analog output over its normal range.

5. Terminal unit controller software: provide software for the management and control of the BCS terminal unit controllers. Software shall allow for operator definition of terminal unit controllers as functional groups; monitoring, alarming and reporting of terminal unit parameters on an individual or group basis; after hours terminal unit operation monitoring and reporting on an individual or group basis; and remote setpoint adjustment of terminal unit parameters on an individual or group basis in response to operator commands or through software interaction.

D. Trending and reporting: a utility software data file log package shall be provided that analyzes and formats, into English language, a hard copy printout of hardware and software configurations of the system. This package shall be designed to allow the operator to select individual data file logs specified herein. This software package shall be executable via the BCS to allow site hard copy documentation of current data file caused by system modifications and schedule changes.

1. System configuration log: data file logs shall document basic system parameters, individual channel configuration with listing of type of hardware used with its assigned system address, listing of peripheral device (printer and operator terminals) and address with its associated segregation as to function.

2. Individual point parameter log: this software package shall provide a detailed listing of system points with the following information:

   a. Digital points: point address, assigned engineering units, type of point, listing of which programs the point is used in the system.

   b. Analog points: point address, engineering units, assigned scale factor, offset, decimal position of value, and a listing of which programs the point is used in the system.

3. System program data file log: provide to document details on individual application programs as listed below:

   a. Time program log of programs, or selected programs, listing program number and on and off times assigned for each individual day of the week.

   b. A listing of points grouped by initiating devices causing a change in condition. For example, a listing of points scheduled on by a fixed time schedule.

   c. Printout listing individual calculation address with its assigned operators and parameters. Also, a listing of other calculation points using its results.

4. Alarm summary: an alarm summary shall be provided which contains the point status of points in the alarm condition.

5. Trend log: a program shall be provided which outputs a log on a time interval basis. This program shall provide the operator with the ability to place a minimum of 16 points on trend logs and the ability to assign the trend interval from 1 second to 99 minutes. Adding, changing, or deleting a trend point, assigning the trend log period, or outputting the trend log shall be performed without any loss of change-of-state reporting on the designated hard copy device. Trend log report information shall be listed in vertical columns. A directory of columnar placement shall appear in the heading of the trend log.

6. Historical data file storage: the system shall provide software to allow operator designation of point values or status to be automatically stored in historical files on the hard disk of the BCS

central computer. Software shall allow operator designation of which point data is to be stored, at what frequency it is to be stored, when to start and when to stop storing the data, and shall allow a minimum of 50 points to be assigned to the historical data function at one time.

7. Field generated reports: the system shall have the capability, as installed, to develop custom management report logs. The software shall be capable of displaying, organizing, and editing the historical data files of point data.

2.07 SENSORS

A. BCS Sensors:

1. Provide sensors, controls, instruments, and control interfaces to meet the performance specified herein. Sensors shall be high quality precision electronic type, selected to be compatible with the BCS controllers and appropriate for the service specified herein. Accuracy values specified herein include sensor, wiring, signal conditioning and display accuracies for overall end-to-end performance. Sensors shall be selected to place the expected value in the middle third of the device's range.

2. Temperature sensors: 100 or 1000 ohm platinum resistance temperature device (RTD), Deutsche Industrial Norms (DIN) 43760, with an average percent change in resistance per degree (α) of 0.00385 ± 0.00002 ohms/ohm/ºC, selected for normal range of media sensed with accuracy of ±0.5ºF at 70ºF except chilled water sensors used for Btu calculations or control as indicated on the I/O summaries shall have an accuracy of ±0.25ºF at 32ºF. Sensors used for Btu calculations shall be matched pairs at the calibration point. Temperature sensor stability errors shall not exceed 0.25ºF cumulative over a 5 year period. Provide thermowells and insertion type sensors for water temperature sensing. Air temperature sensing shall be provided by duct insertion type sensors for supply or return duct temperatures and by extended element averaging type for plenum, and coil entering or leaving temperatures. RTD transmitters shall be a 2-wire, loop-powered device, producing a linear 4-20 mA output corresponding to the temperature span of the connected sensor. The output error shall not exceed 0.1% of calibrated span. Transmitters shall include noninteracting offset and span adjustments and RFI shielding and rejection circuitry to prevent disruption from ambient signals. Transmitter drift shall be less than 0.1ºF per year.

3. Space temperature sensors: space temperature type with setpoint adjustment range of 45ºF to 85ºF. The setpoint adjustment shall be locked out, overridden, or limited as to time or temperature in software from a central or remote operator's terminal. Precision thermistors may be used in space temperature sensing applications below 200ºF. Sensor accuracy over the application range shall be minimum 0.5ºF between the range of 32ºF to 150ºF including sensor error and A/D conversion resolution error. Sensor manufacturer shall utilize 100% screening to verify accuracy. Thermistors shall be pre-aged and inherently stable. Stability error of the thermistor over 5 years shall not exceed 0.25ºF cumulative. Sensor element and leads shall be encapsulated. Bead thermistors shall not be used. Space temperature sensors shall include a communications port for local connection of a portable test/terminal device for communications/programming access to the associated BCS controller.

a. Covers:

1) Unless otherwise specified herein, space temperature sensors shall have blank cover, occupant override push button integral to the sensor assembly, and concealed means of setpoint adjustment.

4. Current sensing relays: current sensing relays shall provide an adjustable setpoint normally open contact rated at a minimum of 50 V peak and 0.5 A or 25 VA, noninductive. There shall be a single opening for passage of current carrying conductors. Relays shall be sized for

operation at 50% rated current based on the connected load. Voltage isolation shall be a minimum of 600 V.

5. Filter status: filter status shall be sensed by 4-20 mA input from differential pressure gauges across each filter, as specified in Section 237000, Air Distribution.

2.08 MATERIALS

A. Actuators:

1. BCS terminal unit actuators: 24 V nonstall spring return type, providing complete modulating control for the full range of damper movement. Actuators shall be de-energized when the damper has reached the operator or system determined position. Actuators shall be supplied to the terminal unit manufacturer for factory mounting and calibration. Actuators shall be removable for servicing without removing the terminal unit. Actuators shall be provided with transformers for proper operation from the terminal unit controller power source.

2. Other actuators: 24 V electric worm-gear type; sized to provide required starting torque and to control the driven apparatus smoothly. Higher voltage actuators are acceptable for specific applications where 24 V actuators are not adequate. Actuators shall have spring return.

B. Control valves: brass-trimmed; 2" and smaller, bronze bodies with screwed connections; over 2", cast iron bodies with flanged connections. Water valves operating at pressure differentials greater than 40 psig shall have stainless steel trim and replaceable seat ring.

1. Valves shall be capable of full closure against 150% of design pump head, or a 50 psig differential pressure, whichever is greater.

2. Valves for water shall have equal percentage flow characteristics. Modulating control valves shall be sized for a pressure drop of 3 psig to 5 psig, unless indicated otherwise on the Drawings. Two-position valves shall be line size.

3. Ball valves used for modulating service shall have a replaceable flow characterizing disk to provide the required flow characteristics.

4. Pressure/temperature rating: as specified in Section 231000, Piping, Valves and Accessories.

5. At the Contractor's option, control valves may be butterfly type for chilled water service in piping 2" and larger. Modulating butterfly valves shall be sized for full flow pressure drop of 2 psig to 4 psig at 60% open and be limited to this opening. Two-position control valves shall be line size. Valves 8" and larger shall be provided with either worm-gear electric actuators or high pressure pneumatic actuators sized for 150% of the torque required to unseat the valve from the closed position. Valves shall be rated for bubbletight closure at a differential pressure equal to the valve body rating.

C. Temperature regulators, self-contained: adjustable type with enclosed bellows, cadmium-plated spring, indexed spring adjustment guide, top mounted 3.5" diameter temperature indicator, sensing bulb and Teflon-covered capillary tubing. Capillary length shall be as required for the installation. Valves up to 2" shall have bronze body, screw pattern, and stainless steel trim, and shall be rated for 150 psig service. Valves 2.5" to 6" shall have cast iron body, 125 psig flanges, and stainless steel trim.

D. Control dampers: single-blade up to 8" high, multiblade over 8" high; minimum 80% free area based on damper frame outside dimensions.

1. Blades: minimum 16 gauge galvanized steel, or extruded aluminum. Blades shall be airfoil shape.

a. Pivot rods: steel, minimum 0.5" diameter or hex, with one rod extended 6" to permit operation of damper from outside the duct.

b. Maximum length 42"; maximum width 8".

c. At points of contact: interlocking or overlapping edges, and compressible neoprene or extruded vinyl blade seals, and compressible metal side seals designed for temperature of -40ºF to 180ºF at leakage rate specified herein.

d. Type:

1) Opposed blade: for balancing and modulating applications.

2) Parallel blade: for 2-position, and outside and return air mixing applications. For mixing applications, orient dampers to achieve maximum mixing at throttled conditions.

e. Maximum damper area per motor: 15 ft2.

2. Leakage when closed: less than 4 cfm/ft2 at 1" wg differential static pressure based on a 48" damper width.

3. Frames: galvanized steel bar minimum 2" wide x 12 gauge for dampers 10" high or less, and 3.5" x 0.875", 16 gauge galvanized roll-formed channel with double-thickness edges or 5" x 1" x 0.125" extruded aluminum channel for 11" high and larger.

a. Corner bracing.

b. Full size of duct or opening in which installed.

4. Bearings: synthetic sleeve type.

a. Thrust bearings: vertically mounted.

b. Maximum spacing: 42".

5. Finish on steel parts: galvanized.

6. Operating linkage: factory-assembled, concealed in frame out of airstream, steel construction.

E. Panels: surface type cabinet with hinged front panel and cylinder lock. Panels shall utilize one master key.

F. Wiring: low voltage control wiring shall be not less than #18 AWG, 600 V plastic covered, color-coded. Line voltage wiring shall be not smaller than #16 AWG, 600 V. Sensor wiring shall be not less than #20 AWG twisted, shielded.

G. Valve tags: as specified in Section 230010, HVAC General.

H. Labels: as specified in Section 230010, HVAC General.

I. Thermometers:

1. Water: as specified in Section 231000, Piping, Valves and Accessories.

2. Air: 5" diameter, bimetal type.

J. Thermowells: monel, brass, or copper for use in water piping and stainless steel for other applications. Thermowells shall have threaded plug and chain, retaining nut, and lagging neck to clear insulation. Inside diameter of insertion neck shall accommodate the element being installed.

2.09 EXISTING BCS MODIFICATIONS

A. BCS software, general: upgrade the existing BCS software to the current version and provide additional updates at no additional cost during the one year warranty period. Modify existing database information and add additional database information as required to interface existing and new BCS components into a single, integrated and fully functioning system.

B. BCS graphics: the monitor display format shall be organized to permit the output of displays, and/or summaries specified herein, while concurrently displaying the most recent change-of-state occurrence.

1. Graphics shall be provided as indicated in the I/O summaries.

a. Graphics shall contain flow schematics, and schematics of mechanical duct and piping systems, electrical switchgear, electrical distribution systems, pumps, fans, valves, dampers, chillers, boilers, coils, pull stations, smoke detectors, heat detectors, circuit breakers, engine-generator sets, and cooling towers, for systems indicated in the I/O summaries to have graphic display.

b. Displays shall include scaled building floor plans with air handling unit and terminal unit temperature control zones identified and space sensors located.

c. Displays shall indicate values or status of I/O points associated with that system and those shall be dynamically updated at least once every 30 seconds. Software shall be provided to allow operator modification of graphics provided with the system and to allow operator creation and storage of new graphics.

PART 3 - EXECUTION

3.01 GENERAL

A. Where control devices are installed on insulated piping or ductwork, provide standoff brackets or thermowells sized to clear insulation thickness. Provide extended sensing elements, actuator linkages, and other accessories as required.

B. Wiring and tubing shall be identified with the same numbers and symbols as used on the corrected, approved record diagrams.

C. Label control apparatus with nameplates or tags bearing the functional designations shown on approved control diagrams.

D. Where control devices are exposed outside the building, provide weather shield enclosures.

3.02 COMMISSIONING SUPPORT REQUIREMENTS

A. Prepare a written plan indicating in a step-by-step manner the procedures that will be followed to test, check-out, and adjust the control system prior to beginning functional testing. Keep the HVAC Performance Verification Supervisor informed of progress with the Project and of changes to the proposed installation, programming and test plan. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:

1. Step-by-step procedures for testing each type controller after installation, including:

a. Process of verifying proper hardware and wiring installation.

b. Process of downloading programs to load controllers and verifying that they are addressed correctly.

2. Process of verifying proper hardware and wiring installation.

3. Process of performing operational checks of each controlled component.

4. Plan and process for calibrating valve and damper actuators and sensors.

5. A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.

6. A copy of the log and field check-out sheets that will document the process. This log shall include a place for initial and final values read during calibration of each point and clearly indicate when a sensor or controller has passed and is operating within the contract parameters. Notification of any equipment failures shall be documented.

7. A description of the instrumentation required for testing, including a certification of calibration for each test instrument.

8. Identify which tests and systems should be completed prior to using the control system for test, adjustment, and balance work.

B. Provide the HVAC Performance Verification Supervisor complete system logic diagrams, describing the proposed system programming, with programmed attributes shown. These diagrams shall be updated with field modifications from the start-up, check-out, and prefunctional testing prior to the beginning of the functional testing of the BCS. Provide a copy of each proposed graphical interface screen with interface points shown for the entire system.

C. Prefunctional tests: verify and document the proper installation, addressing, calibration, programming, operation, and failure mode of BCS control points, sequences, and equipment. Provide a signed and dated certification to the HVAC Performance Verification Supervisor and Owner upon completion of the check-out of each controlled device, equipment, and system that installation, set-up, adjustment, calibration, and system programming is complete as specified herein and as indicated on the Drawings, except functional testing. Completed prefunctional documentation of the system verification shall be submitted to the HVAC Performance Verification Supervisor for review and approval prior to the functional testing of the BCS or its being used in the testing of other equipment or systems, or other purposes. Copies of final field check-out sheets and trend logs shall be provided to the HVAC Performance Verification Supervisor for inclusion in the Commissioning Report.

D. Functional tests: conduct and document a functional test of the complete installed BCS, as defined in Section 230090, Performance Verification. Functional testing of the BCS may be conducted in phases or sections, as defined by the requirements of the Functional Test, or as approved by the HVAC Performance Verification Supervisor. The BCS, or applicable portions of the system, shall have completed functional testing and be approved by the HVAC Performance Verification Supervisor before being used for other purposes, such as test and balance measurements, or in support of the functional testing of other systems.

1. Assist in the functional testing of equipment and systems by implementing trend logs and equipment monitoring as specified herein and as required by Section 230090, HVAC Performance Verification.

E. Meet with the testing, adjusting, and balancing contractor prior to beginning the test, adjustment, and balance process and review the test, adjusting, and balancing plan to determine the capabilities and requirements of the control system in completing the testing, adjusting, and balancing process. Provide the testing, adjusting, and balancing contractor any needed unique instruments for setting terminal units and instruct the testing, adjusting, and balancing contractor personnel in their use. Assist and cooperate with the testing, adjusting, and balancing contractor by providing a qualified technician to operate the controls as required to assist the testing, adjusting, and balancing contractor in performing his work, or alternatively, provide sufficient training for the testing, adjusting, and balancing contractor to operate the system without assistance. Verify the proper operation of affected controls at the completion of the test, adjustment, and balance procedure.

F. Seasonal Adjustment:

1. Assist the HVAC Performance Verification Supervisor with the seasonal adjustment process. During this effort the HVAC Performance Verification Supervisor will:

a. Check and verify the calibration of temperature control devices and thermostats. Test and verify control sequences for proper operation for the season.

b. Where deficient operation or defective equipment is discovered, provide corrective measures as required by the warranty provisions specified herein.

3.03 BCS

A. BCS Failure Mode:

1. BCS controls and interfaces shall be arranged so that equipment controlled by the BCS operates as indicated on the I/O summaries on failure of the BCS controller for any reason, including logic power supply failure, CPU lock-up, or interposing relay failure. Safety and operational interlocks shall remain in effect.

B. Control sequences for fire alarm system signal responses shall be independent of the BCS controller and its outputs.

C. Modify the existing BCS software to include new systems specified herein. Provide graphic displays for systems and systems components as indicated in the I/O summaries.

D. Transient surge suppressors: install on low voltage signal or communications conductors entering the building from exterior locations, including those conductors from devices mounted on the exterior of the building. In addition, provide AC voltage power transient suppressors for BCS equipment power supplies.

E. BCS Sensors:

1. Liquid temperature sensors: fill sensor wells with thermally conductive material to assure accurate readings.

2. Current sensing relays: fan and pump status shall be sensed by a current sensing relay wired on the load side of each fan and pump. For constant speed fans and pumps, the current sensing relay trip setpoint shall be set at the motor's normal operating speed. For variable speed fans and pumps, the current sensing relay trip setpoint shall be set for the lowest operating speed, as determined by the commissioning process (typically 20%).

3. Proper calibration of sensors shall be demonstrated and documented as part of the commissioning process.

4. Sensor calibration: calibration of sensors shall be included as part of the prefunctional checklists according to the following procedures:

a. General: verify that sensors with shielded cable are grounded only at one end.

b. Sensors without external transmitters: take a reading with a calibrated test instrument within 6" of the sensor installation and verify the sensor reading is within the specified tolerance. If not, install offset, calibrate, or replace sensor to obtain required accuracy.

c. Sensors with external transmitters: disconnect sensor from transmitter input and connect a signal generator in place of sensor. Using manufacturer's data, simulate minimum measured value. Adjust transmitter potentiometer zero until minimum signal is read. Repeat for the maximum measured value and adjust transmitter until maximum signal is read. Reconnect sensor. Make a reading with a calibrated test instrument within 6" of the sensor installation. Verify that the sensor reading is within

the specified tolerance. If not, repeat process until specified accuracy is achieved, or replace the sensor and repeat process.

d. Paired sensors: for sensor pairs that are used to determine a temperature or pressure difference, calibrate both sensors to a common measurement and verify they are reading within ±0.25ºF for temperature and within a tolerance equal to ±2% of the sensor reading for pressure.

F. BCS Start-up and Check-out:

1. Provide the services of control technicians at start-up to check-out the system, verify and calibrate sensors and outputs, input data supplied by the Owner, and place the system in operation. Verify proper operation of each item in the sequences of operation, including hardware and software.

2. Check-out each system for control function through the entire sequence. Check actuator travel on dampers and valves for action and extent. Verify that control dampers and valves open and close completely. Check calibration of instruments. Calculate and verify instrument setpoints.

3. Calibration and testing: calibrate sensors and monitoring inputs and verify proper operation of outputs before the system is placed on-line. Check each point within the system by making a comparison between the operator console and field device. BCS control loops, failure modes, interlocks, sequences, energy management programs, and alarms shall be debugged, tested, and stable operation verified. Control loop parameters and tuning constants shall be adjusted to produce accurate, stable control system operation. Before obtaining permission to schedule the functional test, provide written documentation of system calibration and certification that the installed complete system has been calibrated, verified, and is ready to begin testing.

G. BCS Training:

1. Provide the HVAC Performance Verification Supervisor with a training plan for review 4 weeks before the planned training.

2. Provide designated Owner personnel training on the control system. The intent is to clearly and completely instruct the Owner on the capabilities of the control system.

3. The training shall be tailored to the needs and skill-level of the trainees.

4. The trainers shall be knowledgeable on the system and its use in buildings. The Owner shall approve the instructor prior to scheduling the training.

5. The standard operating manual for the system and any special training manuals shall be provided for each trainee, with a copy included in each copy of the operation and maintenance manual. In addition, copies of the system technical manual shall be demonstrated during training and a copy included in each copy of the operation and maintenance manuals. Manuals shall include detailed description of the subject matter for each session. The manuals shall cover control sequences and have a definitions section that fully describes relevant words used in the manuals and in software displays.

6. Copies of audio-visual materials used in the training program shall be delivered to the Owner.

7. Provide formal training sessions. Each session shall be conducted by factory-trained personnel:

a. Training I: the first training session shall consist of 8 hours of actual training. This training may be held on-site or in the supplier's facility. If held off-site, the training may occur prior to final completion of the system installation. Provide materials and training for up to 6 persons to be designated by the Owner. Upon completion, each student,

using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.

b. Training II: Building Systems: the second session shall be held on-site for a period of 8 hours of actual hands-on training after the completion of system commissioning. Provide materials and training for up to 6 persons to be designated by the Owner. The session shall include instruction on:

1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls, and any interface with security and communication systems.

2) Security levels, alarms, system start-up, shut-down, power outage, and restart routines, changing setpoints, and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and setpoints that if changed will adversely affect energy consumption, energy accounting, and procedures for obtaining vendor assistance.

3) Trending and monitoring features (values, change of state, and totalization), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees shall actually set-up trends in the presence of the trainer.

4) Every screen shall be completely discussed, allowing time for questions.

5) Use of keypad or plug-in laptop computer at the zone level.

6) Use of remote access to the system via telephone lines or networks.

7) Setting up and changing a terminal unit controller.

c. Training III: the third training session shall be conducted on-site 6 months after occupancy and consist of 8 hours of training. Provide materials and training for up to 6 persons to be designated by the Owner. The session shall be structured to address specific topics that trainees need to discuss and to answer questions concerning operation of the system.

d. Supervisory training: provide a separate training course for supervisory personnel. This training shall briefly cover the material of the operator training session but shall address the more advanced features of the system with emphasis on the energy conservation strategies and reporting capabilities of the system and how to implement them. The training session shall be conducted by factory-trained personnel and shall be a minimum of 4 hour. Provide materials and training for up to 6 persons to be designated by the Owner.

8. In addition to the specified BCS training, provide technically competent technicians to attend training sessions for systems and equipment that are monitored or otherwise interfaced with the BCS, to discuss the interaction of the control system to the equipment being discussed.

H. Control System Operation and Maintenance Manual Requirements:

1. In addition to documentation specified elsewhere herein, compile and organize operation and maintenance manuals in labeled 3-ring binders. The manual shall be organized and subdivided with permanently labeled indexed tabs, containing at minimum:

a. Full as-built sequence of operations for each piece of equipment.

b. Full as-built set of control drawings, including the marking of system components, sensors, and thermostats, and power sources on the as-built floor plans and mechanical drawings, identified with their control system designations.

c. Full point list. In addition to the as-built points list for the major equipment identified in the I/O summary, provide a listing of rooms served by BCS terminal controls, with the following information for each room:

1) Floor.

2) Room number.

3) Room name.

4) Air handling unit identification.

5) Reference drawing number.

6) Terminal unit tag identification.

7) Heating and/or cooling valve tag identification.

8) Minimum cfm.

9) Maximum cfm.

d. Controller/module data shall include specific instructions on how to perform and apply functions, features, and modes specified herein and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included.

e. Control equipment component submittals and parts lists.

f. Thermostats, sensors, switches, and timers, including maintenance instructions and sensor calibration requirements and methods by sensor type.

g. Valves and valve actuators.

h. Dampers and damper actuators.

i. Full as-built documentation of software programming, including commented software program printouts, and a full print out of all schedules and setpoints after testing and acceptance of the system. Provide an electronic copy of programming and database information for this facility.

j. Warranty requirements.

3.04 THERMOSTATS

A. Mount space thermostats and space temperature sensors at the following height:

Type	Height
Adjustable	48" above the floor
Concealed adjustment	60" above the floor

1. Align vertically or horizontally with adjacent light switches or, if no light switch, with receptacles.

2. Coordinate final location with the furniture layout and the architectural layout.

3. Concealed setpoint adjustment type space temperature sensors that have occupant override push buttons shall be classified as adjustable type devices.

B. Remote element type: mount on a vibration free surface 5' above the floor, unless specified herein to be mounted on a control panel. Provide 1 linear foot of element to sense the temperature of each ft2 of the coil face. Install in a serpentine arrangement across the entire face of the coil.

C. Averaging and low limit safety type elements: install in a horizontal sine curve manner to sense temperatures across the entire face of the coil, and support independently from the coil by stainless steel bands or multibulb holders. Provide 1 linear foot of element for each ft2 of coil area. Provide 0.5" metallic raceway or 0.375" hard copper rails for support of elements, both top and bottom, for plenum or duct width greater than 36".

D. Provide guards on thermostats and space temperature sensors in storage rooms and equipment rooms.

E. Provide insulated bases for thermostats and temperature sensors installed on exterior walls or walls to unconditioned spaces.

3.05 PANELS

A. Provide a panel for each BCS controller or each system not controlled by the BCS.

B. Mount the following items in the panels unless otherwise specified herein:

1. BCS controllers.
2. Relays.
3. Switches.
4. 120 V duplex convenience outlet wired from the same circuit as the BCS controller.
5. Wiring and controls.
6. Terminal blocks.

C. Wire controllers, relays, switches, and controls in the control panel to a terminal block. Line voltage and low voltage shall be separated on different terminal blocks with labels indicating voltage. Each sensor or other electrical device shall be wired back to the terminal block in the control panel. Devices in series shall be individually terminated at the terminal block, such that each side of each device is available at the control panel for troubleshooting. In addition to number markings on each conductor, conductor color shall be the same throughout each wiring run. Wiring shall be neatly tied and routed in the control panel. Shielded wiring shall be terminated neatly, with heat shrink tubing placed over the bare end of the shield. Ground conductors over 4" long shall be insulated with tubing.

D. Provide 6" x 6"trough the width of the control panel, minimum 24" in length, above the control panel to provide an entrance for cabling and tubing into the panel, with 50% spare nipple capacity.

E. Provide disconnects, power supplies, and transformers associated with each panel located in the top right corner of the panel.

F. Each item in the panel shall be labeled and the panel labeled as to the system or equipment served.

G. Panels shall be located to avoid conflicts with ductwork, piping, equipment, the work of other trades, and building conditions. Panel locations indicated on the Drawings shall be coordinated prior to installation and adjusted to avoid conflicts.

3.06 STATIC PRESSURE SENSORS

A. Install sensors in the associated air handling unit control panel and use extended sensing lines. Provide taps for calibration purposes.

3.07 HYDRONIC PRESSURE SENSORS

A. Install sensors adjacent to measurement points, with sensing lines extended to accessible locations. Provide test ports equipped with Schrader valves in each sensing line for calibration purposes.

3.08 THERMOMETERS

A. Provide at each remote temperature sensor and element location. Do not duplicate thermometers specified in Section 231000, Piping, Valves and Accessories.

B. Mount thermometers in piping, ducts, and equipment in positions adjusted to be accessible for reading. Use angle and adjustable types where straight type would not be readable.

C. Fill thermometer wells with thermally conductive material.

3.09 CONTROL DAMPERS

A. Refer to Section 237000, Air Distribution, for installation.

B. For outdoor air damper assemblies, stage the opening of each section to prevent stratification and poor mixing of outside and return air.

3.10 CONTROL VALVES

A. Refer to Section 231000, Piping, Valves and Accessories, for installation.

B. Provide high pressure air if necessary for valve actuators.

3.11 WIRING

A. Materials and installation of wiring and electrical devices shall be in accordance with Division 26.

B. Exposed control and sensor wiring shall be installed in conduits and shall be separate from power wiring. Plenum rated cable may be used in concealed spaces if run parallel to structural grid and supported by cable trays or tie wraps, and identified in a manner consistent with the documentation of the system every 30'. Conduits to devices in finished spaces shall be concealed.

C. Provide relays, transformers, fuses and interlock wiring as required to accomplish the sequences indicated on the Drawings.

D. See Division 26 for 120 V, 20 A electrical branch circuits designated for control power terminated in junction boxes or disconnect switchies. Provide power wiring from the designated junction boxes through control power transformers to BCS controllers and disconnect switches and other power consuming control devices.

E. Provide data outlets and associated low voltage cabling for each NAC and BCS controller as required. See Division 27 for communications cabling and outlet requirements. Coordinate the installation of new data outlets with the Owner's Information Technology staff.

F. Branch circuit wiring and conduit furnished under this Section for control equipment power shall be separate from other power wiring. No more than 2 BCS controller installations shall operate from a single 120 V branch circuit.

G. Low voltage control and sensor wiring shall be continuous without splicing.

3.12 SEQUENCES

A. As indicated on the Drawings.

END OF SECTION 238000

SECTION 25 50 01

FIRE ALARM BASED EFSO CONTROL SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This Section covers work necessary to add an Emergency Fuel Shut-Off (EFSO) station at Gate F3A. The existing EFSO system is a SimplexGrinnell fire alarm based system. The new EFSO station design, documentation, assembly, test, installation, field testing, startup, training, and final documentation for revisions to the existing EFSO system for the Maynard H. Jackson Jr. International Terminal located at the Hartsfield-Jackson Atlanta International Airport, is described herein.

1.02 GENERAL

A. Major components of this system shall include materials, equipment, installation, and modification required to implement a complete and operational EFSO station fully integrated to the existing system.

B. In order to achieve standardization for appearance, operation, maintenance, spare parts and manufacturer's service, to the greatest extent possible, like items of equipment provided hereunder shall be the end products of one (1) manufacturer.

C. Requirements for the electrical work associated with the installation of the new EFSO station and associated instrumentation equipment are as specified in DIVISION 26. These requirements shall include, but not be limited to, conduit and raceways, signal cabling and conductors and wiring terminations.

D. Contractor shall utilize SimplexGrinnell as the systems integrator for updates required to fully incoporate the new EFSO station into the existing system. Contact Gerald Drury, phone: (678) 896-4179, e-mail: gdrury@simplexgrinnell.com.

1.03 RESPONSIBILITY FOR COMPLETE SYSTEM

A. The Contractor shall be responsible for and shall provide for the design, supply, delivery, installation, certification, calibration and adjustment, software reconfiguration, testing and startup, owner training, warranty and routine future field services, of a complete coordinated system which shall perform the specified functions.

B. The Contractor shall be responsible for coordinating their work with other divisions in these Specifications and the project phasing plans. The Contractor shall be responsible for pre-testing and verifying the proper operation of all controls and related field instrumentation.

C. The Owner and the Engineer will review system technical information as submitted by the Contractor for control strategies and the graphical user interface, i.e. redesigned graphics, valve response to EFSO activation, etc., for complete compliance with these Specifications.

1.04 ABBREVIATIONS

A. EFSO – Emergency Fuel Shut Off

B. HMI – Human Machine Interface

C. IAM – Individual Adressable Module

D. MOV – Motor Operated Valve

1.05 SUBMITTALS

A. Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the Engineer for their review six (6) copies of submittal documents. Submittals shall include full details, shop drawings, catalog cuts and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these Specifications. The Owner and Engineer will evaluate submittal items and make comments that shall be incorporated by the Contractor. Specifically, the Contractor shall submit the following materials:

B. Hardware Submittals:

1. Drawings of equipment to be supplied shall include, as a minimum: overall dimension details including internal and external arrangements and door mounted operator devices with nameplate designations. Wiring diagrams of equipment including field device connections shall be included and specific installation/wiring requirements identified.

2. EFSO system architecture diagram showing connections from new EFSO #9A station to fuel farm. Diagram shall include room numbers where equipment is stored, cable types and counts, etc.

3. Provide a detailed Bill of Materials along with descriptive literature identifying component name, manufacturer, model number, and quantity supplied.

C. Software Submittals:

1. This includes but is not limited to: operator interface, screenshots of revised graphics screen, functions provided at the PC, including: alarm annunciation and acknowledgement, status display, control capabilities, valve closure, etc.

1.06 ON SITE SUPERVISION

A. The Contractor shall provide experienced personnel to supervise, perform, and coordinate the installation of the additional EFSO station, adjustment, testing, and connection to and reprogramming of the existing EFSO system. The personnel shall be present on-site as required to provide a complete and operating system.

1.07 TESTING AND STARTUP

A. All elements of the EFSO station and integration to the existing EFSO system shall be tested to demonstrate that the total system satisfies all of the requirements of this Specification and as indicated on the Drawings. The Contractor shall provide all special testing materials and equipment. The Contractor shall coordinate and schedule all of his testing and startup work with the Owner. As a minimum, the testing shall include both a factory test and a field test. Testing requirements are as follows:

1. Field Tests:
All system components shall be checked to verify that they have been installed properly and that all terminations have been made correctly. Witnessed field tests shall be performed on the complete system. Each function shall be demonstrated to the satisfaction of the Owner and Engineer on a paragraph-by-paragraph basis. Each test shall be witnessed and signed off by the Contractor and the Engineer upon satisfactory completion. The Contractor shall notify the Owner at least four (4) weeks prior to the commencement date of the field tests. Field Tests shall apply to newly installed equipment as well as existing equipment altered during construction.

1.08 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall provide (6) complete sets of hard-covered ring bound O&M manuals. In addition to “as-built” system drawings, the manuals shall include internal wiring diagrams and operating and maintenance literature for all components provided under this Section.

B. The submitted literature shall be in sufficient detail to facilitate the operation, removal, installation, programming and configuration, adjustment, calibration, testing and maintenance of each component and/or instrument.

C. Operation and Maintenance manuals shall also include copies of all program(s) written to accomplish the monitoring and control functions specified. In addition, the Owner shall be provided with two (2) compact diskettes (CD) which will each contain copies of all new and/or altered program(s) written to accomplish the monitoring and control functions specified. The CD copies shall be the latest updated version after startup is complete.

D. The contents of the O&M manuals shall be generally organized as follows:

1. System Hardware/Installation
2. System Software
3. Operation
4. Maintenance and Troubleshooting

1.09 DEFINITION OF ACCEPTANCE

A. System acceptance shall be defined as that point in time when the following requirements have been fulfilled:

1. All O&M documentation has been submitted, reviewed, and approved.
2. The addition of EFSO 9A has been completed and fully integrated into the existing EFSO system. EFSO 9 has been recommissioned. Contractor has successfully completed all testing requirements specified herein without issue.
3. As-built documentation has been submitted to the Owner.
4. Owner signs a document indicating system has formally been accepted.

PART 2 - PRODUCTS

2.01 GENERAL

A. The functions and features specified herewithin are the minimum acceptable requirements for the system. The provided system shall equal or exceed each requirement.

B. In some cases, the specifications may allow the accomplishing of certain functions by means of more than one hardware/firmware/software approach. Any approach that is proposed shall equal or exceed all functional, operational, convenience and maintenance aspects of the one described.

C. Major equipment, component and software items are specified; however the Contractor shall, provide all appurtenant items necessary to achieve the required operation as hereinafter specified.

2.02 FUNCTIONAL REQUIREMENTS

A. Basic system overview description: The system is intended to continuously monitor for manually activated EFSO pushbutton stations, provide alarm upon activation, and

automatically control fuel valves as specified. It shall also provide an updated graphical representation of the fuel facility infrastructure, including EFSO 9A. The graphics consist of interactive block diagrams, flow diagrams, tables and layered menus.

2.03 COMPONENT SPECIFICATIONS

A. General

1. EFSO station components and associated infrastructure required to connect to existing EFSO F3 input module terminal shall be as specified in contract drawings.

B. Spare Parts

1. None.

2.04 SYSTEM SOFTWARE

A. Graphics: Provide revised HMI graphic display with added EFSO station 9A. Added EFSO station shall contain same functionality as existing EFSO station graphics. Alarms, status, and analog data depicted on the screen shall be updated as data is made available to the computer.

PART 3 - EXECUTION

3.01 GENERAL

A. This Section further defines the responsibilities of the installer and programmer.

B. Coordinate all work with the Owner and Engineer to avoid conflicts, errors, delays and unnecessary interference with operation of the existing system during installation, testing, cutover and startup.

C. Install all new equipment in accordance with the manufacturer's instructions and approved submittals.

D. Naming and addressing of new station shall match format of existing stations.

E. Alarms shall match that of existing EFSO stations.

3.02 SEQUENCE OF OPERATIONS

A. The sequence of operations shall match that of existing EFSO stations.

3.03 TEST AND STARTUP

A. Prior to commissioning, the Contractor shall produce a testing and pre-commissioning report to be submitted for approval by the Engineer, Owner, and Operator.

B. Work and/or systems installed under this Section shall be fully functioning prior to Commissioning, Acceptance, and Contract Close Out. Contractor shall start, test, adjust, and calibrate all work and/or systems under this contract, as described below, and record results in pre-commissioning report:

1. Verify proper electrical voltages and amperages, and verify all circuits are free from grounds or faults.

2. Verify proper control signals, instrumentation signals and condition (if applicable).

3. Verify integrity/safety of all electrical connections.

4. Test, calibrate, and set all digital and analog sensing, and actuating devices.

5. Check each digital point by making a comparison of the state of the sensing/control device and the workstation computer display. Record the results

for each device in the pre-commissioning report. ON/OFF commands from the workstation should be performed in order to verify its true operation.

6. Verify proper sequences of operation. Record results and submit with pre-commissioning report. Verify proper sequence and operation of all specified functions by adjusting input variable to determine if sequence of operation is operating as specified.

C. Commissiong:

1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this Specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed their own tests.

2. The tests described in this Section are to be performed in addition to the tests that the Contractor performs as a necessary part of the installation, startup, and debugging process. The Owner and Engineer will be present to observe and review these tests. The Owner and Engineer shall be notified at least 30 days in advance of the start of the testing procedures.

3. Commissioning shall not be scheduled until all hardware and software submittals, and the pre-commissioning test report are approved by the appropriate parties as defined in this Specification.

4. Verifying compliance of equipment operation and sequence of operation with this Specification through all modes of operation. The Contractor is expected to call any design concerns and other factors beyond their control that might cause system failure to the attention of the Engineer and the Owner.

5. As control inputs and outputs are checked, a log shall be completed showing the date, technician's and Engineer’s and Owner’s initials, and any corrective action taken or needed.

D. Commissioning Tests shall include:

1. Demonstrate that points specified and shown can be interrogated and/or commanded (as applicable) from all workstations.

2. Demonstrate correct calibration of input/output devices using the same methods specified for the pre-commissioning tests.

3. Verification of sequence of operation for all levels of valve closure (i.e. primary and secondary).

4. Check valves to verify travel and failed condition.

6. The Contractor shall provide at least two persons equipped with two-way communication, and shall demonstrate actual field operation of the Terminal F EFSO System and EFSO power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the Contractor.

7. Demonstrate successful communication of point values that are communicated between the EFSO station and the graphic displays.

8. Demonstrate complete operation of Operator Interface such as graphic screens, alarms, etc.

E. Programming changes for correction of improperly programmed sequences will not be considered legitimate reasons for change orders.

F. Commissioning software:

1. Provide one complete set of programming and operating manuals for all graphics software packages concurrently with the commissioning software to the Owner as part of the O&M documents.

G. Acceptance

1. System acceptance shall be defined as that point in time when the following requirements have been fulfilled:

a. EFSO station 9A has been installed and commissioned.

b. Existing EFSO station 9 has been re-commissioned.

c. All O&M documentation has been submitted, reviewed and approved.

d. The complete EFSO system and instrumentation have successfully completed all testing requirements specified herein.

e. As-built documentation has been submitted to the Owner.

f. Owner signs a document indicating system has formally been accepted.

END OF SECTION 26 90 60

SECTION 26 01 20

OPERATION AND MAINTENANCE OF LOW-VOLTAGE ELECTRICAL DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. See General Conditions for submittal requirements.

B. Drawings and general provisions of Contract, including General Conditions and Division 01 specification sections, apply to work of this section.

1.2 QUALITY CRITERIA:

A. The requirements of this Section apply to all Sections of Division 26 and to other Divisions of Work when referenced to Division 26. Applicators shall be qualified to perform the required task.

1.3 SPECIAL REQUIREMENTS:

A. Completeness of work: Provide all wiring, connections and miscellaneous accessories necessary for the complete installation of and final connections to equipment furnished under other divisions of the specifications and/or Owner, where indicated on the Electrical Drawings or otherwise specified herein. Make all final connections to such, including installation of all special devices furnished with such equipment, and furnish all material necessary that is not supplied with the special equipment.

B. Drawings indicate locations of fixtures, apparatus, equipment and raceways and while these are to be followed as closely as possible, if it is necessary to change the location of same prior to initial installation to accommodate building conditions, make changes without additional cost to the Owner and as approved by the Architect.

C. Locations of motors, equipment and apparatus as indicated on the Drawings are approximate; connections shall be made to such equipment as actually installed.

D. Provide access to equipment and apparatus requiring operation, service or maintenance within the life of the system.

E. Do not install switchboards, panelboards, power panels, motor control centers, transformers, or starters within 42" horizontally, from floor to the structure above, of piping, ductwork and mechanical equipment.

1.4 CODES AND STANDARDS:

A. Materials specified by reference to a specific standard such as the American Society of Testing Materials, Underwriters' Laboratories, American National Standards Institute, Federal Specifications, a trade association standard, or other similar standard shall comply with the requirements in the latest revision thereof, in effect at the time of bidding, except as limited by type, class or grade, or modified in such reference.

B. UL Listed Products: Provide all materials, equipment and apparatus with Underwriters' label for all items where such labels are available. Items which are not Underwriters' labeled will not be acceptable if labeled equipment can be obtained from approved manufacturer.

C. Code Compliance: The work under this Division shall comply with the applicable edition of the following standards and codes that are in force the day the permit is issued:
   1. Federal Occupation Safety and Health Act.
   2. National Fire Protection Association Publication Number 70 (National Electrical Code).
   3. National Fire Protection Association Publication Number 72E (Proprietary Protective Signaling Systems).
   4. All local ordinances and codes.
   5. National Fire Protection Association Publication Number 101 (Fire Safety Code).
   6. The Georgia Building Code
   7. Georgia Accessibility Code for Buildings & Facilities
   8. Georgia Rules and Regulations for State Minimum Fire Safety Standards

1.5 SPECIFICATIONS AND DRAWINGS:

A. The drawings show the general run of conduits, raceways, busways, etc., and the approximate location of apparatus. Do not scale the drawings to determine exact positions and clearances. Obtain from the Architect any necessary dimensions not shown. Notify the Architect immediately of any changes in the size or location of the material or equipment which may be necessary in order to meet field conditions, or in order to avoid conflict with the equipment of other Sections. Obtain the Architect's approval before such deviations are made.

1.6 RECORD DRAWINGS:

A. Upon completion of the Project, the Contractor shall submit 2 DVDs and 2 complete sets of mylar reproducibles indicating as-built conditions of all electrical equipment, apparatus and raceways, and incorporating changes made during construction. The cost of producing the three mylar reproducible shall be paid by the contractor.

B. A record of as-built conditions shall be kept throughout the Project and shall be used in the preparation of the final record drawings.

C. See Division 01 of these specifications for additional requirements. Contractor shall provide a digital copy of the as built drawings.

1.7 CONTINUITY OF SERVICE:

A. Obtain approval from the Owner and Architect at least 7 days prior to any utility interruption or connection after any portion of the building is occupied by the Owner.

B. Perform work at such time and in such manner as to cause minimum inconvenience to the Owner and as approved by the Architect. No allowance will be made for lack of knowledge of existing conditions.

1.8 SYSTEM CHARACTERISTICS:

A. Service to the building is 277/480V, 3-phase, 4-wire, wye connected, ground neutral.

1.9 SHOP DRAWINGS/SUBMITTALS:

A. Mark shop drawings/submittals indicating the particular make, model number, accessories, options and specification paragraph numbers in which the equipment is specified.

B. Submit shop drawings/submittals for the equipment listed below:
   1. Fire alarm equipment.
   2. Lighting fixtures.
   3. Lighting and power panelboards.
   4. Transformers
   5. Wiring devices & faceplates
   6. Distribution Panels
   7. Lighting control system (relay system)
   8. Occupancy sensors
   9. Lightning Protection System
   10. Transient Voltage Suppressors

C. If manufacturer's cut sheets are being submitted as shop drawings, all information on the cut sheet that does not apply to the product that is being submitted for approval shall be clearly crossed out.

D. Along with the shop drawing submittals, the contractor shall submit two samples of every type wiring device and faceplate used on the job. This includes receptacles, toggle switches, and occupancy sensors. Shop drawing submittals will be rejected if the samples are not submitted.

1.10 MAINTENANCE DATA:

A. Submit two manuals in hardback three ring loose leaf binders, covering details of operation and maintenance for all apparatus requiring service including:
   1. Title Page with job name, Contractor's and Subcontractor's names, addresses and telephone numbers.
   2. Index sheet.
   3. Manufacturers' operating and maintenance manuals, including wiring diagrams and parts lists, for each piece of equipment and accessory requiring service or maintenance, the guarantee period and the name, address and phone number of the nearest sales and service organization for each item.
   4. Complete description of functions and operations of each piece of equipment including description of how equipment operates. Instructions for cleaning, lubricating, routine inspections, tests, and similar maintenance procedures.
   5. Step-by-step procedure for starting, stopping and operating each system.
   6. Copies of inspection certificates provided by the City, County, State and insurance companies.
   7. Approved start and completion guarantee dates.

B. All contents shall be typewritten.

C. All information that does not pertain to the equipment or systems for this building shall be completely erased or blacked out in all manuals being submitted.

D. In two binders, provide the installation sheet that is shipped with each light fixture, occupancy sensor and lighting relay system.

E. In two binders, provide the installation sheet that comes with each transformer, voltage regulator, panelboard and switchboard.

1.11 EQUIPMENT AND INSTALLATION REQUIREMENTS:

A. Each piece of apparatus shall be of the customary standard and quality furnished by the designated manufacturer for that catalogue number.

B. All electrical materials shall be new and listed by the Underwriters' Laboratories, Inc., shall meet their requirements, and shall bear their label wherever standards have been established and label service is regularly furnished by this agency.

C. Where standards have not been established by the Underwriters' Laboratories and label service or certification service is not available, the manufacturer shall certify that the material has been manufactured, assembled and tested in accordance with the applicable standards specified.

D. Except where specific instructions are included herein, materials shall be installed in accordance with the manufacturer's written instructions and recommendations.

1.12 SUBSTITUTIONS:

A. Substitutions are not allowed unless specifically noted as being allowed.

1.13 BASIS OF DESIGN

A. The electrical circuiting for all equipment specified in every section of specification is based on a specific piece of equipment that is considered to be the "basis of design". If a piece of equipment that is other than the "basis of design" is being provided, the contractor is responsible for the cost of re-engineering and implementation of all changes in electrical circuiting that are required for the piece of equipment that is other than the "basis of design".

PART 2 - PRODUCTS

2.1 CONCRETE:

A. Concrete shall be normal weight concrete (145 pcf) using Type I Portland Cement, 1" maximum size coarse aggregate and only necessary materials to provide a minimum 28-day compressive strength of 3,000 psi.

2.2 SLEEVES AND CORES:

A. Sleeves shall be standard weight steel conduit except sleeves for concealed conduit through floors not in structural members, and through interior drywall construction may be 26 gauge galvanized sheet metal.

B. Prior to pouring concrete on slabs above grade, plastic core form block-outs may be used to form sleeve openings. When block outs are removed, the metal sleeves shall be installed and grouted in. Sleeves must extend 3" above finished floor and the gap between the slab and sleeve must be watertight.

C. Conduits penetrating walls below grade shall be sealed with a waterproof, modular, mechanical expansion seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening.

D. NOT USED.

E. Openings through fire-rated floors and partitions shall be sealed after installation of conduits, etc., in a manner to maintain the fire rating of the separation.

F. Fire retardant shall be UL classified in accordance with ASTM E814-1983 (UL 1479). Acceptable products are General Electric RTV Silicone Foam, Thomas and Betts Flamesafe, 3M Company 303 Fire Barrier, or Flammadur E473. Forming and backing material installed with the sealant shall be bulk ceramic fiber or rigid fiberboard rated for 2300°F, except the Dow ethylfoam board shall be used for forming and backing material with Flammadur E473.

2.3 ELECTRICAL SERVICE:

A. The electrical system parameters are indicated on the drawings. The Contractor shall make all necessary arrangements with the Airport regarding the coordination with their construction and scheduling of tie-ins.

2.4 MOTORS, STARTERS AND CONTROL DEVICES:

A. Generally all individually mounted motor control devices will be furnished by other divisions. Where such devices are indicated on electrical drawings Division 26 Contractor shall receive device and install it completely including line and load side connections to equipment.

2.5 SLEEVES, OPENINGS AND FIRESAFING:

A. Exterior non-membrane openings: Provide cast iron pipe sleeves for conduits passing through non-membrane waterproofed exterior walls, footings, roofs or beams. Sleeves through exterior walls below grade shall have continuously welded center flange buried in construction. Make conduit watertight in sleeve with oakum packing and caulked lead joints on both sides of wall.

B. Interior membrane openings: Provide cast iron sleeves passing through interior membrane waterproofed floors with integral flashing flange and clamping ring, similar to Josam Series #1880. Adjust sleeves to floor construction with galvanized steel or wrought iron pipe nipples top and bottom, extending two inches above finished floor. Securely clamp sleeve to flashing with clamping device.

C. Exterior membrane openings: Provide cast iron sleeves passing through exterior membrane waterproofed walls, floors and roof with integral flashing flange and clamping ring, similar to Josam Series #1870 modified for required thickness. Make conduit watertight in sleeve with oakum packing and caulked lead joint.

D. Fire rated assemblies: Sleeves in slabs or in fire rated walls shall be packed with incombustible compound and caulked at ends with an incombustible compound. Provide a watertight seal at top of sleeves in slab. Seal off excess areas of floor openings around conduit and cable risers at each floor slab with a compound similar to Chase-Form CTC PR-855. Provide firesafing construction which has the same fire rating as the work penetrated.

E. In machine rooms sleeves: Set sleeves with their top end set at least three inches above finished floor. In addition, where sleeves pierce slabs or walls separating Machine Room Areas from Office Areas or other quiet areas, sleeves shall be packed with Fiberglass insulation to prevent noise transfer.

F. Provide flashing fittings for passing through roofs, Josam 1840 or 1830 or approved equal set at a suitable level above the roof to terminate the base flashing. Arrange conduit passing through the roofs to be a minimum of twelve inches from walls or other obstruction so as to permit proper flashing.

2.6 ENTRANCE SEALS:

A. Where a conduit enters building through the concrete foundation wall or floor below the water table, a watertight entrance seal shall be used. Each end of the device shall have a gland type sealing assembly with pressure bushings, which may be tightened at anytime. Device shall be securely anchored into the masonry construction with one or more integral flanges.

2.7 CONDUIT EQUIPMENT SUPPORTS:

A. Exposed conduit: Securely fasten in place by means of approved supports and fastenings and install with threaded fittings or types adaptable for the particular location. Hang no electric conduits on hangers with any other service and hang above all other service pipes unless otherwise shown on the contract drawings. Do not support conduit from ductwork, piping, equipment, etc.

B. Vertical support: Support vertically run conduits of less than 2" trade size at intervals not exceeding eight feet. Support such conduits, 2" trade size or larger, at intervals not greater than story height, or fifteen feet, which ever is smaller. Support conduits on heavy steel clamps bolted tightly around the conduits and anchored securely to the building structure without blocking.

C. Where riser conduits pierce floor slabs: Set conduits on each floor with approved beam clamps, special brackets or adjustable trapeze hangers.

D. Horizontal conduits: Securely fasten conduits in place at not more than ten foot centers, and hangers, supports or fastenings shall be provided at each elbow, at the end of each straight run.

E. Conduit in hung ceilings: Adequately support conduits by means of clamps, pipe straps or clamps designed to support conduit the structural members supporting the ceiling or to the structural slab or to the building's structural steel in the event that the ceiling system has not been installed sufficiently in advance of the conduit installation. Where feeder conduit or more than one branch conduit are installed adjacent to each other the conduit shall be supported on channels with conduit clamps mounted from the building's structural system.

F. Additional hangers: Provide at concentrated load points such as heavy equipment and pull boxes branch connections, for conduit four inches and larger, to limit conduit sag to 0.1 inch between supports.

G. Provide supporting frames or racks for work indicated as being supported from walls. Provide such frames or racks in electric and telephone closets. No work intended for surface installation in damp locations shall be mounted directly on any wall. In such locations, flat bar

members or spacers shall be used to create a minimum 1/4" air space between the walls and the work. Include in the electrical work channel sills for leveling and support of all floor mounted electrical equipment.

H. Lighting fixtures: Support from supplemental steel attached to suspended ceiling horizontal support members or directly from the building's structural slabs or steel utilizing machine bolt expansion anchors and/or beam clamps. Recessed, lay in fluorescent fixtures shall be secured in place with a wire hanger at four corners and with fixture clips specifically designed to secure fixture to the ceiling grid members.

I. Multiple hanger: Design to support a load equal to the sum of the weights of the equipment of conduits and contents, the weight of the hanger itself, plus 200 pounds. Hanger rods shall be hot dipped galvanized. Utilize single or multiple hangers as appropriate. Provide threaded rods not less than 1-1/2 inches of adjustment. Chains, wood, wire or perforated strapping shall not be used for hanging conduit or equipment.

J. Unenclosed wiring: Secure wiring in ceiling space to the structure with attachments designed for that purpose.

2.8 PRIMING AND PAINTING:

A. Painting: Each electrical enclosure including but not limited to switchboards, panelboards, cabinets, motor control centers, motor controllers, disconnects, wireways and similar enclosures shall be provided with a factory finish of not less than two coats of the manufacturer's standard color. Any finishes scratched or marred during construction shall be touched up to the satisfaction of the Architect prior to final inspection.

B. Priming: The requirements for prime painting apply only to ferrous metal materials furnished under this Section and having no factory finish, and to plywood boards. Metal surfaces shall be thoroughly cleaned of all loose rust and scale, oil, grease, or other foreign substances. Surfaces shall then be given two coats of red lead primer. Plywood surfaces shall be given two coats of fire retardant paint.

2.9 BACK-UP BOARDS:

A. Where telephone cabinets or, where two or more pieces of equipment such as safety switches, motor controllers, timers and contractors are installed in one location, provide a panel of five (5) ply three-fourth (3/4) inch thick softwood face plywood with one side finished and painted black on all sides. Plywood sizes large enough to accommodate the equipment or devices to be attached thereto. Panel shall be attached to the wall or metal frame. Plywood shall have fire-retarding properties.

B. Telephone terminal boards: Provide plywood same as above and approximately 8 feet tall with horizontal dimension approximately as indicated to scale or noted on drawings. Bottom of board shall be 12" above finished floor.

2.10 GROUNDING MATERIALS AND METHODS:

A. Ground rods: Provide copper, 3/4 inch diameter and no less than 10 feet long. Rods shall be driven such that their tops are one foot (minimum) below finished grade.

B. Grounding conductors: Provide within the building a conductor that is insulated and installed in raceway. At all points where grounding conductors enter or leave metal raceway they shall be bonded thereto. Where length of metal conduit is 5'-0" or less, bonding at one end is sufficient. Grounding conductors outside the building shall be bare, directly buried two feet (minimum) below finished grade with a non-corroding runner tape one foot above the conductor the entire length.

C. Buried connections in the grounding system and connections of grounding conductors to structural columns shall be by the Cadweld process. Other connections shall be by means of UL approved clamp type connectors.

PART 3 - EXECUTION

3.1 PROTECTION OF WORK DURING CONSTRUCTION:

A. Provide protective covers, skids, plugs or caps to protect equipment and materials from damage and deterioration during construction.

B. Store equipment and material under cover, and off the ground or floors exposed to rain.

C. For outdoor storage, protective covers of 10-mil thick black sheet plastic shall be fitted. Covers shall be reinforced to withstand wind and precipitation. Set equipment and material on skids or platforms of height to avoid deterioration from splattering and ground water.

D. Provide dust and debris protection for all equipment operated during construction. As a minimum cover open panelboard cans with plastic.

3.2 CLEANING:

A. Remove all stickers, rust, stains, labels, and temporary covers before final acceptance.

B. Foreign matter shall be blown, vacuumed, flushed, or cleaned out of and from equipment, fixtures, raceways, devices, switches, controls and panelboards.

C. Clean and polish identification plates.

3.3 EQUIPMENT AND INSTALLATION REQUIREMENTS:

A. Provide Power wiring and connections for operation of the air conditioning, heating, plumbing and fire protection equipment, and apparatus as described below and as indicated on the Drawings.

B. Do all cutting and repairing of walls, floors and ceilings necessary for the installation of the electrical work.

C. Exterior building walls below grade shall not be pierced by hanger bolts.

D. All equipment shall be installed and connected as specified and indicated in accordance with the manufacturer's instructions and recommendations. Furnish and install all electrical connections and similar items recommended by the manufacturer for proper operation.

E. Equipment operated prior to date of substantial completion shall be maintained in strict accordance with manufacturer's recommendations.

F. Final connections to elevators shall be made by the equipment elevator vendors.

3.4 INSTRUCTION OF OPERATING PERSONNEL:

A. In addition to any training called for elsewhere in these specifications, arrange formal instruction sessions, not less than 4 hours duration, for the Owner's operating personnel, covering:
   1. General familiarization and operating procedures for the entire electrical installation.
   2. Routine maintenance procedures for all electrical equipment.
   3. Specific operating and maintenance procedures for the fire alarm system.

B. Obtain receipt from the Owner's representative acknowledging completion of each item of instruction.

3.5 VIBRATION ISOLATION:

A. Electrical connections to equipment mounted on vibration isolators, or with motors larger than 1 HP, shall be made with a 180° bend of Type EF, extra flexible conduit.

3.6 PAINTING:

A. Where specified, painting shall be done under this Division. Surfaces shall be clean and free from oil.

B. Finishes of factory painted apparatus shall be touched up where finish is marred in installation.

C. Where galvanizing is broken during fabrication or installation, recoat exposed areas with cold galvanizing compound.

D. Exposed ferrous equipment and supports exposed to view without removing ceilings or access panels shall be painted 1 coat of gray rust preventive paint. Prime equipment as recommended by paint manufacturer.

3.7 EXCAVATION AND BACKFILLING:

A. All excavation, shoring, bracing, backfilling, and compaction required by this contractor shall be provided under this section of specifications.

3.8 COORDINATION:

A. Provide offsets, transitions, and fittings as required to coordinate the work of each trade with that of all other trades, including mechanical, plumbing, fire protection, electrical, structural and architectural.

3.9 DEFINITIONS:

A. The following definitions apply to all Division 26 contract documents:

1. Furnish: Items delivered to Project site and not incorporated into work or not incorporated into work defined in that particular Section.
2. Install: Item already on site or "furnished" by another entity and required to be incorporated in work indicated in that particular Section.
3. Provide: item purchased and delivered to Project site (furnish) and incorporated into work or construction activities under requirements of referenced Section (install).

3.10 GENERAL WIRING METHODS:

A. Wiring of all systems: Install wiring in a conduit.

B. Wiring: Provide wiring complete from point of service connection to all receptacles, lighting fixtures, clocks, power outlets, outlets for future extensions, and other devices as shown. Slack wire shall be provided for all future connections. Unless otherwise specified, branch circuit conductors shall be No. 12 AWG or larger. In outlet boxes for future installations, ends of wires shall be taped and blank covers installed.

C. Cables shall not be bent either permanently or temporarily during installation to radii less than 10 times the outer dimensions.

D. Conductors not larger than No. 10 located in switchboards, motor control centers and pull boxes shall be cabled in individual circuits. Bundling and cabling shall be done with nylon straps made of self-extinguishing nylon having a temperature range of 65 degrees Fahrenheit.
   1. Each strap shall be constructed with a locking hub or head on one end and a taper on the other. Straps shall be Thomas & Betts "TY-RAP" or equal.

E. Homeruns: Where the length of a homerun, from panel to first outlet box, exceeds 75 feet for a 120-volt circuit or 150 feet for a 277 volt circuit, the conductor size shall be No. 10 AWG up to the first outlet.

F. Lighting fixture connection: From an accessible approved raceway, outlet or junction box located above a suspended ceiling to recessed or surface lighting fixtures, provide minimum 3/8 inch flexible metallic conduit at least 4 feet and not more than 6 feet in length. The outlet or junction box shall be located a minimum of one foot and not more than 4 feet from the fixture. Additional raceways, outlet or junction boxes including conduit or electric metallic tubing extensions to those shown on the drawings, shall be provided where required to comply with the above length requirements.

3.11 CIRCUIT CONNECTIONS:

A. Circuit conductors shall be connected to the specific pole shown on the drawings. Contractor must provide panelboards with the circuit breakers installed as they are laid out on the drawings. Distribution panels can be laid out in any manner the manufacturer sees fit.

3.12 HOLES AND CUTTING OF SLABS

A. See requirements in the Architectural and structural specifications before boring or cutting any floor or roof slab.

3.13 COMPLETENESS OF WORK:

A. Provide all boxes, offsets, bends, raceways, raceway supports, fittings and wiring for the complete installation. Provide all components to complete the systems specified. Each unit of equipment shall be completely assembled and installed, and all surfaces shall be clean and free from dents, scratches, abrasions or marred areas.

3.14 LOCATION OF OUTLETS:

A. Outlets for lighting, power and equipment, not specifically dimensioned are located diagrammatically on the drawings. Lighting fixtures shall be located in accordance with reflected ceiling plans or tile pattern outlines. If neither is indicated, lighting fixtures shall be symmetrical within the space in which they are located. Reference shall be made to the architectural and mechanical plans and to the shop drawings of the equipment to be installed for the exact location of the outlets. Power outlets shall be located so as to serve the equipment directly. Where new or future furniture, equipment or in built casework is indicated on Architectural plans, outlet height and position shall be coordinated by the Contractor to assure accessibility of the outlet. See drawings for specific notes regarding the location of specific outlets.

B. Outlet location: May be moved 10 feet in any direction before being installed, without additional cost to the owner.

END OF SECTION 26 01 20

SECTION 26 01 26

MAINTENANCE TESTING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. See General Conditions for submittal requirements. Drawings and general provisions of Contract, including General Conditions and Division-1 specification sections, apply to work of this section.

1.2 QUALITY CRITERIA:

A. Applicator shall be qualified to perform required task.

1.3 INTERRUPTION OF SERVICE:

A. Power service interruptions subsequent to occupancy of the building by the Owner shall be done only with the written permission of the Architect at times so designated by him.

B. Coordinate shutdowns of temporary power systems with other contractors so as not to delay completion of their work. Prepare to work continuously including required overtime when required, to restrict power shut down period to an absolute minimum.

C. Provide to the Owner in written notice in advance of any required shutdown. Make requests for shutdown in writing at least fourteen consecutive calendar days in advance of the anticipated shutdown date.

1.4 TESTING:

A. At the final inspection of the work, a thorough test shall be made in the presence of the Architect or his representative and the entire system shall be shown to be in perfect working condition. Contractor shall provide all personnel necessary for tests.

B. Make the following available to the personnel conducting the test:.
   1. Electrician shall take cover off any equipment so directed by the Engineer.
   2. Electrician with hand tools, ladder, and two hand held two way radios.
   3. Accurate voltmeter.
   4. Clamp-on ammeter.
   5. Shop drawings.
   6. Complete electrical Specifications and Drawings with all bulletins, addenda and revisions.

C. Perform tests on all wiring and equipment to prove absence of Ground Faults and short circuits. Conform to requirements of the National Electric Code, local codes, governing authorities, and these specifications. Provide meggar tests on all conductors larger than #4 AWG.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION 26 01 26

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Work in this section consists of the installation of the building wiring system and is part of each Division 26.

1.2 SCOPE OF WORK:

A. Complete systems of wiring shall be installed as indicated on the Drawings and/or as specified.

B. Wiring for communication and alarm systems are not included in this Section.

C. Types of wires, cables, and connectors in this Section include the following:
1. Copper Conductors
2. Fixture Wires
3. Flexible Cords or Cables
4. Wire Connection Devices

1.3 DRAWINGS:

A. Each raceway shall contain a minimum of two #12 AWG and one #12 AWG equipment ground conductor, unless otherwise noted, scheduled, or indicated.

B. Hatchmarks on raceway symbols indicate the number of conductors in a raceway when the number exceeds two, not including equipment grounding conductors.

C. Equipment grounding conductors are not indicated by hash marks. All circuiting above 32 volts shall contain a copper equipment grounding conductor sized according to code. In some cases, where circuit in a raceway requires a separate isolated grounding conductor, these grounding conductors are indicated by a hash mark with tick mark on the end.

D. Specified wire size refers to American Wire Gauge.

E. Electrical connections and connecting devices are not specifically indicated by symbols on the Drawings, but shall be provided.

1.4 COLOR CODING:

A. See Section: 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS.

PART 2 - PRODUCTS

2.1 COPPER CONDUCTORS:

A. Wire shall be copper, sizes indicated, specified, or scheduled refer to copper wire sizes.

B. Wire shall be a minimum of #12 AWG unless otherwise specified.

C. Insulation shall be NEC type THWN/THHN or XHHW, 600 volt, rated at 75C.

D. All conductors shall have size, grade of insulation, voltage, and manufacturer permanently marked on the outer cover at intervals not exceeding 24".

E. Acceptable Manufacturers:
   1. General Cable Company
   2. Okonite Company
   3. Phelps Dodge Cable and Wire Company
   4. Rome Cable Corporation
   5. Triangle PWC, Inc.
   6. Southwire Company

2.2 COPPER CONNECTION DEVICES:

A. For splices and taps on conductors #10 AWG and smaller, twist-on or crimp-type pressure connectors are approved.

B. For splices and taps on conductors #8 AWG and larger, screw-type connectors, other than split-bolt type, and compression connectors installed with a compression tool, are approved.

C. Dies for compression tools shall be as recommended by the manufacturer for each conductor size involved.

D. Terminations of all stranded conductors, regardless of size, shall be made with compression, crimp-type, or mechanical pressure lugs.

E. Acceptable Manufacturers:
   1. Ideal Industries, Inc.
   2. Minnesota Mining & Manufacturing Company
   3. Panduit Corporation
   4. Thomas & Betts Corporation

2.3 JOINT COVERING:

A. Connections shall be covered with layers of high voltage splicing or filler tape and layers of vinyl plastic electrical tape. Layers shall be sufficiently thick to remove rough edges and provide insulation equal to that of the conductor.

B. Plastic connection covers may be used in lieu of tape.

C. Acceptable Manufacturers:
   1. Ideal Industries, Inc.
   2. Panduit Corporation
   3. Thomas & Betts Corporation

2.4 FIXTURE WIRES:

A. Lighting fixture wiring shall be high temperature fixture or machine tool wire as specified in the National Electrical Code for each application.

PART 3 - EXECUTION

3.1 INSTALLATION – GENERAL:

A. Install wires, cables, and connection devices where indicated, requirements of NEC and NECA's "Standard of Installation" and in compliance with recognized industry practice.

B. Install all wiring in raceways unless specifically indicated otherwise.

C. All conductors in one raceway shall be installed at one time. Pulling compound may be used, when necessary or allowed by conductor manufacturer, however, compound must not deteriorate the conductor or insulation.

D. Conductors in panelboards, switchboards, or control cabinets shall be neatly grouped and laced with nylon tie straps.

E. Connect each circuit of a multi-circuit home run to a different phase at the panelboard.

F. Support cable risers at minimum intervals as required by Code. Refer to Section: 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS for specific supporting methods.

G. Termination of more than one conductor in a single terminal is not acceptable except where terminal is approved by manufacturer for such application.

H. Tighten all set screw or bolted connection devices according to manufacturer's torquing requirements.

I. Prior to energizing, test all cables and wire for continuity, shorts, and circuitry, correct all short circuits, opens, and errors in circuiting.

3.2 CONNECTIONS TO MECHANICAL EQUIPMENT:

A. Locations of motors, equipment, and apparatus indicated on Drawings are approximate and connections shall be made to such equipment where actually installed.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GROUNDING:

A. The specific requirements described under "GROUNDING" are in addition to National and local code requirements.

B. Equipment Grounds: All equipment, enclosures and raceways shall be grounded. All other circuits shall have a green colored or green identified grounding conductor installed in the raceway with the phase conductors. Bond ground conductor at origin of circuit, at intermediate pull boxes, and to panelboard or equipment at termination.

C. Switchboard and Panelboard Grounds: Switchboards and panelboards shall be provided with a copper grounding bar bonded to the enclosing cabinet. The incoming grounding conductors shall be connected to this bus.

D. Supplementary Ground Field: Provide a supplementary ground field in addition to the grounding electrodes required by code. The supplementary ground field shall consist of three rods in a triangular pattern spaced 10' apart. Supplementary ground field shall not be buried under any paving. The ground field conductors shall be No. 4/0 AWG stranded copper conductors with Type TW (PVC) insulation. Ground rods shall be 3/4" diameter, 10' long copper weld. Ground field conductors shall be bonded to rods with exothermic welds using Erico "Cadweld" process, mold types "GT" and "GY", or equivalent Burndy. All splices shall be exothermic welds.

1.2 EQUIPMENT GROUND:

A. Frames and metal enclosures: Connect all electrical equipment to the equipment ground system. All raceways shall be provided with a green grounding conductor except raceways supplying lighting fixtures. Conductors shall be sized in accordance with the Table 250-95 of the National Electrical Code or larger where so indicated.

B. Panelboards and feeder pull boxes: Provide a grounding conductor of capacity as required by the N.E.C. between each ground lug on the panel or transformer and the supply source.

C. Motors: Ground by means of a grounding conductor in the same raceway with the motor feeder connected to a grounding bushing at the motor terminal box, and the ground bus in the motor control center or to panel.

D. Transformers: Ground by means of a grounding conductor in the same raceway with the primary voltage supply feeder connected to ground bus at supply end of the conduit run and to the common grounding stud on transformer case. This is a supplementary ground.

E. Wherever flexible conduit is used for part of a conduit run, provide a grounding conductor in the conduit and connected to a grounding bushing or bus at each end of the run.

F. Power receptacles: Ground by means of an insulated green grounding conductor terminated at the ground bus in the Branch Panelboard and to a ground terminal on the receptacle.

G. Neutral of dry type transformers: Connect neutral of transformers to common grounding stud on transformer case. At every dry transformer location, provide a copper conductor cadweld connected to nearest grounded building steel. This is the primary ground. There shall also be a terminal wide ground grid that is connected to the ground stud on every dry type transformer.

H. The ground source shall consist of building steel, a ground field as indicated on drawings, and a connection to the cold water line in the interior of the building. All ground sources shall be connected with a copper conductor, sized according to N.E.C. Table 250-94.

I. Maximum resistance to ground shall be to 5 ohms.

J. Lighting Fixtures: Fixtures supplied through flexible conduit or cord shall be grounded to the box through which they receive power. This ground shall be by means of a green conductor the same size as the power conductors connected to the box and to the fixture by connections approved for grounding by U.L. This grounding conductor shall be installed inside the flexible conduit or be manufactured into the flexible cord.

K. Flexible Conduit: Ground continuity shall be maintained across sections of flexible conduit.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.1 TERMINAL WIDE GROUND GRID

A. See drawings for demolition, replacement, and addition requirements to the existing terminal wide ground grid.

3.2 EXOTHERMIC CONNECTIONS

A. All underground connections/splices to the ground system shall be by an exothermic process.

END OF SECTION 26 05 26

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Work in this Section consists of the installation of all supporting devices required for the installation of all equipment specified in Division 26.

1.02 SCOPE OF WORK

A. All raceways, cables, and electrical equipment shall be firmly anchored or supported in place as required by codes and as specified herein.

B. Types of supporting devices specified in this Section include the following:
1. Beam Clamps
2. Cable Ties
3. Channel Strut Systems
4. Chain
5. Conduit Supports
6. Lead Expansion Anchors
7. Power Actuated Fasteners
8. Round Steel Rod
9. Toggle Bolts
10. Wood Backboards

1.03 DRAWINGS

A. Generally, supporting devices are not indicated on Drawings, however, supporting devices are to be supplied as required for each specific application to comply with codes and as specified herein.

PART 2 - PRODUCTS

2.01 BEAM CLAMPS

A. Beam clamps shall be galvanized steel, furnished with tapped holes in base and face for bolt or hanger rod.

B. Acceptable Manufacturers:
1. Appleton Electric Company
2. Efcor, Inc.
3. Kindorf Electrical Products Division

2.02 CABLE TIES

A. Cable ties shall be one piece, all nylon, with a 90 degree insertion angle.

B. Acceptable Manufacturers:
1. Panduit Corporation

2. Thomas & Betts Corporation

2.03 CONDUIT SUPPORTS

A. Conduit supports shall be galvanized steel straps or hangers, or spring steel type hangers or clamps.

B. Acceptable Manufacturers:
1. Appleton Electric Company
2. Caddy Corporation
3. Raco, Inc.
4. Thomas & Betts Corporation

2.04 CHANNEL STRUT SYSTEMS

A. Channel shall be #14 gauge minimum galvanized steel. Attachment holes shall be factory punched. Straps for the support of conduit shall be designed so that the attachment nut is captivated on the shoulder of the strap when tightened. Attachment nuts shall be designed to provide a surface on the turned down edge while making positive contact with the side walls of the channel. All nuts, bolts, straps, and other equipment required for proper installation according to manufacturer's recommendation shall be provided and shall be protected with same finish as channel.

B. Acceptable Manufacturers
1. Kindorf Electrical Products Division
2. Unistrut, Inc.

2.05 WOOD BACKBORDS

A. Wood backboards shall be 3/4" thick, exterior grade "B- C" Underwriter's listed fire-resistant plywood.

PART 3 - EXECUTION

3.01 BEAM CLAMPS

A. Beam clamps may be used for support of raceways, enclosures, panelboards or other equipment where attached to/from fixed steel supports or structures. Beam clamps fastened to steel supports not horizontal or vertical shall be provided with a swing connector. Beam clamps fastened to structures in a horizontal position (bolt is horizontal) shall not be used for support of equipment exceeding 10 pounds.

3.02 CABLE TIES

A. Cable ties shall be provided when specified elsewhere for grouping and organizing conductors or cables in panelboards, switchboards, wireways, or enclosures. Cable ties shall be used for securing cables from movement.

3.03 CABLE SUPPORTS

A. Install cable supports in vertical runs at Code required intervals and as recommended by manufacturer.

3.04 CHANNEL STRUT SYSTEMS

A. Channel strut systems shall be used for support of all multiple runs of conduit. Channel may also be used for support of enclosures, panelboards, or other equipment.

B. Channel strut shall be supported from steel rods 3/8" minimum when not directly fastened to structure.

3.05 CONDUIT SUPPORTS

A. Straps, clamps, or hangers shall be used for support of individual runs of conduit. Channel strut systems shall be used for multiple runs.

B. Spring steel type hangers or clamps shall be used for support of conduit to steel except where exposed to rain or moisture.

C. Conduit support devices shall be secured to structure with wood screws on wood, toggle bolts on hollow masonry, lead anchors on solid masonry or concrete, and machine bolts and beam clamps on steel. Nails are not acceptable. Threaded studs driven in by a power charge and provided with lock washers and nuts may be used in lieu of lead anchors where approved by Architect but not where cable or rebar is embedded in concrete for reinforcing.

D. Conduits secured to surfaces exposed to water or spray shall be supported by hangers which hold conduit completely off surface.

E. Conduits shall not be supported from ceiling suspension system unless written approval is obtained from Architect prior to installation.

F. Conduit supports shall not be welded to steel structures.

G. Riser clamps shall be installed at all vertically routed conduits where required by Code.

3.06 WOOD BACKBOARDS

A. Wood backboards shall be installed where two or more disconnect switches, individual circuit breakers , or other similar equipment are installed, or where indicated on Drawings and as specified herein.

B. Wood backboards shall be firmly anchored to wall with lag bolts on wood, toggle bolts on drywall or hollow masonry, and lead anchors on solid masonry or concrete.

C. Backboards shall be painted with two coats of fire inhibiting gray enamel before installation of equipment.

D. Size of backboard shall be coordinated with equipment mounted thereon, however, lower edge shall be set 30" A.F.F., unless indicated otherwise. Telephone backboards shall have their bottom at 12" AFF.

3.07 SEISMIC

A. All hangers and supports must meet the seismic requirements dictated by section 26 05 48-1 of these specifications.

END OF SECTION 26 05 29

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Work in this Section consists of the installation of raceways and is part of each Division 26 Section making reference to raceways specified herein.

1.2 SCOPE OF WORK:

A. Install all wiring in raceways unless otherwise specified.

B. Route raceways concealed in ceilings, walls, below floors or underground, as indicated by symbols on the Drawings and as hereinafter specified. Raceways may be run exposed only where specifically allowed by notes and in electrical rooms and mechanical rooms.

C. Conductors: Route all conductors in conduit, unless noted on drawings or specified hereinafter. Each length of conduit shall bear the manufacturer's trademark or stamp.

D. The plans indicate the general location of outlet boxes and circuiting. Conduit runs for these circuits may be modified at the time of installation to adapt same to building construction, but in no case shall a circuit be doubled up or modified.

E. Types of raceways in this Section include the following:
1. Electric Metallic Tubing (EMT)
2. Flexible Metal Conduit
3. Liquid-Tight Flexible Metal Conduit
4. Rigid Metal Conduit
5. Rigid Non Metallic Conduit

1.3 SYMBOLS:

A. Provide conduit sizes in accordance with the National Electrical Code; minimum size of conduits in framed walls or in accessible ceiling spaces shall be 1/2"; minimum size of conduit concealed in floor slabs, in grade, cast-in-concrete, or exposed shall be 3/4"; minimum size of flexible conduit shall be 1/2" except for drops to light fixtures which may be 3/8".

B. Each raceway indicated by symbol on drawings for telephone or communication wiring shall be 3/4" minimum unless otherwise noted, scheduled, or specified.

C. Flexible conduit, of 3/8" trade size, to recessed lighting fixtures will be acceptable.

1.4 BOXES:

A. Install boxes at each lighting fixture, device, outlet, or junction box indicated on the Drawings. Provide all material described in this Section.

B. See details on Drawings for outlet boxes in acoustically rated partitions.

C. Types of boxes described in this Section include the following:
   1. Outlet Boxes
   2. Floor Boxes
   3. Junction Boxes
   4. Pull Boxes
   5. Conduit Boxes

D. Outlet boxes for devices recessed in metal door jambs shall be sheet metal partition boxes sized to suit the application.

E. Outlet boxes recessed in concrete block walls shall be square cornered masonry boxes or standard 4" square boxes fitted with square cornered tile covers of proper depth for block. Both type boxes shall be 2-1/8" minimum depth.

F. Outlet boxes recessed in ceilings shall be 4" octagonal or square, 2-1/8" depth.

G. Outlet boxes recessed in concrete shall be code-approved for such application.

H. Thru-wall type outlet boxes are not acceptable.

I. Alarm and signal outlets shall be as specified for electrical outlets.

J. Wall telephone outlets shall consist of a 4" box with single device plaster cover and outlet boxes suitable for each specific device.

K. Where special purpose devices require a larger outlet box than specified herein, provide outlet boxes suitable for each specific device.

L. Metal barrier shall be provided in boxes where 277 volt and 120 volt or multiple 277 volt switches or devices are installed in a common box.

M. Outlet boxes shall be provided with fixture studs as required for support of surface mounted light fixtures.

N. Boxes shall be of form and dimension as to be adapted to is specific use and location, device or fixture to be mounted in or on box, and number, size, and arrangement of raceways connecting thereto.

O. Outlet boxes shall be constructed of code-gauge galvanized steel unless otherwise specified.

P. Boxes exposed to hazardous conditions, rain or spray shall be corrosion resistant cast metal of type, shape, and size to suit respective locations and installations. Provide with threaded entrances, removable covers, gaskets, and corrosion-proof stainless steel screws.

Q. Outlet boxes recessed in plastered or gypsum walls or columns shall generally be 4" or 4-11/16" square, 2-1/8" deep with plaster ring ½" in height.

R. Acceptable Manufacturers:
   1. Appleton Electric Company
   2. Crouse-Hinds, Inc.
   3. Efcor, Inc.
   4. Midland Ross Corporation
   5. O. Z. Gedney Company
   6. Raco, Inc.

7. Steel City Electrical Products Division

PART 2 - PRODUCTS

2.1 FLOOR BOXES, SINGLE USE:

A. Box shall be concrete-tight and fully adjustable.

B. A leveling plate with screws at each corner shall be factory welded to bottom of box for rough leveling. Adjusting rings mounted to top of box shall provide a 1/2" vertical or angular adjustment of the top after concrete pour and installation of wiring devices.

C. A cap shall be provided over top of box to protect adjusting ring during concrete pour.

D. Floor plates shall be of bronze construction, configuration as indicated on Drawings.

E. Carpet flanges, if required, shall be of bronze construction.

F. Provide duplex receptacle in the box.

G. Acceptable Manufacturers:
1. Crouse-Hinds Company
2. Hubbell, Inc.
3. Pyle National Company
4. Steel City Corporation
5. Thomas & Betts Corporation

2.2 JUNCTION AND PULL BOXES:

A. Boxes shall be constructed of code gauge galvanized sheet metal unless otherwise indicated or specified. Boxes shall be of dimensions as required by number and size of connecting raceways and wire, and as required by Code.

B. All boxes shall be provided with screw removable blank covers. Covers on recessed ceiling boxes shall be round, and painted to match ceiling. Covers on recessed wall boxes shall be of size and finish as used on switch and receptacle outlets. Refer to Section: WIRING DEVICES.

C. Acceptable Manufacturers:
1. Appleton Electric Company
2. Crouse-Hinds, Inc.
3. O. Z. Gedney Company
4. Raco, Inc.
5. Steel City Corporation

D. When rigid metal conduit is run exposed, only cast metal boxes can be used.

2.3 CONDUIT BODIES:

A. Conduit bodies shall be constructed of corrosion- resistant cast-metal of type, shape and size to suit respective locations and installations.

B. Conduit bodies shall have threaded conduit-entrance ends, removable covers, gaskets and stainless steel screws.

C. Acceptable Manufacturers
1. Appleton Electric Company
2. Crouse-Hinds Company
3. O. Z. Gedney Company
4. Pyle National Company

2.4 CONSTRUCTION:

A. Boxes shall be of form and dimension as to be adapted to its specific use and location, device or fixture to be mounted in or on box, and number, size, and arrangement of raceways connecting thereto.

2.5 ELECTRICAL METALLIC TUBING:

A. Electric metallic tubing shall be electro or hot-dipped galvanized steel and approved for the following applications unless otherwise specified:
1. In slabs above grade, columns, walls, and suspended ceiling spaces.
2. Connectors and couplings shall be malleable iron or steel, galvanized or cadmium plated, compression type with insulated throats and code approved for each application.

B. Acceptable Manufacturers:
1. Allied Tube & Conduit Corporation
2. Efcor, Inc.
3. Georgia Tubing Corporation
4. Republic Steel Corporation
5. Wheatland Tube Company

2.6 FLEXIBLE METAL CONDUIT:

A. Flexible metal conduit shall be galvanized steel and approved for the following applications unless otherwise specified:
1. Connections to recessed lighting fixtures (maximum length 72").

B. Connectors shall be of the twist-in, insertion type with insulated throats.

C. Acceptable Manufacturers:
1. Alflex Corporation
2. American Flexible Conduit Company
3. Cerro Wire & Cable Corporation
4. Steelflex Electro Corporation

2.7 LIQUID-TIGHT FLEXIBLE METAL CONDUIT:

A. Liquid-tight flexible metal conduit shall be neoprene-jacketed, and approved for the following applications:
1. Connections to dry-type transformers.
2. Connections to motors.
3. Connections to all electrical equipment subject to movement or vibration.
4. Connections to equipment subject to oil or grease.
5. Connections to kitchen equipment.

B. Connectors shall be water-tight, of the twist-in, insertion type with insulated throats.

C. Acceptable Manufacturers:
   1. Alflex Corporation
   2. American Flexible Conduit Company
   3. International Metal Hose Company
   4. Universal Metal Hose Company

2.8 RIGID METAL CONDUIT:

A. Rigid metal conduit shall be hot-dipped galvanized steel and is approved for all applications unless otherwise specified.

B. Connectors and couplings shall be threaded galvanized malleable iron or steel.

C. Locknuts shall be of the type with sharp edges that will bite into enclosure where connected.

D. Bushings shall be brown or black, of the high temperature type.

E. Acceptable Manufacturers:
   1. Allied Tube & Conduit Corporation
   2. Efcor, Inc.
   3. Triangle PWC, Inc.
   4. Wheatland Tube Company

F. Rigid metal conduit shall be used as follows:
   1. Where no other conduit is allowed to be used.
   2. In grade below slab.
   3. In slab on grade.
   4. In poured concrete walls that have earth on one side of wall.
   5. Where conduit is run exposed.

2.9 RIGID NON-METALLIC CONDUIT:

A. Rigid non-metallic conduit shall be rigid polyvinyl chloride, non-burning, high impact, schedule 40.

B. Can only be used where specifically called for on the drawing, such as for lighting protection system down conductors.

C. NOT USED.

D. NOT USED.

E. Couplings and connectors shall be rigid polyvinyl chloride, high impact, schedule 40.

F. Cement for connections of conduit shall be approved by the conduit manufacturer.

G. Acceptable manufacturers:
   1. Carlon Company
   2. Plastiline, Inc.
   3. Sedco Pipe Products

2.10 FLOOR BOX, MULTIPLE USE:

A. If installed in slab on grade, box shall be water tight cast iron. If installed on an elevated slab, box shall be galvanized steel.

B. Box shall contain one duplex receptacle and shall have three data compartments for various jacks. From the data compartments, extend a total of two one-inch conduits to above an accessible ceiling and one one-inch conduit to below the slab if it is not slab on grade. Terminate the conduits with smooth bushings. See drawings for additional conduit requirements.

C. Box shall have a hinged cover with a slot for cables to pass through and a recess to install the same flooring material as is that that surrounds the box. Contractor shall install the surrounding floor material in the box cover recess with its top at the exact same elevation as the surrounding floor.

PART 3 - EXECUTION

3.1 RACEWAY INSTALLATION:

A. Install the raceway systems, where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation" and in accordance with recognized industry practice.

B. The raceway installation shall follow the layout indicated on the drawings. Where changes are necessary due to structural conditions, or other causes, such changes shall be made without any additional cost to the Owner. Offsets in conduit are not indicated and shall be furnished as required.

C. Where raceways must pass through structural members, approval from the Architect shall be obtained with respect to location and size of sleeves.

D. Raceways that cross expansion joints shall be provided with expansion fittings approved for the application.

E. Exposed raceways shall be run parallel with or at right angles to the building walls.

F. Lateral runs of raceways in block work shall not exceed 3/4" trade size.

G. Raceways shall be secured in place and protected where necessary to prevent damage to the work during construction. Refer to Section: SUPPORTING DEVICES for specific support requirements and methods.

H. Installation of raceways shall be complete and shall be blown out and swabbed clear of water and trash prior to pulling wire. Owner's representative shall be present at "blowout".

I. Where connections are made to motors not near walls or columns, a vertical rigid metal conduit, minimum size 3/4" attached to floor and ceiling shall be installed and wiring carried into and out of this conduit by means of condulets and flexible conduit.

J. Install junction boxes where necessary to avoid excessive runs or too many bends. Refer to Section "BOXES" for specific box types and requirements.

K. Pull lines with a minimum tensile strength of 200 lbs. in all empty raceways. At each end, leave 12" of slack coiled in box or at end of conduit where boxes are not installed.

3.2 ELECTRICAL METALLIC TUBING:

A. Electrical metallic tubing stubbed up from floor or down from ceiling space and not connected to an enclosure shall terminate with an insulated throat connector.

3.3 RIGID METAL CONDUIT:

A. Rigid metal conduit shall be secured to metal enclosures with two locknuts if there is no threaded hole for the conduit.

B. Insulated bushings shall be installed at all connections to cabinets and boxes. Terminate stub-ups not attached to enclosures with an insulated throat, grounding bushing.

C. Commercial conductive pipe joint compound shall be applied to the male threads on all threaded joints and fittings.

D. Connections shall be wrench tight and where subject to ground water, rain or spray shall be watertight.

E. Treat metallic conduit and fittings buried in earth or gravel with one of the following:
   1. Two coats of asphaltum, field applied.
   2. A plastic coating, factory applied.
   3. Spiral wrapped, half lapped, 20 mil plastic tape, field applied.

3.4 RIGID NON-METALLIC CONDUIT (PVC):

A. Rigid non-metallic conduit shall be encased in concrete extending 3" on all sides for electrical service entrance. Run the electrical service ductbank below all structural foundations.

B. Minimum depth below surface shall be 24" and earth or sand shall be carefully compacted around conduit to eliminate air voids.

C. An insulated copper grounding conductor shall be installed in each plastic conduit used for power circuits, unless prohibited by local codes or utility company. Grounding conductor shall be bonded to grounded metal enclosure or device at origin and at each outlet.

D. All rigid non-metallic conduit that is not encased in concrete shall have an expansion joint installed so that no part of the conduit is more than 100 feet from an expansion joint.

E. No rigid non-metallic conduit is allowed to be run inside the building.

3.5 NOT USED:

NOT USED.

3.6 RACEWAY SLEEVES AND SEALING:

A. Provide sleeves for electrical raceways in all above grade floor slabs and structural beams where raceways penetrate. Sleeves shall be galvanized steel conduit or tubing, of ample inside diameter, and shall extend 3" above finished floor. Space between slab and sleeve must be watertight.

B. Where raceways penetrate fire walls or floors, the space between the raceway and building material shall be sealed with a Code approved material or fitting equal in fire rating to the building material being pierced. Spaces between raceways and sleeves shall also be sealed.

C. Conduits entering refrigerated spaces, i.e., freezers and coolers, shall be installed with sealing fittings to prevent entrance of moisture.

D. Raceways installed between lighting fixtures and outlets exposed to weather and interior conditioned space shall be sealed with duct seal at the last outlet in the conditioned space.

E. Provide a 6" wide yellow PVC tape buried 4" above all conduit runs in grade outside the footprint of the building.

3.7 BUSHINGS:

A. All conduit except that is terminated at a threaded hub, shall be terminated with a bushing or fitting that has a smooth hard plastic insert that will not allow conductor insulation to be damaged during pulling.

3.8 BOX INSTALLATION:

A. Install boxes where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practice.

B. Coordinate box installation with wire/cable and raceway installation.

C. Coordinate box installation with all other trades such that boxes will not be rendered inaccessible.

D. Outlet boxes shall not be installed back to back.

E. Firmly anchor all boxes in place.

F. Provide knockout closures to cap unused knockout holes where blanks have been removed.

G. The approximate locations of outlets are shown on the Drawings. The exact locations shall be determined at the building. The right is reserved to change the exact location of any switch, ceiling or other outlet in any room before it is permanently installed.

3.9 OUTLET BOX:

A. Install outlet boxes at heights above finished floor, measured to centerline of outlet, as indicated on Drawings.

B. Set outlet box trim rings for flush mounted devices to within 1/8" of finished wall.

C. Adjust mounting heights of outlets in concrete block walls to minimize cutting and patching of masonry.

D. Install outlet boxes in one vertical line when shown adjacent on drawings but at different mounting heights.

E. Look at all architectural elevations and details for mounting of outlet boxes. The height indicated on any elevation or detail shall take precedence over a mounting height noted on the electrical drawings.

3.10 FLOOR BOXES:

A. Install floor boxes according to manufacturer's recommendations.

B. Complete floor box installation, except for final height adjustment, before concrete pour.

C. Install carpet flanges in all locations where carpet exists or is being installed.

3.11 JUNCTION AND PULL BOXES:

A. Install junction and pull boxes as indicated on Drawings and also where necessary to avoid excessive length of run or number of bends and to provide access to cable supports. Several such boxes may be indicated on the Drawings, however, the locations, if shown, may be varied and additional boxes shall be provided as required.

B. Install exposed junction or pull boxes only in unfinished spaces, unless indicated otherwise on Drawings.

3.12 FLUSH BOXES:

A. All outlet boxes except those in unfinished spaces shall be mounted flush with the surface they are mounted in. All conduits connected to such boxes shall be run concealed. Any question about whether a space is finished or not shall be submitted to the architect in writing.

3.13 PULL STRINGS:

A. Provide a minimum 200 pound nylon pull string in every empty conduit. The pull string shall be securely tied to some object on each end so that it can not be accidentally pulled into the conduit. In finished spaces, the pull string shall not be visible.

3.14 BLANK COVER PLATES:

A. Every outlet box that does not have a device in it, shall have a blank cover plate (i.e. a telephone outlet when the telephone jack is not installed as part of the contract).

3.15 SUPPORT:

A. No conduit shall be supported from any piece of plumbing or mechanical equipment.

3.16 COMBINING HOMERUNS:

A. Homeruns shall not be combined. Each homerun shown on the drawings shall be installed with the circuits indicated.

3.17 FIRE STOPPING:

A. Every electrical penetration of a fire rated wall or floor shall have a UL listed fire stop system or material that maintains the fire rating of the fire rated wall or floor.

3.18 EXPANSION DEVICES:

A. Every conduit, bus duct and cable tray that crosses a building expansion joint shall have an expansion device at the crossing of the building expansion joint.

END OF SECTION 26 05 33

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Work in this Section consists of providing identification of electrical equipment and is part of each Division 16 Section.

1.2 SCOPE OF WORK:

A. Provide identification of electrical equipment to the extent indicated on Drawings or specified herein.

B. Types of electrical identification specified in this Section include the following:
1. Exposed conduit color bandings
2. Buried cable/conduit warnings
3. Cable/conductor identification
4. Operational instructions and warnings
5. Danger signs'
6. Equipment identification signs
7. Feeder and circuit identification

PART 2 - PRODUCTS

2.1 CONDUIT MARKERS:

A. Conduit markers, when specified, shall be self-adhesive vinyl tape, a minimum of 3 mils thick by 1.5" wide, and color-coded in the same colors as existing conduits in the work area.

B. The marker shall indicate the voltage of the conductors inside the conduit. If the conductors are less than 50 volts, the marker shall indicate what system the conductors are for.

2.2 LINE MARKER:

A. Line markers shall be vinyl self-adhesive, wrap around type, pre-numbered plastic coated, numbered to show circuit identifications number.

B. The conductor markers shall be installed at every point the conductor is terminated.

2.3 PLASTICIZED TAGS:

A. Tags shall be pre-printed or partially pre-printed accident prevention and operational tags, of plasticized card stock with matt finish suitable for writing, approximately 3-1/4" by 5-5/8", with brass grommets and wire fasteners, and appropriate wording, i.e., DANGER, CAUTION, DO NOT OPERATE, etc.

2.4 UNDERGROUND LINE MARKER:

A. Underground line markers shall be 6" wide brightly covered vinyl with a description of what is buried below the marker imprinted on the marker.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Where identification is to be applied to surfaces which require a finish, identification shall be installed after surface has been finished.

3.2 CONDUIT IDENTIFICATION:

A. Electrical conduit shall be marked in all locations.

B. Fire alarm conduit shall be painted red.

3.3 UNDERGROUND CABLE/CONDUIT IDENTIFICATION:

A. During backfilling, line markers shall be installed, continuous at 6" to 8" below grade, above all buried power, communications, or signal cables or conduits.

B. Multiple markers shall be installed where cables or conduits are installed in groups exceeding a width of 16" are run outside the foot print of the building.

3.4 CONDUIT IDENTIFICATION:

A. Conductors, #10 AWG or smaller, shall have outer covering color-coded to indicate phase, neutral, and ground conductors. Color-coded self-adhesive 1" wide tape bands shall be installed on conductors larger than #10 AWG. Colors shall be as follows:

All grounding conductors	Green
208Y/120 volt system	
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
204Y/277 volt system	
Phase A	Brown
Phase B	Orange
Phase C	Yellow
Neutral	Gray

B. Color code switchlegs identical to phase conductors.

3.5 CABLE IDENTIFICATION:

A. Install cable identification on each communication and signal cable and fire alarm. Identification shall match schedule at termination point(s), shop drawings and similar previously established identification for project. Every conductor shall be identified at every termination or splice or access point.

3.6 OPERATIONAL IDENTIFICATION AND WARNINGS:

A. Install self-adhesive plastic signs or similar equivalent identification for instruction or warnings on switches, outlets, controls, devices and covers of electrical enclosures wherever reasonable to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel.

3.7 DANGER SIGNS:

A. Install danger signs where required by governing regulations and authorities as constituting a danger for persons in or about project.

B. Install danger signs wherever it is possible for persons to come into contact with electrical power of voltage in excess of 120 volts to ground.

C. Install danger signs on switches and equipment, regardless of whether concealed or locked up, where untimely or inadvertent operation could result in significant danger to persons, or damage to or loss of property.

3.8 EQUIPMENT IDENTIFICATION NAMEPLATES:

A. Nameplates for emergency system equipment shall be red and for normal systems shall be black.

B. Nameplates shall be engraved on lamacoid plastic with ½" margin maintained around the outer edge. Nameplates shall be screwed or riveted to the equipment. Gluing is not acceptable.

C. Provide equipment identification nameplates for all normal and emergency (Life Safety, Critical, Legally Required Standby, Optional Standby, and Uninterruptable Power Supply) power electrical equipment including but not limited to, substations, switchgear, switchboards, panelboards (power, lighting, receptacle), motor control centers, non-fusible disconnect switches (including individually mounted circuit breakers), fusible disconnect switches, wire ways, bus ducts, cable trays, automatic transfer switches, transformers, uninterruptable power supplies, generators, etc.

D. Install labels at locations of best convenience for viewing without interference with operation and maintenance of equipment.

E. Nameplates: Electrical Equipment Identification Methodology

All new electrical equipment shall have a unique identification number. The identification number shall be annotated on three lines, centered within a nameplate with a minimum Y2 inch margin maintained around the outer edges. The methodology used to create an electrical equipment nameplate identification number is outlined in Table 3:

Table 3 - Nameplate Description

Line One	Line one shall list the official H-JAIA room number where equipment is located. Room numbers for existing spaces are located near each electrical room at the CPTC. For CPTC electrical designs which utilize existing open spaces, where electrical equipment will be or is located and a CPTC space number has not been assigned for this area, an identifier shall be developed by using the following method: step one) obtain the CPTC zone number for this area by contacting the H-JAIA DOA planning department. This designator will become the first identifier for line one, step two) add the CPTC level. This designator will become the second identifier for line one, step three) locate the closest vertical and horizontal column identifier which is typically a letter and number and add to line separated by a back slash. This designator will become the third identifier for line one. These key designators together and separated by a hyphen will become the new electrical equipment location name. Example: CPTC zone designator is **AS17,** CPTC level number designator is **1,** and horizontal/vertical column number designators are **AI16.** Line one will now become **AS17-1-AI16.**
Line Two	Line two shall include the **Power** Type - **Voltage** Type - **Equipment** type (plus sequential number) - **Source** identifier and CPTC concourse identifier. A hyphen shall be used to separate the categories identified. See Table 4, 5, 6, 7 and section 1.14 for type descriptions which shall be used when creating the identification number for line 2.
Line Three	See specification section 26 05 53, 3.11

Table 4 - POWER TYPE IDENTIFIER

N	Normal Power
E	Standby Power
R	Legally Required
S	Life Safety
U	Uninterruptible Power Supply (UPS) Power

Table 5 - VOLTAGE TYPE IDENTIFIER

M	Medium (above 480VAC)
H	277/480 VAC, 3 phase
L	120/208 VAC, 3 phase
B	120/240 VAC, 1 phase
0	Other (24VDC and below 120VAC)

Table 6 - EQUIPMENT TYPE IDENTIFIERS: The below listed identifier abbreviations approved by the DOA Electrical Department. To use abbreviations not listed, submit a descriptive written request to the DOA Electrical Department for approval.

Identifier	Equipment Type
AT	Automatic Transfer Switch
BD	Bus Duct
CB	Cable Bus
CT	Cable Tray
DF	Fusible disconnect Switch
DS	Non-Fusible disconnect Switch
EG	EmerQency Generator
FA	Fire Alarm Control Panel
IB	Individually mounted circuit breaker
LC	Lighting Control Panel
MC	Motor Control Center
PP	Panel board (Power, Lighting, Receptacle)
SB	Switchboard
SG	Switchgear
TR	Transformer
TV	Transient Voltage Surge Suppressor
UP	Uninterruptible Power Supply (UPS)
UT	Utility Transformer or Bus
WW	Wire way

Table 7 - CPTC CONCOURSE IDENTIFIERS

A	Concourse A	E	Concourse E
B	Concourse B	M	Main Terminal including Atrium
C	Concourse C	T	Concourse T
D	Concourse D	F	Concourse F

3.9 CIRCUIT IDENTIFICATION:

A. Install typewritten directory in all branch circuit panelboards describing load served by each circuit and the location. The room number where the load is at shall be typed on the directory.

3.10 MECHANICAL EQUIPMENT NOMENCLATURE:

A. This Contractor shall use the actual names or designations of equipment supplied under other Divisions when making labels or panelboard schedules.

3.11 DISCONNECTS:

A. The third line of each disconnect switch nameplate shall state the circuit that the disconnect switch is disconnecting and the name of the piece of equipment that the disconnect switch feeds.

3.12 EMPTY CONDUITS:

A. At each end of every empty conduit, there shall be a plastic tag marked with permanent ink stating where the other end of that conduit is terminated. Also, each empty conduit shall have a number that is unique to that conduit (i.e. EC #8) written on the tag at each end of the conduit. Contractor shall use the room numbers on the Architectural floor plans to identify rooms.

3.13 FACEPLATES:

A. On the outside of every faceplate, there shall be a white stick on label that states the circuit number that serves the device under that face plate. Label shall match existing labels in the area. The same circuit number shall be written on the inside of the faceplate with a permanent marker along with all other circuits that are in that outlet box.

3.14 JUNCTION BOX COVERS:

A. All blank junction box covers shall have written, the circuit designations of all circuits that are in that box. The writing shall be neatly done with a permanent marker.

3.15 SIGNAGE:

A. Contractor shall provide all signage that is required by code. Such signage shall be white engraved letters on a red plastic substate.

3.16 FIRE ALARM CONDUITS AND BOXES

A. All fire alarm system conduits and boxes shall be painted red.

END OF SECTION 26 05 53

SECTION 26 09 03

LIGHTING FIXTURE CONTROLS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section covers controls for lighting fixtures both interior and exterior.

1.02 WHERE REQUIRED

A. Controls shall be installed as indicated by symbol, letter notation and special notes on the drawings.

PART 2 PRODUCTS

2.01 SENSOR LIGHTING CONTROLS

A. General: Provide complete sensor lighting control system including necessary sensors, power packs, control wiring, conduit and all associated accessories. The installation shall be warranted for the period of one year after acceptance. The Contractor shall be responsible for contacting the manufacturer for proper placement, and adjustment of sensors. The product shall be warranted for a period of 5 years for wall sensor switches, ceiling sensors and power packs. The Contractor shall provide as-built drawings showing the location of sensors, power packs, and low voltage wire.

B. Submittal: Provide pictures, literature and circuit diagrams, of all components of lighting control system for engineer's review and approval. Provide two samples with faceplates of every wall type occupancy sensor.

C. Manufacturers: Watt Stopper, Mytech ILC, Leviton, Hubbell, Pass & Seymour, UNENCO, Lutron, and Lightolier.

D. Passive Infrared Wall Switch Sensor:
   1. The passive infrared sensors shall be capable of detecting presence, in the control area, by detecting changes in the infrared energy. Small movements shall be detected such as when a person is writing while seated at a desk.
   2. The digital time delay range shall be adjustable from 30 seconds to minimum 15 minutes and sensitivity shall be adjustable.
   3. Adjustments and mounting hardware shall be concealed to prevent tampering of adjustments and hardware.
   4. Sensor shall cover up to 900 sq. ft. for walking motion, with a field of view of 180 degrees.
   5. Sensor shall be capable of switching 0 to 800 watt incandescent or fluorescent 120 volts and 0 to 1200 watts for 277 volts.
   6. For safety, the sensor shall have a 100% off override switch with no leakage current to the load. When sensor is in off mode, either manual-off or auto-off, there is no leakage to load.
   7. If an open circuit occurs in the AC line (such as a ballast or lamp failure), the sensor shall automatically switch to OFF mode.
   8. Sensor shall have 2 positions only, OFF and AUTO, for normal operation.
   9. The sensor shall have an override ON switch to work as normal toggle switch.
   10. Sensor shall have standard 5-year warranty.
   11. Sensor shall have an auxiliary relay for use by HVAC controls contractor.

E. Dual Technology Ceiling Sensor
   1. Sensor shall combine passive infrared and ultrasonic abilities.
   2. Sensor shall be low voltage type and will require a power pack.
   3. Provide manual on wall toggle switch.
   4. Sensor shall be equal to Watt Stopper #DT-200.
   5. Provide the number of power paks needed to accommodate the number of dual technology sensors controlling the light fixtures in any one area.

2.02 EXISTING LIGHTING CONTROL PANEL SYSTEM

A. Where shown on the drawings, some normal lighting circuits shall be on/off controlled by a relay in an existing lighting control panel.

B. Manual lighting control panel system stations provided by this contractor shall match manual stations at similar locations. Mount all manual stations in counter as directed by Architect.

PART 3 EXECUTION

3.01 SETTING SCHEDULE

A. Contractor shall program in a 7 day schedule for every newly activated lighting control panel relay as directed by the building owner's representative.

B. Contractor shall program every lighting control panel system manual on/off station as directed by the building owner's representative.

END OF SECTION 26 09 03

SECTION 26 22 13

DRY-TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 DRY-TYPE TRANSFORMERS:

A. Dry type distribution transformers shall be 480 volt delta primary, 208/120 volts, three phase, 4-wire, wye secondary, with six 2-1/2% taps, two above and four below normal.

B. Insulation shall have 220°C rise rating.

C. Noise level as certified by manufacturer shall not exceed Ansi standards. Coils and cores shall be mounted on vibration dampers to minimize transmission of vibrations. Flexible conduit links shall be placed in secondary and primary conduit connections to transformers to minimize transmissions of vibration to the building conduit system. In addition, vibration absorbing neoprene pads shall be installed between transformer unit and its support, whether floor, bracket or hanger.

D. Cable connection lugs shall be of copper or copper alloy. Transformer windings shall be copper.

E. This contractor shall torque all tap connections according to manufacturer's recommendations.

F. Transformer Requirements:
   1. Positive & negative sequence impedance at 60Hz: 2.8% to 3.5% (up to 75 kVA)
   2. Secondary neutral connection rated at 200% of the rated secondary phase current.
   3. Linear Load Efficiency: The efficiency at 35% load shall ensure 25% less losses than that required by NEMA Std TP1. The following efficiency levels shall be maintained from 35% to 65% load: 15 kVA: 97.7%, 30 kVA: 98.1%, 45 kVA: 98.3%, 75 kVA: 98.5%.
   4. Non-linear Load Efficiency with K-13 non-linear load from 35 to 65% load: 15 kVA: 97.0%, 30 kVA: 97.5%, 45 kVA: 97.7%, 75 kVA: 98.0%.

PART 2 – PRODUCTS

A. NOT USED.

PART 3 – EXECUTION

A. Where a transformer is suspended, it shall be mounted on steel strut supported by ½ inch all thread rod with two steel extreme vibration locknuts with nylon inserts on bottom of all thread rod. Transformer to rest on four sound/vibration manufactured isolation mounts with studs on top and bottom of mounts. The studs shall not be continuous through the mount. Mounts shall be rated for the weight of the transformer. All thread rod shall be supported from structure or supplemental steel as designed by a licensed structural engineer.

B. When a transformer is mounted on the floor slab or on a rack, it shall rest on four

sound/vibration isolation pads and four spring isolators, all rated for the weight of the transformer. The pad shall have a stud on the top side that bolts to the transformer base.

END OF SECTION 26 22 13

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section covers the installation of panelboards.

1.2 STANDARDS:

A. Panelboards shall be in accordance with NEMA and U.L. "Standards for Panelboards" and shall comply with National Electric Code and Federal Specification W-P-115a and Am-3 where applicable.

1.3 IDENTIFICATION:

A. Provide a typewritten directory of circuits controlled. Install on back of door.

PART 2 - PRODUCTS

2.1 VOLTAGES:

A. Panelboards shall be designed for voltages as scheduled.

2.2 BUS MATERIAL:

A. All bus work shall be copper.

B. Where "space" is indicated for future branch circuit breakers, bus shall be fully rated for minimum 100 amp branch breaker installation.

2.3 CABLE CONNECTIONS:

A. All cable connection lugs shall be copper alloy, rated for the type of material to which connected.

2.4 TYPE MAINS:

A. Main lugs or main breakers shall be provided as scheduled.

2.5 GROUND BUS:

A. Provide a ground bus bar brazed to the cabinet.

2.6 CIRCUIT BREAKERS:

A. Protective devices in panelboards shall be molded case thermal-magnetic, automatic circuit breakers of frame types, number poles, trip ratings and quantities as scheduled and as described below.

B. Main and branch breakers shall be rated for the fault current level indicated on the drawings, minimum 10,000 amperes for 208 volt system, 14,000 amperes for 480 volt

system RMS symmetrical.

C. Multipole breakers shall have internal common trip.

D. All circuit breakers shall be bolt on type.

2.7 CABINETS:

A. Cabinets shall be galvanized code thickness steel with door and trim finished in gray enamel or lacquer. Mounting shall be flush or surface as indicated on the plans. Door shall have combination latch and cylinder lock. A minimum 8" wide gutter shall be provided on the top or bottom of panelboards to accommodate the feeder lug connections to the panelboard bussing or main breaker. Gutter space shall be a minimum of 4" on all sides around the panel, except that cabinets enclosing a through feeder shall have an 8" gutter on the feeder size.

2.8 MANUFACTURERS:

A. Panelboards shall be of same manufacture as existing switchgear.

2.9 SPACES:

A. All spaces in a panelboard shall have all bussing installed so that a breaker can be installed without any additional work.

2.10 DOORS:

A. All doors shall be the door within a door hinged type.

PART 3 - EXECUTION

3.1 ELEVATION:

A. Unless otherwise indicated, install top of branch lighting and receptacle panelboard cabinets 6'-6" above finished floor.

3.2 SUPPORT:

A. Panelboards shall be anchored firmly to the building structure.

B. All circuits shall be connected to the poles in the panelboard exactly as they are shown except if the circuit breaker for the TVSS must be relocated.

3.3 FAULT RATING

A. The entire panelboard shall have a fault current rating greater than the available fault current listed. Series ratings are not acceptable.

3.4 SPECIAL HACR RATING:

A. Where a circuit breaker feeds a piece of equipment that is required to be protected by a HCAR circuit breaker, then that circuit breaker shall be a HACR circuit breaker.

3.5 PANELBOARD SCHEDULES:

A. Panelboard schedules shall state the type load and the room(s) where the load is located for each pole that is used. When a circuit feeds multiple rooms, the panelboard schedule shall list the room from which the homerun originates. The words spare or space shall be penciled in, but all other information shall be type written.

3.6 SWITCHING DUTY:

A. If a circuit breaker feeds a lighting circuit and there is no toggle switch controlling the lighting, then the circuit breaker shall be rated for switching duty if such a rating is available.

3.7 ARC FLASH RATING:

A. On the inside of every panelboard door on panels that have doors and on the trim of others, the contractor shall place a sticker that gives the actual calculated arch flash rating for that piece of equipment.

B. The manufacturer of the panelboards shall perform the arc flash study and shall perform a coordination study so as to have the required information needed to perform the arc flash study. The contractor shall set up the circuit breaker trips as determined by the coordination study.

3.8 TVSS:

A. If a panelboard is shown as having a transient voltage surge suppessor (TVSS) connected to it, then the panelboard must be factory constructed with the ground bus, neutral bus and TVSS circuit breaker arranged so that the leads for the TVSS are shorter than 15 inches. Make the leads shorter than 15 inches, if possible.

B. TVSS devices shall be integral to the panelboard. Provide necessary overcurrent device/disconnect for each TVSS.

3.9 SPACING:

A. In electrical rooms, panelboards and all other electrical equipment shall be installed as close as possible to adjacent panels so as to leave as much free space as possible for future equipment.

END OF SECTION 26 24 16

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This Section covers the installation of receptacles, wall switches, and cover plates.

1.2 WHERE REQUIRED:

A. Wall switches and receptacles, complete with cover plates, shall be furnished and installed where shown on the Drawings or specified.

1.3 DEVICE TYPES:

A. All wiring devices catalog numbers shown are for devices with Manufacturers standard finish. For devices with other color finishes, refer to Manufacturer for proper catalog number suffix.

1.4 COLOR:

A. All devices and face plates in a room or contiguous area shall be the same color and type.

B. In all rooms and spaces, ivory devices and stainless steel face plates shall be used except in certain rooms designated by the Architect where special color wiring devices and coverplates must be provided. The architect will furnish a list of these rooms and the color of the devices and coverplates that go in them.

C. Any duplex receptacle that is fed by any emergency circuit shall be red in color.

D. Corrosion resistant devices shall be yellow in color.

PART 2 - PRODUCTS

2.1 SINGLE POLE TOGGLE SWITCHES:

A. 20A, 120-277V AC

B. Product/Manufacturers
1. Hubbell #HBL1221X
2. Or equal

2.2 THREE-WAY TOGGLE SWITCHES:

A. 20A, 120-277V AC

B. Product/Manufacturers
1. Hubbell #HBL1223X
2. Or equal

2.3 KEY-OPERATED TOGGLE SWITCHES:

A. Single pole 20A, 120-277V AC
B. Product/Manufacturers
1. Hubbell #HBL1221L
2. Or equal

2.4 GENERAL PURPOSE RECEPTACLES

A. Duplex, 20A, 125V, 2 Pole, 3 Wire, Grounding, NEMA type 5-20R

B. Product/Manufacturers
1. Hubbell #HBL5362X
2. Or equal

2.5 NOT USED

2.6 CORROSION RESISTANT RECEPTACLES:

A. Duplex, 20A, 125V, 2 Pole, 3 Wire, Grounding, NEMA type 5-20R

B. Product/Manufacturers

1. Hubbell #HBL 53CM62
2. Or equal

2.7 GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLES:

A. Duplex, 20A, 125V, 2 Pole, 3 Wire, Grounding, NEMA type 5-20R

B. Product/Manufacturers

1. Hubbell #GF8300X
2. Or equal

2.8 FACE PLATES:

A. Stainless steel faceplates shall be a smooth surface type with satin (brushed) finish, equal to Hubbell #S1.

B. Faceplates shall be made for the particular type of wiring device it covers.

PART 3 - EXECUTION

3.1 LOCATION:

A. Refer to the Drawings for device outlet box mounting heights.

B. Where two or more switches or receptacles are shown at the same location, they shall be in gangs and covered with one faceplate.

C. Bond receptacle ground straps to outlet boxes with 6" long green insulated #12 AWG stranded copper jumpers.

D. Light switches shall be mounted with the faceplate approximately 2 inches from the door frame where architectural features allow.

E. When an outlet is shown in a certain location or an architectural elevation, the Contractor shall install that outlet at that location. The Contractor must examine every elevation in the contract document set.

3.2 ALIGNMENT:

A. Where a device (or devices) is installed below an architectural feature (i.e., a window) it shall be centered under the feature.

B. Where a device is mounted in an architectural feature, it shall be centered in that feature, it shall be centered in that feature.

C. Where two or more devices are stacked, they shall be stacked in a vertical line.

D. Where several devices of the same type are mounted adjacent, they shall be installed under one faceplate.

C. Where, two or more faceplates are mounted adjacent, the tops of all faceplates shall be at the same elevation and the same spacing shall be between all faceplates. This could occur where toggle switches and wall box dimmers are mounted beside each other or where duplex receptacles and data/telephone outlets are mounted adjacent to one another. During the final inspection, the Contractor shall use a bubble type level to prove that the top of all adjacent faceplates are at the same elevation and that that elevation is exactly horizontal.

D. All faceplates must be installed plumb.

3.3 SAMPLES:

A. The contractor shall submit with the shop drawings two samples of each type of wiring device and each type of faceplate that is to be installed on this project. If these samples are not submitted, the shop drawings will be rejected.

3.4 TYPES:

A. In damp or wet locations and in the mechanical rooms, where GFCI receptacles are not used, corrosion resistant receptacles shall be used.

B. Where a WP (weatherproof in use) receptacle is specified or required by code, the Contractor shall provide an appropriate outlet box and a hinged cover that will provide a UL listed NEMA 3R rating. The hinged cover shall be a die cast metal alloy and shall be similar to Hubbell #WP8M and appropriate for the type of receptacle being used.

END OF SECTION 26 27 26

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section covers the installation of fuses.

1.02 WHERE REQUIRED

A. Provide fuses in all fusible devices.

B. Furnish and turn over to the Owner spare fuses as follows:
   1. Three fuses of each size, UL Class, and voltage rating fusible devices.

PART 2 - PRODUCTS

2.01

A. Fuses in devices through 600 amperes capacities shall be UL Class RK1, dual element, current limiting, equal to Bussman #LPN-RKXSP or Bussman #LPS-RKXSP unless noted otherwise on drawings.

B. Fuses in devices 601 amperes and larger shall be UL Class L, time-delay, current limiting, equal to Bussman # KRP-CXSP.

C. All fuses shall be voltage rated for the system in which they are to be installed.

D. Manufacturers: Bussman; Gould Shawmut; Reliance Electric. For equivalence use Bussman ALow-Peak@ as RK-1, Fusetron as RK5, Hi-Cap as L.

E. Fuses must have a minimum 2:1 ratio for selective coordination.

2.02 SPECIAL FUSES

A. Fuses in control circuits and other special applications shall be of type and size for duty required for the specific application.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install correctly sized fuses in all fusible devices.

3.02 FUSE STORAGE

A. Furnish a galvanized sheet metal cabinet with hinged door and latch to contain spare fuses. To the back side of the door attach a typewritten list of spare fuses itemized to show quantity, amperage, class and catalogue order number.

3.03 LABELS

A. The engraved name plate on any device with fuses installed in it shall list the size and type of fuses, and manufacturer.

3.04 SPARES

A. For each size fuse on the project, provide three (3) spare fuses.

END OF SECTION 26 28 13

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This Section provides for connection to all power consuming equipment.

1.2 REQUIRED CONNECTIONS:

A. Provide breakers, wiring and connections for proper operation of the air conditioning, heating, plumbing, and miscellaneous equipment, and apparatus as described below and as indicated on the Drawings.

1.3 EQUIPMENT LOCATIONS:

A. Locations of motors, equipment and apparatus as indicated on the Drawings are approximate; connections shall be made to such equipment as actually installed. Coordinate with other divisions.

1.4 RELATED DOCUMENTS:

A. Work in this Section consists of the installation of individually mounted, fused and unfused circuit and motor disconnects and is part of each Division 26 Section.

1.5 SCOPE OF WORK:

A. Install disconnects of the type and size denoted on Drawings in locations indicated on Drawings.

B. Provide disconnects at all equipment required by applicable codes to have a disconnecting means even if disconnect is not shown on the drawings.

C. Types of disconnects in this Section includes the following:
1. Equipment Disconnects
2. Appliance Disconnects
3. Motor-Circuit Disconnects

D. Disconnect/motor starter combinations and disconnects for all Division 23 equipment are specified in Division 23.

PART 2 - PRODUCTS

2.1 ITEMS FURNISHED UNDER OTHER DIVISIONS:

A. See Division 23 for mechanical equipment and controls furnished under that Division of the work and descriptions of the control functions.

2.2 ITEMS FURNISHED UNDER DIVISION 26:

A. See other Sections of Division 26 for wire, safety switches, raceways, boxes, etc., for use performing work required in this Section.

2.3 ENCLOSURE:

A. Enclosure shall be surface mounted type, unless indicated otherwise.

B. Type of enclosures indicated on Drawing refer to NEMA type enclosures used in this Section and defined in NEMA Standards Pub. No. 250.

C. Enclosures shall generally be NEMA Type 1 in dry locations and NEMA Type 3R where exposed to rain or sprays, unless indicated otherwise.

D. Disconnect enclosures installed in hazardous locations or corrosive atmosphere shall be U.L. listed for each specific application.

2.4 FUSIBLE DISCONNECTS:

A. Fusible disconnects shall be heavy duty type, horsepower rated, 600 volt, with ampere rating indicated on Drawings or matches the circuit overcurrent amperage. Fuse holders shall be designed to receive type "R" dual element fuses.

2.5 UNFUSED DISCONNECTS:

A. Unfused disconnects shall be heavy duty type, horsepower rated, 600 volt, with ampere rating indicated on Drawings or matches the circuit overcurrent amperage.

B. Unfused disconnects for motor loads 2 HP or smaller or non-motor loads connected to a 20 ampere or smaller circuit may be toggle-type switches or non-automatic circuit breakers, when U.L. listed for each specific type load.

2.6 DISCONNECTS FOR FRACTIONAL HORSEPOWER MOTORS:

A. All disconnect switches labeled as 20A/1P and disconnect switches for 208 volt or 120 volt motors, 2 HP or smaller in size shall be equal to Square D type "K" manual switches, with toggle handle.

B. Type "K" manual switches shall be mounted in oversize metal housing with handle guard/lock off guard. On and off shall be permanently and clearly marked on the housing with engraved nameplates.

C. Provide a green pilot light on the disconnect switch that will be on when the switch is on.

2.7 ELEVATOR ENCLOSED CIRCUIT BREAKERS

A. The enclosed circuit breakers that feed the elevator motors shall be the shunt trip type and shall have a NO and a NC spare contact for use by the elevator controls. The shunt trip function shall be controlled by heat detectors in elevator shafts and elevator machine room so that the elevators will be stopped before any sprinkler head in the shaft or machine room releases water.

PART 3 - EXECUTION

3.1 POWER WIRING:

A. Provide power wiring to all equipment requiring electrical power including, but not restricted to, air conditioning and heating equipment, water heaters, pumps, etc. Power wiring is defined as all wiring in the electrical circuit between the source of power and the current consuming device (motor, heater, etc.).
   1. It includes the installation of control devices as required in the power circuit; firestats, thermostats, and interlock contacts controlling loads for which no magnetic starter or contactor is provided.

3.2 WIRE SIZES:

A. If a wire size is not shown on the floor plans, install wiring in that circuit that has an equal or greater ampacity than the overcurrent device protecting that circuit.

3.3 INSTALLATION:

A. Disconnects shall be installed, where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation" and in accordance with recognized industry practice.

B. Combination disconnects/motor starter furnished under other Divisions of these Specifications shall be installed under Division 26.

C. Anchor all disconnects firmly in place. Refer to Section: HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS for specific requirements.

D. All disconnects shall be properly identifies. Refer to Section: IDENTIFICATION FOR ELECTRICAL SYSTEMS for specific requirements.

3.4 LOCATION:

A. Coordinate exact location of disconnects with location of equipment being switched or protected.

B. When used for disconnecting means, disconnects shall be located as near as practicable to the load controlled.

C. Disconnects provided integral with equipment may serve as disconnecting means where allowed by Code, unless indicated otherwise.

D. Disconnects used with motor-driven appliances, or motors and controllers shall be located within sight of controller, unless indicated otherwise.

3.5 FUSIBLE DISCONNECTS:

A. Fusible disconnects shall be mounted in a "readily accessible" location when required by code.

B. Fuses shall be installed in all fusible disconnects; size as indicated on Drawings, when indicated, and coordinated with equipment manufacturer when no indicated. Refer to Section: FUSES for specific requirements.

3.6 DISCONNECTS:

A. Disconnects shall be installed in an "accessible" location.

3.7 MOUNTING:

A. In no case shall a disconnect be mounted on a piece of equipment unless the disconnect comes integral to the equipment.

END OF SECTION 26 28 16

SECTION 263543

GROUND POWER UNITS (400Hz)

PART 1-GENERAL

1.01 DESCRIPTION

A. Solid State Frequency Converters: 60Hz to 400Hz AC. Converters shall be designed to be mounted on the underside of Passenger Boarding Bridge (PBB) cab, and kVA sized per Drawings.

1.02 APPLICABLE CODES AND STANDARDS

A. The Ground Power Unit (GPU) manufacturer shall comply with the following norms and standards. Include UL-label and Certificate of Conformity.

MIL-704F	Aircraft electric power characteristics.
DFS 400	Specification for 400Hz aircraft power supply.
ISO 6858	Aircraft ground support electrical supplies.
EN 61000-6-4	Electromagnetic compatibility, Generic mission standard.
EN 61000-6-2	Electromagnetic compatibility, Generic immunity standard.
SAE ARP 5015	Ground equipment – 400Hz ground power performance requirement.
ISO-6858	Aircraft ground support electrical supplies.
NFPA 70	National Electrical Code.
UL-1012	Underwriter's Laboratory.

1.03 SUBMITTALS

A. The Following Submittals shall be required:

1. Manufacturer's Data.
2. Connection Diagrams and Outline Drawings.
3. Interconnection Schematics and Diagrams.
4. Recommended Spare Parts List.
5. List of required Special Tools.
6. Operational and Maintenance Manuals.
7. Test Reports.

PART 2 - PRODUCTS

Provide frequency converter consisting of modular construction solid-state components for 60Hz to 400Hz input/output devices and ancillary control devices. The frequency converter shall be the manufacturer's latest design that complies with the specification. Only PWM designs are acceptable; units designed with switching devices using Isolated Gate Bi-polar Transistors (IGBT) technology shall be used. No step conversion or Bi-polar transistor units shall be considered.

2.01 DESIGN REQUIREMENTS

A. The solid state frequency converter shall be complete with components and accessories coordinated so that the complete unit shall function as specified, and shall be capable of continually running under full load conditions in accordance with the specification.

2.02 MANUFACTURER

A. JBT Aerotech - Jet Power

2.03 PERFORMANCE

A. SUPPLY INPUT POWER

1. INPUT VOLTAGE: 460 VAC ±15%, 3 PH, 60HZ ±10Hz.
2. Indication and protection for incorrect phase rotation.
3. INRUSH CURRENT: Shall not exceed 100% of rated full load current.
4. LINE CURRENT DISTORTION: Shall not exceed 10% free mains voltage.
5. POWER FACTOR: From 50% to 100% rated load input, power factor shall be not less than 0.95.
6. POWER INTERRUPTION: Frequency Converter shall be designed to withstand a 20 msec power interruption without shutting the system down or affecting the output voltage.

B. ENVIRONMENTAL

All equipment provided must be capable of operating in the installed environment. The equipment shall be capable of operating in the following conditions without adverse effects:

1. Temperature: -10°C -40°C
2. Humidity : 0% to 100%
3. Precipitation: Rain, dust and wind combined
4. General: Glycol/Skydrol hydrocarbons from jet fumes

C. GPU CONSTRUCTION REQUIREMENTS

The GPU cubicle shall consist of a painted welded steel frame, providing support for the components / modules. The covers / doors shall be painted steel plates. Access to transformers / fans shall be via bolted covers. Access to zones containing electronic components shall be via hinged doors. Zones containing electronic components shall be completely sealed from the environment and from the forced cooled zones. Surface treatment shall be suitable for outdoor marine environment to ensure maximum surface protection.

D. WIRING

Power cables shall be high temperature (125°C) and halogen free. Termination shall be with compression type cable lugs / bolts and secured with leaf springs. The minimum size of cables used within the unit shall be 1 mm with the exception of PCB and ribbon cables. Control terminals and small power terminals shall be of the clamp type capable of taking up to 4 mm flexible core. All cables shall be clearly marked near termination points at both ends, using an indelible method (e.g., slip-on type markers). Wrap-around adhesive markers shall not be accepted. The marking/numbering shall correspond with schematics / diagrams.

E. COMPONENTS

Standard components used in the GPU (breakers, terminals, etc.) shall be of well-known manufacture and high standard / quality.

F. DISPLAY

The display shall be alphanumeric and able to provide information at different levels. The levels shall be as follows:

1. Status of the converter, e.g., input voltage, output voltage, output current, and output frequency
2. Detailed alarm description in case of a fault and alarm historic.
3. The power consumption during operations
4. View and adjust parameters. Minimum setup parameters are output voltage, voltage compensation, time, interlock by-pass and fan test.

G. INDICATION

The unit shall be equipped with the following LED lamps and push-buttons:

1. Input Power Available
2. 400HZ ON
3. START/RESET
4. STOP
5. Emergency Stop Button, Mushroom Type, Turn to Release
6. Lamp Test

H. INPUT/OUTPUT CABLE TERMINATION

This Section shall suit the entrance of both output and input cables. It must be large enough to provide easy access to terminate the power and control cables. Min. distance from 400Hz power cable entrance to terminals must be 400 mm. Min. distance from 60Hz mains cable entrance to terminals must be 400 mm. The input cable shall be connected to an input isolator inside the 400Hz converter.

I. 12-PULSE RECTIFICATION ON INPUT

To ensure low voltage distortion on the mains supply, the unit shall have, as standard, 12-pulse rectification. The input current harmonic distortion shall not exceed 10% when the converter is operating at full rated load.

J. INDIVIDUAL PHASE REGULATION ON OUTPUT

The GPU shall be designed with individual phase regulation to ensure balanced voltage at the aircraft plug.

K. DATA LOGGING

The GPU shall be equipped with a Self-Diagnostic system, where it is possible to log up to 50 errors.

L. DATA COMMUNICATION

The GPU shall be fitted with RS485 data communication port. The GPU shall have the ability to communicate via Ethernet and transmit data (including GPU status and operational/metering information) to a building management system. The unit shall have the ability to communicate directly with the passenger boarding bridge control system. Coordinate communication requirements with the passenger boarding bridge manufacturer. It shall be possible to set up the protocol type and JBUS address number of the unit via the display / keyboard interface.

M. FANS

The GPU shall be equipped with fans controlled by the temperature of the modules in the electronic zone. This allows the fans to run only when the “factory set” pre-determined temperature level is exceeded, thus reducing noise level and giving the fans an extended life time. During service or maintenance, the fan temperature control may be by-passed, to perform functionality test. Furthermore, it is a strict requirement that the fans are easily accessible and changeable for service and maintenance.

N. NBPT CAPABILITY

The GPU must have an active synchronization system to meet the demands of No Break Power Transfer, which a requirement for modern-day aircraft. The system shall be capable of synchronizing with phase displacement of up to 70°.

O. INTERLOCK SYSTEM

1. The GPU shall have an aircraft interlock system, which may be by-passed via the keyboard interface. When the plug is plugged into the aircraft, it must automatically return/default to normal mode.
2. See SECTION 347713 – PASSENGER BOARDING BRIDGES AND FIXED WALKWAYS for control wiring to interlock GPU with PBB for non-simultaneous operation. Provide interlock feature compatible with PBB.

P. ACTIVE HARMONIC ELIMINATION AT OUTPUT

To eliminate the harmonic distortion at the output, the GPU shall have an active regulation system to ensure that harmonic distortion is reduced to a minimum, thus ensuring good voltage quality (DF=2%). This is a requirement due to increasing non-linear loads in modern aircraft (e.g., the A380) (ref. ISO 1549).

Q. OPERATING EFFICIENCY

Overall Efficiency: Higher than 0.93 at 30-100% load for the full range of anticipated aircraft power factors, i.e., 0.8 – Unity with 12-pulse rectifier.

- Stand-by Losses: Less than 50 W
- No Load Losses: Less than 2000 W

R. SAFETY/FAULT REPORTING FEATURES

Each GPU shall have the following safety/fault reporting features incorporated as a minimum

1. Synchronizing at No Break Power Transfer
2. Input over- and under-voltage
3. Input overload
4. Internal high temperature
5. Internal voltage error
6. Output over- and under-voltage (according to MIL STD 704F)
7. Overload at output
8. Short circuit at output
9. Generative loads
10. Aircraft interlock

S. TESTING AND COMMISSIONING

T. FACTORY TESTS

Each functional assembly shall be inspected and tested at the factory prior to shipment for incorporation into the PBB. The client or his representative shall have the right to witness these tests, for which purpose a 30 days notification shall be given prior to test being carried out. Complete test reports shall be submitted. Test procedures shall be submitted by the contractor at least 30 days prior to the scheduled tests for review by the Owner. To ensure that the GPU complies with the technical specification, the supplier must have following factory test procedure:

1. The ground power unit supplier shall have a standard testing procedure
2. All ground power units shall be factory tested
3. Each test report shall be approved and signed by the test engineer
4. The testing instruments must be calibrated
5. As a minimum, the following features must be tested:
6. Output voltage regulation output
7. Frequency regulation heat/load test at full load
8. Overload capabilities
9. Test of safety features, e.g., interlock

A copy of the completed test reports shall be submitted to the client/his representative.

PART 3 - EXECUTION

3.01 FIELD TESTS

A. The contractor shall provide a load bank for the purpose of testing and simulating aircraft usage for each of the GPU's. The load bank shall be capable of providing a 72kW load. Schedules shall be submitted to the client/his representative 14 days in

advance of testing for comment. These should identify the proposed testing regime. The client shall be advised 30 days before any testing commences on site. The client or his representative shall be given the option to be present at the on-site tests. Completed test reports shall be submitted within 10 days of completion of the actual tests. Test reports shall contain suitable data reduction and calculation to verify the goals of the test plan and the system capacity.

3.02 WARRANTY

A. The manufacturer shall provide a 12-month warranty for all component parts and labor of the GPU. The Warranty shall commence from the accepted commissioning of the solid state converter.

END OF SECTION 263543

SECTION 263544

AIRCRAFT GROUND POWER CABLE 400 Hz AND HOIST

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to Work of this Section.

1.02 DESCRIPTION OF WORK

A. The Contractor shall furnish and install ground power cables as indicated in the Contract Documents.

B. Electrical wiring, including power, controls, and data are specified in Division 16, Section 16120.

1.03 REFERENCE STANDARDS

A. National Electrical Code - NFPA 70.

1.04 SUBMITTALS

A. Submit catalog cut sheets of product data in accordance with Section 01300 of these Specifications. Catalog cut sheets shall include specifications, installation instructions, and general requirements for type of cable required.

PART 2- PRODUCTS

2.01 CABLE MANUFACTURER

A. J&B., Basis of Design

B. INET

C. Burton Electrical Engineering

D. Ameribridge

E. Or approved equal.

2.02 400 HERTZ CABLE WITH AIRCRAFT POWER PLUG

A. Cables shall be banded type, 60 feet in length, suitable for nominal 115/200 Volt, 3-Phase, 4-Wire, 400 Hertz power. Cables shall be marked as required in Article 400-6 in compliance with the requirements of Article 300-11 which requires maximum rated voltage for which the conductor was listed, type of rating on insulation, the manufacturer's name, trademark, or other distinctive marking by which the organization responsible for the product can be readily identified, and the AWG size or circular-mil area. The conductors shall be color coded to meet the requirements of Articles 400-22 and 400-23 of the NEC. Components shall be as follows: Power Conductors: 3-#1/0 AWG Class M stranding, Neutral Conductor: 1-#1/0 AWG Class M stranding, Control Conductors: E and F interlock wires and control wires configured in a symmetrical layout to minimize inductive losses. Voltage Rating: 600 VAC Ampacity: 260 amperes Frequency: 400 Hertz Voltage Drop: 2.99 Volts Measured at 90 KVA, 0.8 power factor on

60' cable Voltage Unbalance: 0.20 Volts Measured at 90 KVA, 0.8 power factor on 60' cable. Plug Section 1. Shall have a high visibility replacement contact section (nose) which allows for infield replacement in 3-5 minutes. 3. Molded tapered strain relief release at connector back. This release is required to accommodate the whipsaw action commonly used shall have a high visibility replacement contact section (nose) which when inserting and removing connectors from aircraft.

B. Plug Section 1. Allows for infield replacement in 3-5 minutes. 2. Molded tapered strain relief release at connector back. This release is required to accommodate the whipsaw action commonly used when inserting and removing connectors from aircraft.

C. Aircraft cable assembly shall be ETL-listed and labeled.

2.03 CABLE HOIST

A. Electronically operated 400 Hz Cable Hoists:

1. Operate from the Passenger Boarding Bridge 60A power supply.
2. Enclosure shall be steel and weatherproof.
3. Mounted to the apron-drive passenger boarding bridge.
4. Of sufficient size to handle the length and size of the aircraft output cables provided.

B. The cable hoist shall have over-retraction and over-extension limit switches which turn motor off and apply the brake. Shall have auxiliary Up/Down pushbuttons to raise and lower cables located in the frequency converter remote control panel. Provide all wiring associated with cable hoist operation.

C. For 90kVA units provide one cable hoist for 400-Hz cable. For 180kVA units provide dual cable hoists for 400-Hz cables.

PART 3- EXECUTION

3.01 INSTALLATION

A. Contractor shall install cable according to Manufacturer's instructions.

B. Installation shall be coordinated to prevent the cable from lying on the ramp after installation susceptible to damage by construction traffic.

C. Coordinate necessary mounting brackets for under bridge mounting with PBB manufacturer.

D. Apply reflective tape to all units installed under PBB.

3.02 TESTING

A. Prior to energizing, test conductors of cable for electrical continuity and for short circuits.

B. Cables shall be energized prior to final acceptance to demonstrate proper functioning. Contractor shall replace defective cables, correct wiring errors and retest to demonstrate compliance.

END OF SECTION 263544

SECTION 26 41 13

LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.1 LIGHTNING PROTECTION SYSTEM:

A. The contractor shall furnish and install a complete lightning protection system as specified herein and is not shown on the plans. The equipment shall be equal to the equipment of the Thompson Lightning Protection, Inc., St. Louis Lightning Protection Company, or National Lightning Protection Company.

B. The installation shall conform to the latest edition of NFPA No. 780 entitled Lightning Protection Code, and the U.S. Department of Commerce, National Bureau of Standards, Code for Protection Against Lightning and UL Standard UL 96A. The lightning protection system shall be designed by experienced and certified designers.

C. The installation shall be performed by qualified workmen well versed in the installation of lightning protection system. The installation is of the concealed type and must be installed during, but no delaying, normal building construction.

D. Bonding of reinforcing steel and other structural metals within= 6' of main and/or down conductors to be in accordance with Code. Special attention is called to the bonding of copper conductors to the aluminum architectural and structural items. Special fittings shall be used for this application. Fittings of the set screw type will not be approved.

E. Furnish material, connections, etc., required to meet other paragraphs of this specification section. Conductors and points on the roof shall be compatible with the roof materials. Down conductors shall be copper in completely concealed conduit, that is run in the building structure. No material in contact with earth may be aluminum.

F. The lightning protection system installing sub-contractor shall be UL listed as a lightning protection system installer.

G. Shop drawings of the lightning protection system shall be submitted for approval. Shop drawings shall show all points, all conductors, sizes, routing, details of down conductors, fastening methods, ground rod details and all bonding points.

H. All ground rods shall be connected by an exothermic process.

I. All down conductors shall be run concealed inside the building walls in PVC conduit. The shop drawings shall indicate where and how the down conductors are run.

J. After all construction is finished the contractor shall have the lightning protection system for the entire building, meaning the existing terminal building plus the new Gate F3A addition, recertified and provide a lightning protection system Master Label for the entire building.

PART 2 – PRODUCTS

NOT USED.

PART 3 – EXECUTION

3.1 SHOP DRAWINGS

A. The shop drawing shall show the exact location of every point and connection. The location of every point on the roof and all cable routing locations must be approved by the architect during the shop drawing phase.

3.2 MASTER LABEL

A. After the lightning protection system is installed the UL listed lightning protection system installer shall submit the Master Label certification application and provide the Master Label to the building owner after the lightning protection system passes the UL inspection.

END OF SECTION 26 41 13

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 GENERAL

1.01 DESCRIPTION

A. This section covers all lighting fixtures that are specified in the Light Fixture Schedule on drawing E001.

1.02 WHERE REQUIRED

A. Fixtures shall be installed as indicated by symbol, letter notation and special notes on the drawings. Letter notations correspond to lighting fixture schedule on the drawings.

1.03 EXACT LOCATIONS

A. Exact locations of lighting fixtures shall be as indicated on the architectural reflected ceiling plans. Where variance exists between the electrical and architectural plans, the architectural plans shall be followed.

1.04 SUPPORT

A. Attention is called to NEC 410-16 requiring fixtures supported by the ceiling system to be securely fastened thereto.

PART 2 PRODUCTS

2.01 SUSPENDED FIXTURES

A. All suspended fixtures shall have rigid stem pendants and swivel aligners unless specified as being chain hung in non-public areas. Single fluorescent fixtures shall have twin-stem hangers; row fixtures shall have single stem hangers at 4' to 8' spacing.

2.02 RECESSED FIXTURES

A. Recessed fixtures shall have trim and support designed for the type of ceiling in which they will be installed. Attention is invited to the architectural ceiling finish schedules. The Lighting Fixture Schedule does not indicate the type of ceiling in which a fixture will be installed.

B. Recessed fluorescent fixtures in exposed tee lift-out ceilings shall be standard lay-in troffers.

2.03 BALLASTS

A. All ballasts for fluorescent fixtures shall be electronic type.

B. Ballasts for two 32 watt lamps shall have a ballast factor of 0.82.

PART 3 EXECUTION

3.01 WIRING

A. All fixtures shall be completely wired.

3.02 SUPPORT

A. The ceiling support system shall be used to support recessed lighting fixtures and each recessed light fixture shall have a minimum of four (4) #12 AWG galvanized safety wires at each corner extended from the light fixture to building structure. The ceiling shall not be used to support surface or pendant mounted fixtures. Supplemental steel shall be provided to support surface and pendant fixtures.

B. Provide additional blocking or galvanized supplemental steel for the support of all light fixtures mounted on vertical surfaces of the building.

C. For surface mounted light fixtures, provide a 12 AWG galvanized hanger wire at each end and attached to deck.

D. For down light, and exit lights attached to ceiling, provide a heavy duty bracket which attaches to the ceiling grid and a #12 AWG galvanized hanger wire attached to the fixture and to the deck.

3.03 ALIGNMENT

A. Stem connections to outlet boxes shall be made with swivel aligner box covers. Stems and rods not connected into a raceway system shall be supported with non-rigid connection points which will allow the stem or rod to hang vertically.

3.04 VOLTAGE

A. See drawings for voltage requirements of each lighting fixture.

3.05 FIXTURE DESIGNATIONS

A. The light fixture model numbers listed on the drawings may not provide all items necessary for a complete installation. Contractor shall provide all items necessary or as verbally described to make the installation complete and correct.

3.06 CEILING TYPE

A. This contractor shall examine the architectural reflected ceiling plans and schedules to what type ceiling each light fixture is installed so as to be able to order the correct light fixture. Provide any necessary plaster frames or flanged light fixtures when a recessed light fixture is mounted in a gypboard ceiling.

3.07 EMERGENCY FIXTURES

A. Every light fixture on the emergency system shall have an integral fast blow fuse in each phase conductor.

3.08 VOLTAGE

A. The voltage requirements of each light fixture shall be determined by looking at how the fixture is

circuited on the floor plans.

3.09 MOUNTING LOCATIONS

A. Where the location of a light fixture occurs under ductwork, contractor shall span under this ductwork with steel strut supported by all thread rod from the structure above and support the light fixture from this steel strut.

END OF SECTION 26 51 00

SECTION 26 77 77

DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the Instructions to Bidders, General Conditions, Supplementary General Conditions, and Division-01 Specification sections, apply to work of this section.

1.2 WORK DESCRIPTION

A. This section of the specifications describes requirements pertaining to electrical demolition work in areas set forth in by the Architectural drawings.

B. Visit job site and review the existing conditions prior to submitting bid.

C. The drawings show the final layout to be achieved; the Contractor shall relocate or remove any electrical devices as required to achieve final layout.

D. De-energize all electrical wiring that terminates in the area to be demolished. Remove all wiring (conduits and conductors), lighting fixtures, outlets, and any other electrical devices in the area to be demolished except as defined elsewhere in this specification or on drawings (such as bus duct, cable tray, circuiting that passes through the demolition area, etc.).

E. Wiring entering and leaving the area serving equipment not in the area to be demolished shall remain in service. Wiring that connects equipment in the demolition area with equipment not in the demolition area shall be reconnected to keep equipment not in the demolition area in service.

F. Wiring in floor slab that extends above finished floor shall be cut off flush with floor and conductors removed.

G. Any wiring removed or disturbed that serves equipment that is to remain in service shall be replaced.

H. Motor control equipment and any other electrical equipment so noted undamaged, shall become property of the Owner and shall be stored in a location at the direction of the Owner. Any equipment the Owner elects not to keep shall become the Contractor's property and removed from the site by this Contractor.

I. If there is any question about whether or not a particular piece of equipment shall remain in service, request a yes or no answer in writing from the HJAIA project manager.

J. If work in this contract requires turning off power to any equipment that serves any area that is outside the construction area, the contractor shall coordinate the

turning off power with the HJAIA project manager. The contractor shall obtain from the HJAIA project manager in writing, the time period when this power is allowed to be turned off. The contractor shall clearly and completely inform the HJAIA project manager all of the consequences of turning off this power.

K. If circuiting feeds equipment in the area of demolition and then feeds other equipment outside the area of demolition, the contractor shall disconnect the circuiting to the equipment in the area of demolition and then extend the circuiting to the equipment outside the area of demolition that is to remain in service.

L. If circuiting (signal, data, wiring and conduit, or power), cable trays, or bus ducts pass through a demolition area, they shall be maintained in service and be extremely well protected. As a minimum, bus ducts and cable trays shall be protected by four inch, by four inch wood frames, with three quarter inch plywood, dust tight enclosures that extend at least ten feet beyond the area of demolition.

1.3 PHASING OF WORK

A. Work shall be done as indicated on the Architectural drawings and specifications. Coordinate with other trades and keep required areas in service and perform new work in areas per architectural drawings and specifications.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 BALLAST DISPOSAL

A. Contractor must dispose of all ballasts removed on this project. Ballasts labeled "No PCB" may be disposed of at approved landfill (See Article F-09). All other ballasts shall be disposed of in accordance with the provisions of this Section.

3.2 PROCEDURES

A. **THE FOLLOWING PLAN OF ACTION MUST BE SUBMITTED PRIOR TO THE BEGINNING WORK:**

1) Work plan for ballast removal _____

2) Scheduling/sequencing of work _____

3) Interface of other trades in work schedule _____

4) Methods used to ensure safety _____

5) Disposal of waste, location of site, and permit from Owner and regulatory authority _____

B. To be submitted during work: Items below are to be submitted to the Owner as work progresses:

1) Notification of EPA if leaking ballasts are to be accumulated _____

2) Notification of local jurisdiction if leaking ballasts are accumulated _____

3) Laboratory Qualification Information (to be submitted before any sampling) _____

a) Name and location of firm _____

b) Proof of current accreditation of firm by AIHA _____

4) Results of wipe and/or air sampling _____

5) Transporting and disposing of PCB Containing Materials:

a) Hazardous waste manifests _____

b) Drum labelled with: PCB container serial _____

initial date container filled _____

name of company person filling container _____

container description _____

c) Itemized list of containers with manifest(s) prior to site removal _____

d) Shipping manifest forms _____

e) Disposal receipts _____

f) Certificates of Destruction _____

g) Certificates of Recycling _____

3.3 MINIMUM QUALIFICATIONS REQUIREMENTS

A. Contractor Qualification

The Contractor shall be a firm of established reputation (or if newly organized,

whose personnel have a previously established a reputation in the same field), which is regularly engaged in, and which maintains a regular force of workmen skilled in PCB removal, and shall have performed this work on previous projects.

Contractors/subcontractors performing PCB disposal work are required to submit a copy of their current PCB disposal certification/license.

3.4 REMOVAL AND DISPOSAL OF FLUORESCENT LIGHT BALLASTS

A. Fluorescent light ballasts manufactured after 1978, have been labelled "No PCB's" by the manufacturers. Prior to 1978, fluorescent light ballasts were not labelled as to whether they contained PCB, therefore all unlabeled capacitors and ballasts are assumed contain PCB. In older buildings where some ballasts have been replaced due to renovation or attrition, it is not possible to determine the percentage of replacement. Therefore, all ballasts not labeled "NO PCB's" will be considered to contain PCB and be removed and disposed of as such. The following procedures have been developed to assure proper disposal of fluorescent light ballasts. Larger quantities of, or damaged leaking light ballasts are to be disposed of as PCB waste using the procedures listed below.

3.5 SAFETY AND HEALTH

A. APPLICABLE PUBLICATIONS:

1. The publication listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

2. Code of Federal Regulations (CFR).

B. OSHA General Industry Safety and Health Standards (29 CFR 1910), Publication V2206; OSHA Construction Industry Standards (29 CFR 1926). One source of these regulations is OSHA Publication 2207, which includes a combination of both Parts 1910 and 1926 as they relate to construction safety and health. It is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

1. National Emission Standards for Hazardous Air Pollutants (40 CFR, Part 61).
2. Environmental Protection Agency (EPA) Final Rule (40 CFR Part 761) dated July 17, 1985.

C. DEFINITION OF HAZARDOUS MATERIALS:

1. Refer to hazardous and toxic materials/substances included in Subparts H and Z of 29 CFR 1910; and others as additionally defined in Fed. Std. 313. Those most commonly encountered include asbestos, polychlorinated biphenyls (PBC'c), explosives, and radioactive material, but may include others. The most likely products to contain PCB's are transformers, capacitors, voltage regulators, ballasts, and oil switches.

D. QUALITY ASSURANCE:

1. Safety Meeting: Representatives of the Contractor shall meet with the Construction Inspector prior to the start of work under this contract for the purpose of reviewing the Contractor's safety and health programs and discussing implementation of all safety and health provisions pertinent to the work to be performed under the contract. The Contractor shall be prepared to discuss, in detail, the measures he/she intends to take in order to control any unsafe or unhealthy conditions associated with the work to be performed under the contract. The level of detail for the safety meeting is dependent upon the nature of the work and the potential inherent hazards. The Contractor's principal on-site representative(s), the general superintendent and his/her safety representative(s) shall attend this meeting.

2. Compliance with Regulations: All work including contact with and handling of hazardous materials, the disturbance or dismantling of structures containing hazardous materials and/or the disposal of hazardous materials shall comply with the applicable requirements of 29 CFR 1926/1910 and 40 CFR 761.

3. Contractor Responsibility The Contractor shall assume full responsibility and liability for compliance with all applicable regulations pertaining to the health and safety of personnel during the execution of work, and shall hold the Owner harmless for any action on his/her part of that of his/her employees or subcontractors, which results in illness, injury or death.

E. SUBMITTALS:

1. Accident Reporting: A copy of each accident report, which the Contractor or subcontractors submit to their insurance carriers, shall be forwarded to the Owner Representative as soon as possible, but in no event later than seven (7) calendar days after the day the accident occurred.

2. Permits: If hazardous materials are disposed of off site, submit copies of permits from applicable, Federal, state, or municipal authorities and necessary certificates that the material has been disposed of as per regulations

F. MATERIALS AND EQUIPMENT:

1. Special facilities, devices, equipment, clothing, and similar items used by the Contractor in the execution of work shall comply with the applicable regulations.

G. PROTECTION:

1. The Contractor shall take all necessary precautions to prevent injury to the public, building occupant, or damage to property of others. For the purpose of this contract, the public or building occupants shall include all persons not employed by the Contractor or a subcontractor working

under his/her direction.

3.6 DESCRIPTION OF WORK

A. GENERAL:

This section includes all work necessary to remove and dispose of fluorescent light ballasts which contain polychlorinated biphenyl (PCB) in accordance with current environmental regulations.

1. Work Area: The work area is the actual area where ballasts are removed from light fixtures.

3.7 QUALITY ASSURANCE

A. Sampling for PCB: In the event that ballasts are discovered to be damaged, clean-up shall proceed as follows:

1. If contamination is restricted to the light fixtures, the entire fixture should be discarded as PCB contaminated.

2. If surfaces below the light fixtures are suspected to be contaminated, the Contractor is responsible for proper clean-up of the area.

3. Wipe samples shall be collected utilizing EPAs Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup. Samples are to be analyzed by a qualified laboratory accredited by the American Industrial Hygiene Association (AIHA) for organic materials analysis.

3.8 REFERENCES

A. Code of Federal Regulations (CFR):

29 CFR 1910, Occupational Safety and Health Act

29 CFR 1926, Occupational Safety and Health Act, Construction Industry.

40 CFR 761, U.S. Environmental Protection Agency Regulations for PCB.

29 CFR 1910.120: OSHA General Industry Hazardous Waste Operations Requirements.

B. Department of Transportation Regulations (DOT)

DOT 49 CFR Part 178

C. State and Local Regulations:

Applicable state and local regulations shall apply.

3.9 SUBMITTALS

A. The following shall be submitted to the Owner for approval prior to starting work.

1. Plan of Action: Submit a detailed plan of the procedures proposed for use in complying with the regulations included in this specification, the location and configuration of work area where ballasts will be removed, and the debris storage location which shall either be a designed restricted access area or an area isolated temporarily by use of plastic sheeting or other method so that any accidental contamination will not spread to unrestricted areas of the building. The plan shall also include the number of debris filled drums to be allowed on site, the sequencing of PCB removal work, the interface of trades involved in the performance of work, methods to be used to assure the safety of building occupants and visitors to the site, disposal plan including location of approved disposal site. Expand upon the packaging of removed PCB items. The plan must be approved by the Owner prior to commencement of work.

2. Contingency Plan: A contingency plan for response to suspected release of PCB's such as leaking ballasts, etc. should be prepared. This should include notification of the Owner, environmental testing, and clean up of any contamination resulting from Contractor activities. The contingency plan shall include environmental sampling performed by entities meeting the requirements specified elsewhere in this document.

B. During-Work PCB Submittals: The following are to be submitted to the Owner as work progresses at the time specified.

1. If leaking ballasts were accumulated, submit proof of notification of EPA and local jurisdiction if debris is to be stored for a period over 30 days.

2. PCB sampling:

In the event of a PCB release episode, the contractor shall be requested to submit:

a) Laboratory Qualification Information: Submit proof of qualifications of testing laboratory and personnel. Accreditation by the American Industrial Hygiene Association (AIHA) for organic materials analysis, shall be minimum proof of compliance. This submittal must be approved by the Owner prior to beginning any testing.

b) Submit results of any sampling conducted during the project.

C. TRANSPORTING AND DISPOSING OF PCB CONTAINING MATERIALS:

1. Recordkeeping: Recordkeeping of all Owner-generated PCB must be accurate, thorough and complete, since Owner remains ultimately responsible for their generated PCB until its final EPA approved distruction. To insure compliance with EPA regulations (40 CFR Part 761) and to take every precaution against improper/incomplete PCB

disposal, tracking records are required as follows:

a) Provide tracking documentation for each container of PCB and/or PCB-contaminated substance(s) by forwarding copies all manifests and continuation sheets (information of content of each PCB container) to the Owner.

b) Each drum shall be properly labelled prior to its leaving the PCB filling location with the following information:

1) A unique PCB container serial number as follows:

Each PCB drum, filled with PCB contaminated substances, will have a serial number that is a combination of the Building name; and the container serial number painted on the drum.

2) The initial date the PCB container was filled.

3) Contents of the PCB container. Liquids shall not be mixed with solids.

4) The name of the Company and person filling the container.

5) Description of container. (Example: contaminated rags, light fixtures, etc.). All communication relating to these containers must reference the container serial number(s).

c) Provide the Owner with an itemized list of all PCB containers along with copies of all PCB manifest(s) and continuation sheets prior to any PCB container being removed from the job site.

d) Shipping Manifest Forms: Signed and completed shipping manifest forms shall be used for the transportation of PCB (in accordance with 40 CFR Part 761). Each manifest is to be assigned a unique number. This form shall be signed by each party who has control over the PCB waste, and a copy retained by each party who has control over the PCB waste, and a copy retained by each party as responsibility for the waste is transferred to the next party. Provision of legible copies of manifests are to go to the Owner.

e) Certificates of Destruction: Provision of Certificates of Destruction to the Owner Respresentative, as well as a method to ensure that the disposal facility destroys the PCB material and provides a signed copy of the manifest within 30 days of receipt of material and a CD within one year of receipt of the material.

D. FINAL SUBMITTALS:

A Summary Report containing copies of any sampling results and all narrative reports performed as part of this contract is to be submitted to the Program with each pay request.

3.10 CONTRACTOR RESPONSIBILITY

The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local regulations pertaining to the protection of his workers, vistors to the site, and persons occupying areas adjacent to the site. The Contractor is responsible for providing medical examinations, maintaining medical records of personnel as required by the applicable Federal, State, and local regulations.

3.11 WORK SCHEDULE

A. General Procedures: Perform all PCB related work and comply with the general safety and health provisions in conformance with 29 CFR 1910, 29 CFR 1926, and 40 CFR, respectively. If a conflict arises, the more stringent application shall apply until a determination is made by the Owner.

3.12 PCB ITEM REMOVAL

The following is a basic outline of the minimum steps that will be taken during the removal of PCB containing items from buildings. The procedure, plan of action, submitted for approval by the Contractor should address these points.

A. The Owner shall verify count of PCB ballasts prior to placing in disposal drums.

B. Place a minimum of two layers of 6-mil plastic on the floor beneath the disposal drum, the actual work area, and beneath stored disposal drums.

C. Pour significant (minimum three inch layer) amount of oil absorbent in the DOT 17-H drum labelled as containing PCB.

D. Remove the light ballast from the light fixture and place the ballast in the drum. If it says "NO PCBs", throw it in a separate container.

E. If an unmarked ballast shows any sign of leaking, PCB resistant gloves shall be worn when handling the fixture.

F. Dispose of any light fixture which held a labelled leaking ballast as PCB contaminated material.

G. Alternately layer the ballasts and absorbent until the drum is full, carefully checking to assure that the layer will be absorbent.

H. Place all used disposable protective clothing, and plastic in drum.

I. Label the drum with the following minimum information:

1. Date of materials were placed in the drum.

2. Materials in the drum, i.e. "75 two-tube light ballasts."

3. Name, address and phone number of the generator, or owner of the light ballasts.

4. Container identification serial number.

J. The weight of each container is to be recorded (in Kilograms) and entered on the manifest.

K. Make arrangement, i.e. obtain EPA Generator Identification Number, make EPA notifications, fill out hazardous waste manifest, and dispose of the drum as PCB contaminated solid waste.

L. Transport the drum and any other PCB materials to a designated storage area and then transport to an EPA approved incineration.

M. Contractor may transport the drum and other PCB materials to an EPA approved ballast recycling facility which dismantles the ballast, segregates, and packages the PCB components of a ballast for incineration and then reclaims non-contaminated metals. All PCB materials are destroyed by incineration.

3.13 CLEANUP AND DISPOSAL

A. Permits and Notifications: Secure necessary permits in conjunction with PCB removal, hauling and disposition and provide timely notification of such actions, as may be required by federal, state, regional, and local authorities. Notify the Regional Office of the United States Environmental Protection Agency and provide copies of the notification to the Owner 10 days prior to the commencement of the work.

B. Housekeeping: Essential parts of PCB control are housekeeping and cleanup procedures. Maintain all surfaces in the work area free of accumulations of debris to prevent further dispersion. Give meticulous attention to restricting the spread of debris, keep waste from being distributed over the general area or to other areas in the building. The blowing down of the work area with compressed air is forbidden. Post appropriate hazard warning signs. In all possible instances workmen shall cleanup their own areas, Equip personnel engaged in cleaning up scrap and waste with necessary personal protective clothing.

C. Disposal of PCB Containing Materials: The methods of disposal of PCB containing materials are discussed in this specification elsewhere. Collect and dispose of all other PCB contaminated waste, rags scrap, debris, bags, containers, equipment, and PCB contaminated clothing in properly labeled PCB disposal drums. Waste PCB containing material shall be disposed in accordance with all Federal regulations at an incineration or ballast recycling facility. The Contractor will provide the Owner with a copy of all manifests and continuation sheets resulting from the disposal of the PCB containing waste. Establish a temporary holding area approved by the Owner for properly packaged PCB

waste.

END OF SECTION 26 77 77

SECTION 270100

GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Specification 270100 contains the General Requirements for Communications Systems applicable to all technical systems specifications listed in Paragraph 1. 3 of this specification in the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project.. This section shall apply to all referenced documents.

B. Drawings and general provisions of the Contract, including Contractual Conditions and Division 00 and Division 01 specifications sections apply to this section.

C. This Section provides telecommunications infrastructure that will be installed using a phased approach and schedule.

D. Contractor shall provide all labor, materials, tools, plant, transportation, storage costs, training, equipment, insurance, temporary protection, permits, inspections, taxes and all necessary and related items required to provide complete and operational systems shown and described in the Specifications.

E. The Contractor is responsible for providing and coordinating final equipment arrangements, locations, phased activities and construction methods that minimize disruption to Terminal operations and provide complete and operational systems.

F. The Contractor shall coordinate interfaces to existing systems that are being extended in the Project in order to minimize disruption to the existing systems operations. Any systems outages shall be approved in advance and scheduled with the Owner.

G. The Contractor shall coordinate specialty electronic, ACS, Information Technology (IT) data networks, common use and flight information systems and displays, CCTV, public address and any other IT infrastructure systems.

H. All Specifications listed in Paragraph 1.3 of this specification shall be used as functional performance-based specifications. The Contractor shall be responsible for completing and coordinating requirements necessary to design, furnish and install fully engineered and functional systems. These requirements include any site analysis, furthering of design documents, determination of quantities of equipment, verification of existing conditions and external service providers, and the like. It shall be the responsibility of the Contractor to provide any additional equipment, software, arrangements or infrastructure necessary to complete the system commissioning.

1.02 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

B. Specific reference in Specifications to codes, rules regulations, standards, manufacturer's instructions or requirements of regulatory agencies shall mean the latest printed edition of each in effect at date of Contract unless the Document is shown dated.

C. Comply with all local codes and requirements of Authorities Having Jurisdiction (AHJ).

D. Reference to General Conditions

1. The Owner's General Conditions shall be considered as forming an integral part of the Specification and shall be carefully examined before proposals for any work are submitted. Unless this section contains statements which are more definitive or more restrictive than those contained in the Owner's General Conditions, this Specification shall not be interpreted as waiving or overruling any requirements expressed in the General Conditions.

E. Publication References. Applicable portions of the following codes, standards, regulations and recommendations shall be observed in the design and implementation of the converged network system, equipment and associated technologies:

1. ANSI: American National Standards Institute including:

   a. ANSI-C2 (2007);
   b. ANSI/TIA/EIA-526-7 – Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant (Method A)
   c. ANSI/TIA/EIA-526-14A – Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant
   d. ANSI/TIA-568-C.0 Generic Telecommunications Cabling for Customer Premises
   e. ANSI/TIA-568-C.1 Commercial Building Telecommunications Cabling Standard
   f. ANSI/TIA-568-C.2 Balanced Twisted-Pair Telecommunication Cabling and Components Standard
   g. ANSI/TIA-568-C.3 Optical Fiber Cabling Components Standard
   h. ANSI/TIA/EIA-569-A
   i. ANSI/TIA/EIA-569-A-1 to A-7
   j. ANSI/TIA/EIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces
   k. ANSI/TIA/EIA-606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
   l. ANSI/TIA/EIA Joint Standard – 607-A Commercial Building Grounding and Bonding Requirements for Telecommunications
   m. ANSI/TIA/EIA-758-A – Customer-Owned Outside Plant Telecommunications Cabling Standard
   n. ANSI/TIA-758-1 – Addendum No. 1 to Customer-Owned Outside Plant Telecommunications Cabling Standard
   o. ANSI/TIA/EIA/IS-811 Telephone Terminal Equipment, Performance and Interoperability for VoIP Feature Telephones.
   p. ANSI/TIA/EIA-854 Full Duplex Ethernet Specification for 1000Mbps Operating Over Category 6 Balanced Twisted Pair Cabling
   q. ANSI/TIA/EIA-942 Data Center Standards

2. ASTM: American Society for Testing Materials
3. Building Industry Consulting Service International (BICSI).
4. CFR: Code of Federal Regulations; CFR 47 Part 15; Radio Frequency Devices
5. Federal Aviation Administration (FAA)
6. Federal Communications Commission (FCC) regulations and standards.
7. ICEA: Insulated Cable Engineers Association S-84-608-1994 Telecommunications Cable, Filled, Polyolefin Insulated Copper Conductor
8. IEC 603-7

a. NTPv2 (RFC 1119), NTPv3 (RFC 1305)
b. SNTP (RFC 1361), Time protocol (RFC 868)

9. Institute of Electrical & Electronics Engineers (IEEE).

a. 142-1991 Recommended Practice for Grounding of Industrial and Commercial Power Systems
b. 1100-1999 Recommended Practice for Powering and Grounding Sensitive Electronic Equipment in Industrial and Commercial Power Systems
c. C62.41 Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
d. 802.1 LAN/MAN Bridging and Management
e. 802.3 CSMA/CD Access Methods (Ethernet)
f. 802.3ae 10 Gigabit Specification
g. 802.3z 1000 Base-S specification
h. 802.3ab 1000 Base-T specification
i. 802.3af/at Power over Ethernet
j. 802.3u 100 Base-T specification
k. 802.1Q VLAN
l. 802.1P Prioritization
m. 802.11 a/b/g/n CSMA/CA Access Methods (Wireless LANs)

10. International Air Transport Association (IATA)

a. IATA PDF417 2D Bar Code – Latest Standards
b. IATA RP 740, 740a; BTP related resolutions.
c. IATA CUSS Standard RP 1706c.
d. IATA CUPPS – RP 1797 latest version.

11. International Telecommunications Union–Telecommunications (ITU-T)

a. ITU-T FG IPTV.

12. IEC 603-7
13. IETF: Internet Engineering Task Force

a. NTPv2 (RFC 1119), NTPv3 (RFC 1305)
b. SNTP (RFC 1361), Time protocol (RFC 868)

14. IBC: International Building Code 2006
15. ISO: International Organization for Standardization including:

a. International Standards Organization/International Electromechanical Commission (ISO/IEC) DIS11801, January 6, 1994;
b. ISO 9001; Quality Assurance in Design/Development, Production, Installations and Servicing;
c. ISO 9003; Quality Assurance in Final Inspection and Test;
d. ISO 9004; Quality Management and Quality System Elements Guidelines;
e. ISO/IEC JTC 1/SC 25/WG 3 N655 (Nov. 2001)
f. Class D ISO/IEC 11801, 2nd Ed., Information Technology – Generic Cabling for Customer;
g. Premises, 2002;

h. Class E ISO/IEC 11801, 2nd Ed., Information Technology – Generic Cabling for Customer Premises;
i. Class EA Amendment 1 to ISO/IEC 11801, 2nd Ed., Information Technology – Generic Cabling for Customer Premises, pending publication; Class F ISO/IEC 11801, 2nd Ed., Information Technology – Generic Cabling for Customer Premises, 2002;
j. Class FA Amendment 1 to ISO/IEC 11801, 2nd Ed.
k. ISO 9003 – Model for Quality Assurance in Final Inspection and Test
l. ISO 10012-1 – Quality Assurance Requirements for Measuring Equipment.
m. ISO 18000-6C EPC Gen2 UHF RFID Tags

16. Local/National Electrical codes.
17. Local/National Health & Safety codes.
18. Local/National radio frequency regulations.
19. Local and national regulations and codes in effect as of date of purchase.
20. Motorola R56, "Standards for Communications Sites".
21. NEC: National Electrical Code – Articles 770 and 800
22. NEMA: National Electrical Manufacturers Association (NEMA)
23. NFPA: National Fire Protection Association

    a. NFPA-70 (2008)
    b. NFPA-72 (2010)
    c. NFPA 101 (2009 ed.)
    d. NFPA 780 (2008)
    e. NFPA 5000 (2006 ed.)

24. NESC: National Electrical Safety Code
25. OSHA: Occupational Safety and Health Agency
26. UL: Underwriters Laboratories;

    a. UL 83 Thermoplastic Insulated Wire and Cables
    b. UL 96 Lightning Protection Components
    c. UL96A Installation Requirements for Lightning Protection Systems
    d. UL 467 Grounding and Bonding Equipment
    e. UL 497 Protectors for Paired-Conductor Communication Circuits

27. Wireless Communications Principles and Practice second edition, Theodore S. Rappaport.

F. Design and Install cabling in accordance with the most recent edition of Building Industry Consulting Services International (BICSI®) publications:

1. BICSI – Telecommunications Distribution Methods Manual (TDMM)
2. BICSI – Information Technology Systems Installation Methods Manual (ITSIMM)
3. BICSI – Network Design Reference Manual
4. BICSI – Outside Plant Design reference Manual
5. BICSI – Wireless Design Reference Manual
6. BICSI – Electronic Safety and Security Design Reference Manual

G. Conflicts: Where the requirements of the specifications conflict with other documents the following shall apply:

1. Between Plans and Specifications, between different specifications, or between different plans: Comply with the one establishing the more stringent requirement.
2. Between referenced requirements or between industry standards: Comply with the one establishing the more stringent requirements.
3. Between referenced requirements and Contract documents: Comply with the one establishing the more stringent requirements.

1.03 RELATED SECTIONS

A. Specification 270500 Common Work Results for Communications.

B. Specification 270526 Grounding and Bonding for Communications Systems.

C. Specification 270528 Pathways for Communications Systems.

D. Specification 270553 Identification for Communications Systems.

E. Specification 271500 Communications Horizontal Cabling.

F. Specification 273000 Voice Communications System.

G. Specification 274216 Multi-User Flight Information Display System.

H. Specification 275113 Public Address System.

I. Specification 275300 Distributed Antenna System

J. Specification 275416 Common Use Passenger Processing System.

K. Specification 280100 General Requirements for Security Systems.

L. Specification 281300 Access Control System.

M. Specification 282313 Video Surveillance System.

1.04 SCOPE OF WORK

A. General: See related section in each Specification listed under Paragraph 1.4.

1.05 QUALIFICATIONS

A. Project Qualifications

1. The Contractor must currently be and have been in the business of selling, installing, and maintaining similar systems at airports for a minimum of five (5) years. The Contractor must have been actively engaged in designing, installing, maintaining and operating similar systems and services as outlined in this document.
2. The Contractor must have a minimum of three (3) customer sites that are actively using the same or similar solutions, and each of those solutions must be currently in operation, and have been in operation for at least the preceding twelve (12) months.
3. The Contractor is required to submit information regarding a minimum of three (3) reference sites that are actively using the same or similar systems. The sites should be similar in terms of number of equipment, devices throughput, and network operations. This reference information shall include the contact name, address, telephone number, and date of original installation for each reference site listed. Additionally, for each reference site detail the features that make it a qualified site (e.g., final system acceptance date, number of devices, etc.).
4. General Certification: The Contractor shall be capable of installing, maintaining, and troubleshooting audio systems. The minimum requirement is one (1) project

dedicated staff holding a Certified Technology Specialist, Installation (CTS-I), or other equivalent ISO/IEC/ANSI certified audio credential.

5. Code Certification: The Contractor shall have a working knowledge of the systems specified herein.
6. The Contractor shall have a fully staffed service department capable of responding to system needs as specified. The minimum requirement is a fully staffed service department within 60 miles of the project site.

B. Organization Qualifications

1. The Contractor shall provide a complete description of organizations and/or firms involved including:

   a. Involvement of Sub-Contractors or product vendors
   b. The name of the Team Leader responsible for the project coordination, development and ongoing Implementation
   c. Detailed description of the team and organization chart noting its structure
   d. Résumés for key personnel.
   e. Specific role definition including provision for leadership, technical control, teamwork, partnering, coordination and communication
   f. Percentage of time committed for the project by each key personnel
   g. Mobilization plans for the different phases of the project
   h. Listing of all current projects where there is an overlap or potential for overlap of manpower resources. For these projects provide a detailed description of the role, committed level of effort, schedule and completion date for each key individual of the proposed team.

C. Unless accepted otherwise by the Engineer, use manufacturers and installers that employ a Quality Management System complying with the program described in ISO 9001-2000, or similar system.

1.06 SUBMITTALS

A. Proposal Submittals:

1. In addition to all required proposal submittals listed in the appropriate Division, the Contractor shall provide the following submittals:

   a. Design Approach: In designing the systems, it is desired to standardize hardware, operating systems, etc. in order to facilitate long-term maintenance of the systems. However, the Contractor may propose an alternative solution to any of the design requirements. These alternatives shall be clearly delineated and shall be bid as options, in addition to the base design. Preference shall be given to vendor solutions which best integrate into the overall system design.
   b. References: The Contractor is required to submit data sheets for same or similar implementations as specified in the "Qualifications" article of this specification.
   c. Qualifications: The Contractor shall supply qualification data sheets for firms and persons as specified in the "Qualifications" article of this specification to demonstrate their capabilities and experience.

B. Contract Submittals:

1. Work Plan and Schedule: The Contractor shall supply a schedule of proposed installation and implementation, including dates and milestones within 30 days of contract award. Updates shall be submitted monthly.
2. Proposed product data sheets: The Contractor shall submit catalogue cut-sheets that include manufacturer, trade name, listings, and complete model number for each product specified. Model number shall be handwritten and/or highlighted to indicate exact selection. Identify applicable specification section reference for each product. Product data sheets shall be bound in a three ring binder and shall include a product index listing the model number and description of product.
3. Shop Drawings: The Contractor shall submit floor plans scaled not smaller than 1/8"=1' and shall include a bar scale on the respective sheets. The shop drawing package shall include:

    a. Floor plans to scale
    b. Riser diagrams showing all panels, devices, interconnections with other systems, and interconnections between components.
    c. Input/Output matrix showing sequence of operation between actions.
    d. Battery calculations.
    e. Voltage calculations for speakers.

4. Other Drawings: The Contractor shall review other discipline drawings and confirm that all are acceptable. If unacceptable, it is the responsibility of the Contractor to submit written comments, including revised drawings markups (if required) to ensure the adequacy of all other work applicable to the Contractor's system.
5. System Block Diagram: The Contractor shall supply a block diagram that depicts the final system design, including riser diagrams, logical flow, and single line diagrams.
6. Configuration: Submit complete lists of all proposed configuration setups, business rules, process flows, and processes implemented in the system. Lists must be submitted weekly during the project and thirty (30) days prior to any formal testing.
7. Parts Lists: The Contractor shall supply complete Systems parts lists and breakdowns that identify each component (to the lowest repairable unit) as well as ordering information for these parts shall be provided. The characteristics of each component shall also be shown, where applicable, to aid in obtaining substitute parts. Schematics and parts layout drawings to the component level are to be provided when available. The Contractor shall supply a complete list and cross-reference of all supplied documents (i.e., name, brief description, and document number).
8. Test Plans, Test Procedures and Test Reports: Indicate testing methods, devices, and procedures. Progress payments shall depend on the successful completion of testing and documentation. Provide the test plan at least forty five (45) days prior to the scheduled start of the first test. The test plan shall detail the objectives of all tests and samples of all proposed test forms.
9. Test Results: The Contractor shall supply report of test results in accordance with test procedures specified herein.
10. Manufacturers' system manuals for each system/component provided under the referenced specification Section, including:

    a. Design and Installation.
    b. Operation/System Administration.
    c. Maintenance and Service.
    d. End-user.

11. Training Plan: Indicate proposed training methods as specified in the "Training" section of this specification.
12. Progress Schedule – The Contractor shall submit to Owner estimated construction progress schedules for the Work.
13. Compliance Matrix: The Contractor shall submit a compliance matrix that summarizes compliance or non-compliance with each specification component.

C. Supply all documents necessary to enable users to operate all systems and to change feature assignments and software parameters without assistance from the Contractor. This includes a complete listing of all software parameters of the system.

D. Record Drawings: Furnish hardcopy and electronic drawings, in AutoCAD latest format, of completed work including labeling, where applicable.

1.07 INTELLECTUAL PROPERTY

A. Software: All furnished software shall be Common-off-the-shelf (COTS) and shall be delivered with standard documentation and shall be registered in the name of the Owner.

1. A backup copy of the configured system software shall be provided on DVD/CD-ROM media. All original distribution software shall be delivered with an installable backup.
2. All required software licenses shall be identified and supplied by the Contractor with the exception of software licenses provided by the Owner. All software licenses shall be sized to accommodate the number of seats/users expected for use of the project systems.
3. Commercial software packages shall have all registration and licensing documentation filed indicating the Owner as the owner of the software. The price of an ongoing service contract shall be separately identified, and shall include a per year price for continuing the contract.

B. Patents: Should patented articles, methods, materials apparatus, etc., be used in this work, the Contractor shall acquire the right to use same. The Contractor shall hold the Owner harmless for any delay, action, suit, or cost growing out of the patent rights for all devices or software used on this Project.

C. Copyrights: Should copyrighted software be used in this work, the Contractor shall acquire the right to use same. The Contractor shall hold the Owner harmless for any delay, action, suit, or cost growing out of the copyrights for any software on this Project.

1.08 WARRANTY

A. General:

1. The Contractor shall warrant complete installation of the equipment, system, and software to be free from defects in materials and workmanship for a period of no less than twenty-four (24) months, starting with the date of Substantial Completion. As an option, the Contractor shall supply pricing for an extended Warranty of the system. This option shall be renewable on a yearly basis, and pricing shall be supplied for a minimum of five (5) years from the expiration of the initial Warranty.

B. Hardware Warranty:

1. The Contractor shall warrant that the proposed hardware equipment will conform to its description and any applicable specifications, and shall be of good quality for

the known purpose for which it is intended. This Warranty shall be in addition to any standard Warranty or service guarantee given by the Contractor to the Owner.

2. The Warranty shall allow for replacement or repair of failed systems, equipment and components.
3. The hardware warranty can be supplied by a service contract. If a service contract is used to provide warranty, the price of the contract shall be separately identified, and shall include a per year price for continuing the contract.
4. All hardware installed without an on-site spare shall have a twenty-four (24) hour repair/replacement Warranty from the time the Contractor is notified of the hardware failure.

C. Software Warranty:

1. The warranty shall allow for replacement or repair of failed components. All software necessary to compile, modify, and maintain software supplied for this specification shall be included in this warranty.
2. The software warranty can be supplied by a service contract. If a service contract is used to provide warranty, the price of the contract shall be separately identified, and shall include a per year price for continuing the contract.
3. The warranties shall include the price of all software upgrades and computer operating system upgrades during the warranty period. If a new version of the system software becomes available during the warranty period, it shall be upgraded as part of the warranty.

1.09 QUALITY ASSURANCE

A. General: In addition to the general requirements, the Contractor must have been in the business of selling and installing similar systems for a minimum of five (5) years. The Contractor shall have been actively engaged in installing, maintaining and operating similar systems and services as outlined in the Related Sections portion of this document. The Contractor shall include eighty (80) hours of on-site assistance (excluding travel time) to be used after the final acceptance of the system. This assistance time is in addition to Warranty services and shall be performed on an on-call basis at the Owner's request.

1. Unless accepted otherwise by the Engineer, use manufacturers and installers that employ a Quality Management System complying with the program described in ISO 9001-2000, or similar system.
2. The Contractor shall upgrade each software package and firmware (where applicable) used in the system to the latest version by the end of the Warranty period.
3. The Contractor shall offer an "Optional One (1) Year Extended Warranty" package renewable for up to five (5) years to the Owner. The Owner shall inform the Contractor of the acceptance or rejection of the first year of the package at the time of final acceptance.

   a. Installation personnel shall meet manufacturer's training and education requirements for implementation of extended warranty program.

B. NEC Compliance: Comply with NEC as applicable to construction and installation of all system components and accessories including fire rating to all cables and enclosures as applicable.

C. UL Compliance and Labeling: Provide system components, which are UL-listed and labeled.

D. Equipment and materials supplied shall be a standard product of manufacturers regularly engaged in the manufacture and installation of that type of equipment and shall be the manufacturer's latest standard design. Items of the same classification shall be by the same manufacturer and shall be the same series and model. This requirement includes equipment, modules, assemblies, parts, and components. Electrically powered equipment shall be UL approved. Electronic equipment shall meet the requirements of CFR 47 Part 15.

E. All technicians providing final wire terminations, configurations, and programming on major components shall be manufacturer certified and trained on products being installed under this project.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver system components properly packaged in factory-fabricated containers. Enclose an operating impact sensor in each container that is holding sensitive electronic equipment. The impact sensor shall be capable of recording a 5G rating.

B. Handling: Handle equipment and components carefully to avoid breakage, impact, denting and scoring finishes. Do not install damaged equipment. Replace and return damaged units to equipment manufacturer.

C. Equipment delivered to the job site shall be opened and inspected immediately upon arriving and compared to the approved Shop Drawing submittal and checked for defects. If the equipment is not correct, the equipment shall be returned to the manufacturer immediately and a new order for the approved equipment shall be placed at no cost to the Owner.

D. Equipment and components shall be protected from the prolonged exposure, weather, humidity, temperature variations, dirt, dust, or other contaminants. Equipment damaged prior to system acceptance shall be replaced at no cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL:

SEE RELATED SECTION IN EACH SPECIFICATION LISTED UNDER SECTION 1.3 FOR PRODUCT REQUIREMENTS.

PART 3 - EXECUTION

3.01 EXAMINATION

A. The Owner assumes no responsibility or liability for transportation from country of origin, storage fees, drayage, import taxes, duty taxes, or other costs associated with the delivery and storage of system components.

B. The Contractor shall be responsible for any and all loss or damage in the shipment and delivery of all material until transfer of title to the Owner

C. The Contractor shall store products in accordance with manufacturer's instructions, within Contractor's staging area and with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

D. The Contractor shall provide coverings to protect products from damage from traffic and construction operations, remove when no longer needed.

E. The Contractor shall ensure that all work performed under these Specifications is in accordance with the requirements and standards defined and referenced in these Specifications. Any work performed in deviation of these Specifications, any of the referenced material, or any applicable standards or requirements, shall immediately be corrected by the Contractor without additional charges, regardless of the stage of completion. The Contractor shall record all inspection observations. As a minimum, the record shall include the name(s) of personnel conducting the inspection, a brief description of the inspection and the observations. These records shall be available for the Owner to review at any time. Also, these records shall be delivered to the Owner before final acceptance.

F. Installation Inspections: Installation inspections shall be undertaken through the performance of pre-installation, in-progress, and final inspections as follows:

1. Pre-Installation Inspection: The Contractor shall make an inspection of all equipment and material to be used prior to installation. All items shall be verified for compliance with the requirements of these Specifications and all other applicable standards. All equipment, cable, and associated hardware identified for installation shall be inspected for damage and completeness utilizing standard practices to determine integrity and acceptability.
2. In-Progress Inspection: At the Owner's discretion, the Contractor shall perform in-progress inspections that shall include visual inspections of equipment, wiring practices, cabling, placement of equipment, marking of cables and adherence to safety procedures. In addition, the Owner, or his representative, may conduct additional inspections any time.
3. Final Inspection: The Contractor shall conduct a final inspection that encompasses all portions of the installation. This inspection shall be performed to ensure that all aspects of the installation have been performed in accordance with these Specifications, standard industry practices and the publications referenced herein. All non-compliance items shall be noted by the Contractor during this inspection. The Owner shall witness this inspection.
4. Corrective Action and Verification Inspection: The Contractor shall perform all corrective actions to ensure that all non-compliance items identified during the final inspection have been corrected.

3.02 INSTALLATION

A. Standards: All installation activities shall be performed in a neat and professional manner in accordance with all applicable local and national codes. Additionally, the Contractor and all subsequent Sub-Contractors employed to satisfy the requirements of these specifications shall obtain, or satisfy, the following prior to installation:

1. All licenses and permits
2. All insurance and bonding as required
3. All other standards or requirements specified in this document

B. The Contractor shall install and inspect all hardware required in this specification in accordance with the manufacturer's installation instructions.

C. The Contractor shall adhere to the following during installation of the system:

1. Underwriter's Laboratories (UL) listing for restricted access installations in business and customer premises applications. This listing is required by the National Electric Code for customer premise installations.
2. Fire resistance requirements specified by Underwriter's Laboratories in UL 1459, 2nd edition.

D. Where undefined by codes and standards, the Contractor shall apply a safety factor of at least two (2) times the rated load to all fastenings and supports of system components.

E. The Contractor shall install all system components including furnished equipment, and appurtenances in accordance with the manufacturer's instructions, and shall furnish all cables, connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.

F. Rack Mounted Equipment:

1. As a general practice, the Contractor shall run power cables, control cables, and high level cables on the left side of an equipment rack as viewed from the rear.
2. The Contractor shall run other cables on the right side of an equipment rack, as viewed from the rear.
3. For equipment mounted in drawers or on slides, provide the rack accessories as well as interconnecting cables with a service loop of not less than three feet and ensure that the cable is long enough to allow full extension of drawer or slide.

G. Contractor shall install all custom and packaged software in the development and production environments'.

H. Contractor shall provide a migration plan for all new and updated software to be migrated from within the development environment to the production environment.

I. Final hardware selected and installation of hardware shall be submitted for review by the Engineer. Additionally, the Contractor shall review the cabinets and equipment room to ensure ventilation requirements are met or recommend modifications.

J. Contractor shall install and configure all software required in this Specification in accordance with the software manufacturer's installation instructions. Apply the latest patches and security updates. Register the application with the manufacturer to the Owner.

K. The contractor shall facilitate, configure, document and test all network connections required by other systems or other facilities not in contract that require access to the network specified herein.

L. Contractor shall place materials only in those locations that have been previously authorized. Any other locations shall be authorized, in writing, by the Engineer.

M. Contractor shall provide all tools, applications and test equipment required to install, verify, and test the installation and to determine that it meets the specifications. The Contractor shall furnish all necessary materials required to implement and to achieve the required work performance.

3.03 DOCUMENTATION

A. This Section requires complete documentation of all systems for the purpose of system operation and maintenance during and after the Warranty period. It is intended that the operation and maintenance manuals be exhaustive in the coverage of the system to the extent that they may be used as the sole guide to the troubleshooting, identification,

and repair of defective parts. All documentation, as described here-in shall comply with NFPA 72 and shall be submitted to the Owner for approval thirty (30) days prior to final submission.

B. Scope: The Contractor shall provide the Owner with Operation and Maintenance Manuals and other documentation on all installed systems. These manuals shall include basic wiring diagrams, schematics, and functional details such that any component, wire, or piece of equipment in the system may be easily identified by going to the actual equipment and making reference to this manual. It is required that everything in the system be neatly labeled and easily identifiable. Every terminal, wire, component, or piece of equipment, and other such items shall have a number or letter designation. All of these identification characteristics shall be included in the maintenance and operation manuals.

C. The maintenance manual requirement of this Section is in addition to Shop Drawing requirements. Maintenance manuals and Drawing sets shall be compiled after system fabrication and testing, and shall incorporate any changes made after Shop Drawing submittal. The maintenance manuals and drawing books shall be permanently bound in hard plastic covers.

D. Maintenance Manuals, Manufacturer's Literature: Provide manufacturer's standard literature, covering all equipment included in the system. The maintenance manuals shall contain specifications, adjustment procedures, circuit schematics, component location diagrams, and replacement parts identification. All references to equipment not supplied on this Project shall be crossed out.

E. Drawing Books: All Drawings developed specifically for this Project shall be created at 30" x 42" and bound. The Drawings provided shall be easily readable after printing, even if this requires breaking large Drawings into several parts. Text shall be no smaller than 3/32". The drawing book documents shall be produced with current version of AutoCAD and the electronic files shall be provided to the Owner at the completion of the Project on DVD/CD-ROM. Provide component identification and cross reference on the Drawings to allow the maintenance department to understand the function of each item (the block diagram), find the room where the device is mounted (Contract Document plans), find its location in a rack (Arrangement Drawings), find how it is wired (wiring diagrams), and its detailed Specifications (vendor data sheets), and how to repair it (spare part lists). Include the following drawings as a minimum:

1. System Block Diagram: Drawings shall depict the final System overview, including equipment types, location, and any special information.
2. System Riser Diagram(s): Drawings shall show all System components, wire numbers, color codes, pin numbers, component locations and connections, depicting the "as-built", final configuration.
3. Rack Elevation and Wiring Diagram(s): Elevation diagrams shall depict the front views of the equipment racks identifying all equipment installed within. Complete wiring diagrams of the racks shall also be included.
4. Floor plans of the communications rooms showing the location of all equipment affected as a part of this contract within the communications rooms.
5. Elevation drawings of all wall mounted equipment showing the location of each component on the wall. Components on the walls shall be identified as in the functional block diagrams.

6. Wiring Diagrams: Provide wiring diagrams showing all field installed interconnecting wiring. Wire identification on the diagrams shall agree with the wire markers installed on the equipment.
7. System Administrator Documentation: The Contractor shall supply three (3) hardcopies of administrator documentation and [three (3)] copies of the documentation in PDF format on CD-ROM that detail the operation of the system. This documentation shall provide complete information on the configuration, business rules, operation, maintenance, and trouble-shooting of the system.
8. Refer to Section 1.6. C of this specification for additional requirements for Systems Manager Documentation.

F. Warranty: The Contractor shall supply all warranties as required in the "Warranty" article of this specification.

3.04 GENERAL TESTING REQUIREMENTS

A. Project Testing: The system installation shall not be considered complete until Testing is completed. The purpose is to test the complete system and demonstrate that all specified features and performance criteria are met. All requirements of the specification shall be tested, including:

1. Functionality, including reporting and response
2. System capacity
3. Hardware and software interaction
4. Failure Recovery
5. Report generation

B. Test Plan/Procedure: Contractor shall provide six (6) copies of the proposed test plan/procedures for each testing phase for the review of the Engineer. The test plan for each phase of testing shall detail the objectives of all tests. The tests shall clearly demonstrate that the system and its components fully comply with the requirements specified herein. The submission of Test Plans shall adhere to the following:

1. A draft test plan shall be presented to the Engineer at least forty-five (45) days prior to the scheduled start of each test.
2. A workshop for reviewing comments shall be conducted with the Engineer at least thirty (30) days prior to the scheduled start of each test.
3. A final test plan shall be submitted to the Engineer at least fourteen (14) days prior to the scheduled start of each test.

C. Test plans shall contain at a minimum:

1. Functional procedures including use of any test or sample data.
2. Interconnection of test equipment and steps of operation shall be defined.
3. Expected results required to comply with specifications.
4. Traceability matrix referencing Specification requirements with specific test procedures.
5. Record of test results with witness initials or signature and date performed.
6. Pass or fail evaluation with comments.

D. The test procedures shall provide conformity to all Specification requirements. Satisfactory completion of the test procedure is necessary as a condition of system acceptance.

E. All Test plans must be reviewed by the Engineer. To successfully complete a test, the test document must be signed and dated by both the Contractor and the Engineer.

F. The Engineer will review, witness and validate the execution of all formal test procedures prepared by the Contractor and deliverable under the contract to assure the tests cover all requirements and that there is a conformity between the conducted test, the test results and Specification requirements.

G. Documentation verification both interconnects and operationally, shall be part of the test. Where documentation is not in accordance with the installed system interconnect and operating procedures, the system shall not be considered accepted until the system and documentation correlate.

H. The Contractor shall provide the Owner or Owner representative the opportunity(s) to participate in any or all of tests.

I. Test Reports: The Contractor shall prepare, for each test, a test report document that shall certify successful completion of that test. Six (6) copies of the test report shall be submitted to the Owner representative for review and acceptance within seven (7) days following each test. The test report shall contain, at a minimum:

1. Commentary on test results.
2. A listing and discussion of all discrepancies between expected and actual results and of all failures encountered during the test and their resolution.
3. Complete copy of test procedures and test data sheets with annotations showing dates, times, initials, and any other annotations entered during execution of the test.
4. Signatures of persons who performed and witnessed the test.

J. Test Resolution: Any discrepancies or problems discovered during these tests shall be corrected by the Contractor at no cost to Owner. The problems identified in each phase shall be corrected and the percentage of the entire system re-tested determined by the Engineer before any subsequent testing phase is performed.

3.05 NOT USED.

3.06 NOT USED.

3.07 NOT USED.

3.08 MAINTENANCE AND SUPPORT

A. General

1. The Contractor shall provide maintenance and support of all components provided for this system at no additional charge during the warranty period. This extends to systems requiring vendor pre-purchased maintenance agreements.
2. The Contractor shall supply a list of special tools, test equipment, and outside inventory required for this Project. The Contractor may recommend specific items to facilitate long-term support of the system as an option
3. All lead technicians performing installation and maintenance shall have a minimum of two (2) years experience on the proposed system and be manufacturer certified on all hardware/software applications. All maintenance technicians shall be provisioned to attend a one (1) week manufacturer training class each year. Pre-assigned backup technicians shall be available to backfill for onsite technicians who are on vacation, in training or who are out sick
4. The Contractor shall provide twenty-four (24) hours/seven (7) days a week telephone support as a minimum maintenance and support agreement. Additionally, the Contractor shall specify a maximum amount of time to get the

system up and operational in the event of a system failure. This time period shall be subject to Owner's approval

B. Hardware and Software Support

1. Hardware and Software support shall be supplied by the Contractor directly or by a Sub-Contractor reviewed by the Owner. Support shall cover all equipment and systems referenced in this Specification
2. The Contractor shall assume full responsibility for the performance of all equipment supplied by the Owner, provided that such equipment meets the specifications set forth by the Contractor
3. All software shall be delivered with an installable backup

C. Pricing after Warranty Period: Cost of maintenance and support on a yearly basis after the Warranty period has expired, shall be included as an option to be exercised by the Owner or his designated representative. Contractor shall clearly state in the bid the annual cost and availability of the following services that the Owner may wish to use or to continue after the initial Warranty period has expired (Costs shall be given for a three (3) years with additional two (2) years to be renewed on an annual basis):

D. Definitions

1. Preventive and Routine Maintenance: Preventive and routine maintenance services shall be provided in accordance with the provisions of the maintenance manual for each component. Preventative maintenance services shall include inspection, test, necessary adjustment, lubrication, parts cleaning, and upgrades. Routine maintenance services shall include scheduled overhauls as recommended by the equipment manufacturer
2. Emergency Failure: A system failure is considered an emergency if any of the key components are inoperative to the extent the system cannot function in a normal manner. Emergency services shall include inspections and necessary tests to determine the causes of equipment or software malfunction or failure. The emergency services shall include furnishing and installing components, parts, or software changes required to replace malfunctioning system elements. The Contractor shall provide telephone support twenty-four (24) hours a day, seven (7) days a week. The Contractor shall provide support on-site within eight (8) hours of request.
3. Support: Support shall be supplied by the Contractor directly or by a sub-Contractor reviewed by the Owner. Support shall cover all equipment referenced in this specification

3.09 CLEANING

A. Upon completion of system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

B. Communications Rooms will be active during the project. Contractor shall keep Communications Rooms free of debris and dust; and shall not place equipment that prevents others from working in the rooms.

3.10 NOT USED.

3.11 ACCEPTANCE

A. The Contractor shall not apply power to the system until after:

1. System and components have been installed and inspected in accordance with the manufacturer's installation instructions
2. A visual inspection of the system components has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections
3. System wiring has been tested and verified as correctly connected as indicated
4. All system grounding and transient protection systems have been verified as properly installed and connected, as indicated
5. Power supplies to be connected to the system and equipment have been verified as the correct voltage, phasing, and frequency as indicated

B. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installations, defective equipment items, or collateral damage as a result of Contractor work/equipment.

C. Acceptance will be withheld until the following have been completed successfully:

1. Acceptance of all submittals
2. Successful testing and delivery of approved test results
3. Completed Training as per the specifications as well as successful demonstration of the operation of the entire system
4. Final cleanup of the system and work areas
5. Delivery of all documentation including accepted As-built documentation.

END OF SECTION 270100

SECTION 270500

COMMON WORK RESULTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. See Section 270100, Paragraph 1.01.

B. Section 270500 contains the technical specifications for Common Work Results for Communications at the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project.

C. This Section includes the following:

1. Communications equipment and spaces coordination and installation.
2. Sleeves for pathways and cables.
3. Sleeve seals.
4. Firestopping.
5. Grout.
6. Common communications installation requirements.

1.02 REFERENCES

A. See Section 270100, Paragraph 1.02.

1.03 RELATED SECTIONS

A. See Section 270100, Paragraph 1.03.

1.04 SCOPE OF WORK

A. The design intent for the Telecommunications Distribution System (TDS) is to integrate the TDS subsystems into one, coherent structured cabling system. Much of the implementation of the TDS depends upon the construction of communications rooms, pathways and proper telecommunications grounding systems.

B. Planning, design and implementation of the TDS must be coordinated with the work of architectural, mechanical, electrical and plumbing design for space, environmental, and communications pathways.

C. The Contractor shall develop the design and implementation of the TDS in coordination with architectural, electrical (grounding and pathway (conduit and cable tray)) design and actual construction and implementation in accordance with TIA/EIA 569-A, which provides standards for Telecommunications, Entrance Facility, Equipment Room, Communications Room, and Conduit Requirements, BICSI Telecommunications Distribution Methods Manual (TDMM), and ANSI/TIA-942-2005 Telecommunications Infrastructure Standard for Data Centers.

D. TDS installation shall comply with BICSI Information Transport Systems Methods Manual (ITSIMM).

E. TDS spare capacity for Horizontal Patch Panels, Backbone Patch Panels, Backbone Cable Strands, shared Horizontal Pathways, Data Cabinets and Telecommunication

Spaces shall be sized to allow a minimum of 25% growth. Sleeves and backbone pathways shall be sized to allow minimum a minimum of 50% growth.

F. Coordinate arrangement, mounting, and support of communications equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

G. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

H. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

I. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."."

1.05 QUALIFICATIONS

A. Project Qualifications: See Section 270100, Paragraph 1.05.A.

B. Organization Qualifications: See Section 270100, Paragraph 1.05.B.

1.06 SUBMITTALS

A. See Section 270100, Paragraph 1.06.

1.07 INTELLECTUAL PROPERTY

A. See Section 270100, Paragraph 1.07.

1.08 WARRANTY

A. See Section 270100, Paragraph 1.08.

1.09 QUALITY ASSURANCE

A. See Section 270100, Paragraph 1.09.

B. All work shall be reviewed and supervised on-site by a BICSI Registered Communications Distribution Designer (RCDD). As an option, on-site supervision may be performed by a BICSI ITS Technician. Must demonstrate knowledge and compliance with all BICSI, TIA/EIA, UL, and NFPA standards and codes. Contractor shall submit proof of RCDD and ITS Technician designation.

1.10 DELIVERY, STORAGE, AND HANDLING

A. See Section 270100, Paragraph 1.10.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Firestopping

1. Specified Technology STI SpecSeal
2. CSD Sealing Systems
3. 3M
4. Approved Equivalent

2.02 MATERIALS

A. Sleeves for Pathways and Cables

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends, with plastic bushings.
2. Sleeves for Rectangular Openings: Galvanized sheet steel.
3. Minimum Metal Thickness:
   a. For sleeve cross-section rectangle perimeter less than 50in and no side more than 16in, thickness shall be 0.052in.
   b. For sleeve cross-section rectangle perimeter equal to, or more than, 50in and 1 or more sides equal to, or more than 16in, thickness shall be 0.138in.

B. Sleeve Seals

1. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.
3. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
4. Pressure Plates: Carbon steel. Include two for each sealing element.
5. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

C. Sleeve Seal Fittings

1. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Presealed Systems.

D. Grout

1. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.03 FIRESTOPPING

A. Provide materials classified by UL to provide fire barrier equal to time rating of construction being penetrated.

B. Provide Firestopping at all penetrations of fire rated zones, including floor slabs.

C. Provide asbestos free materials that comply with applicable Codes and have been tested in accordance with UL 1479 or ASTM E 814.

1. Fire Rated Cable Pathways: Device modules comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill.

PART 3 - EXECUTION

3.01 EXAMINATION

A. See Section 270100, Paragraph 3.01.

3.02 INSTALLATION

A. Common Requirements for Communications Installation

1. Comply with NECA 1.

2. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

3. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

4. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

5. Right of Way: Give to piping systems installed at a required slope.

B. Firestopping

1. The methods, materials, and considerations for reestablishing the integrity of fire-rated architectural structures and assemblies (e.g., walls, floors, and ceilings) required by building codes shall be observed when these barriers are penetrated by cables, pathways (e.g., conduit), or other penetrating elements.

2. Provide minimum sleeve size to accommodate Trade size 4 conduit

3. Secure sleeves firmly in place using filling and patching materials (grout) that match with surrounding construction.

4. Install fire-stopping in open penetrations and in the annular space of penetrations for fire rated barriers.

5. Installation of fire-stops shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.

a. Installation of all fire-stopping shall be in accordance with fire test reports, fire resistance requirements, acceptable sample installations, manufacturer's recommendations, local fire and building authorities, and applicable codes and shall be installed in a manner acceptable to the authority having jurisdiction.

b. Do not use materials that contain flammable solvents.

6. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

3.03 TELECOMMUNICATIONS ROOMS AND SPACES FOR COMMUNICATIONS SYSTEMS

A. General Requirements

1. Conduits, Trays, Slots, Sleeves, and Ducts

a. Locate slot/sleeve systems in places where pulling and termination will be easy.

b. Where vertical and horizontal offsets are required, consider bend radius requirements and service loop issues.

c. Sleeves and slots shall not be left open after cable installation. Firestop all sleeves and slots in accordance with applicable building codes. See Chapter 11: Firestopping for detailed information on firestopping of cabling pathways.

2. Telecommunication Miscellaneous Requirements

a. Wall Linings

1) Provide plywood backboards, as noted on the drawings to be AC grade or better, void-free plywood, 8 ft high with a minimum thickness of 3/4 trade size. The plywood shall be installed with the grade "C" surface facing the wall. Securely fasten the plywood to wall-framing members to ensure that it can support attached equipment.

2) Plywood shall be void-free and either fire-rated or treated on all sides with at least two coats of fire-resistant paint.

b. Firestopping

1) The methods, materials, and considerations for reestablishing the integrity of fire-rated architectural structures and assemblies (e.g., walls, floors, and ceilings) required by building codes must be observed when these barriers are penetrated by cables, pathways (e.g., conduit), or other penetrating elements.

c. Sensitive Equipment and Electromagnetic Interference (EMI)

1) Do not locate sensitive electronic equipment next to electrically noisy equipment that can cause EMI. Keep electrical feeders and branch circuits away from sensitive equipment and its associated telecommunications cabling and equipment. Likely sources of EMI include heavy-duty electromechanical equipment (e.g., copiers, door openers, elevator systems, factory equipment).

2) Follow EMI separation requirements listed in paragraph 3.4.

3.04 PATHWAYS FOR COMMUNICATION SYSTEMS

A. Wall and floor penetrations shall use slot or sleeve pathways as noted on the drawings. Ensure that proper firestopping is maintained at all times. Position cable sleeves or slots adjacent to a wall on which the backbone cables can be supported. Sleeves or slots must not obstruct wall terminating space. That is, they shall not be directly above or below the wall space that is to be used for termination fields. Construct all:

1. Slots and sleeves shall conform to the U.S. NFPA 70, National Electrical Code® (NEC®), and local fire codes.
2. Slots with a minimum 1 in high curb.
3. Sleeves shall extend a minimum of 1 in above the floor level Ensure that proper firestopping is maintained at all times.

B. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends, with plastic bushings.

1. Provide transition conduit fittings between different conduit types,
2. Provide plenum rated NEMA enclosure for each telecommunications outlet mounted within plenum rated spaces, where a separate plenum rated enclosure has not already been provided.
3. Sleeves for Rectangular Openings: Galvanized sheet steel.
4. Minimum Metal Thickness:
5. For sleeve cross-section rectangle perimeter less than 50 in. and no side more than 16 in, thickness shall be 0.052 in.
6. For sleeve cross-section rectangle perimeter equal to, or more than, 50 in. and 1 or more sides equal to, or more than 16 in., thickness shall be 0.138 in.

C. Cable Tray Systems

1. Cable Tray Systems shall be rigid, pre-fabricated support structures that support telecommunications cables. Communications cable tray systems shall not be shared for electrical power distribution. The inside of a cable tray must be free of burrs, sharp edges, or projections that can damage cable insulation. Comply with firestopping codes and regulations when penetrating fire rated structures and wall with cable tray.

3.05 SEPARATION FROM EMI SOURCES:

A. Comply with TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

B. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

1. Electrical Equipment Rating Less than 2 kVA: A minimum of 5 inches.
2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
3. Electrical Equipment Rating More than 5 kVA: A minimum of 24 inches.

C. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

1. Electrical Equipment Rating Less than 2 kVA: A minimum of 2-1/2 inches.

2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
3. Electrical Equipment Rating More than 5 kVA: A minimum of 12 inches.

D. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

1. Electrical Equipment Rating Less than 2 kVA: No requirement.
2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
3. Electrical Equipment Rating More than 5 kVA: A minimum of 6 inches.

E. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or higher: A minimum of 48 inches.

F. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.06 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.07 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

C. Provide sleeves for new conduit and cable penetrations of building construction.

1. Openings to accept sleeves in new building construction will be formed in building construction by the Contractor for General Construction work. Openings to accept sleeves in existing building construction shall be provided under this division of the Specifications. Refer to Article, "Cutting and Patching" in this Section.

2. Use galvanized rigid conduit sleeves for penetrations through exterior masonry/concrete walls and foundations, concrete floor slabs on grade and above grade, and concrete-filled decks.

3. Use only fire-rated listed assemblies for the type of sleeve being installed through CMU walls or gypsum walls for communications penetrations. Sleeve type shall be galvanized rigid conduit.

D. Where conduits are installed before building construction being penetrated, install sleeves loose around conduits. Split, fit, and weld steel sleeves over existing conduits, with respect to anything flammable in the surrounding environment.

E. Secure sleeves firmly in place using filling and patching materials (grout) that match with surrounding construction.

F. In floor penetrations, extend sleeve 4 inches above finished floor unless noted otherwise. In wall penetrations, cut sleeves flush with wall surface and use metal escutcheon plates in finished interior areas.

G. Seal voids between sleeves and building construction with joint sealants. Make allowances for and coordinate the Work with installation of firestopping, conduit insulation, and waterproofing as applicable.

H. The Contractor shall be fully responsible for final and correct location of sleeves. Sleeves which are omitted or incorrectly located in existing building construction, shall be corrected and provided by the Communications Contractor, at no additional costs to the Owner.

3.08 PENETRATION OF BUILDING SURFACES

A. General Requirements: All penetrations of walls and floors shall be fire stopped in accordance with the ASTM and NFPA. Refer to specification section Division 07 for additional information

1. Floor penetrations shall be sleeved with a minimum sleeve diameter of 4 inches. An additional penetration shall be provided for future use, sleeved, fire stopped and capped.
Coordinate size of wall penetration with pathway size, number of conductors. Comply with all NEC requirements.

2. The fire rating of all penetrated walls, floors, and ceiling structures shall be strictly maintained. All penetrations shall be fire stopped and sealed by the Contractor.

3. Install fire-stopping in open penetrations and in the annular space of penetrations for fire rated barriers.

4. Installation of fire-stops shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures. Refer to related specification section.

   a. Installation of all fire-stopping shall be in accordance with fire test reports, fire resistance requirements, acceptable sample installations, manufacturer's recommendations, local fire and building authorities, and applicable codes and shall be installed in a manner acceptable to the authority having jurisdiction.

B. Above Grade Level or Non-waterproof Areas

1. Seal each annular space between conduits or cable and building surfaces. Pack space with Oakum, other rope packing, or backer rod materials and cover with fire-resistant sealant or other protection materials.

2. Provide sleeves as specified in Article, SLEEVE-SEAL INSTALLATION in this Section for conduit and cable penetrations. Seal each space between conduit or cable and sleeve. Sealing shall be as specified in above paragraph.

C. Waterproof Areas (Above and Below Grade)

1. In new and existing construction for penetrations through concrete below grade, ground water level, or in other waterproof areas, provide through-wall and floor seals having galvanized fittings, sealing assemblies, and sleeves as specified.

2. In existing construction when core bore drilled openings are used for conduit penetrations below grade, ground water level, or in other waterproof areas, provide sealing.

D. Fire-resistant Areas

1. Provide through-penetration firestop systems for penetrations through fire-rated walls, floors, and other partitions of building construction. Comply with requirements in Division 07 and as specified in this Section.

2. In walls or partitions with 2-hour or less fire ratings, provide only metallic outlet or device boxes installed per UL Fire Resistance Director, NEC, and other national building code requirements.

E. Cutting and Patching

1. Provide openings, cutting, coring, and patching of openings in existing building construction as required. Patching includes openings and voids left in existing construction as a result of demolition.

2. The Work shall include necessary assemblies and materials to maintain required fire ratings.

3. Perform cutting as to not impair structural stability of building construction and systems. Do not drill holes or weld attachments to beams and other structural members without prior written approval from the Owner's Representative. Contact the Engineer-of-Record for guidance.

4. The Work shall be done by a craftsperson skilled in the particular trades affected.
5. Patching materials shall match existing materials in type and quality. Patching shall be done in a manner to match appearance of adjacent surfaces.

3.09 RETROFIT-CUTOVER

A. Furnish equipment, materials, labor and services, and perform operations required to retrofit/cutover existing cabling systems. Removals shown are general indications and may not indicate full extent of removals which may be required to complete Work.

B. Furnish equipment, materials, labor and services, and performing operations required to enable continued functioning of existing system until cutover to new system.

C. Remove wiring, punch blocks, cabinets, outlets, raceways, and equipment not required for new system.

1. Abandon flush mounted device and junction boxes and cover with blank plate to match the current room decor.
2. Remove surface telecommunications outlets and pathways unless said removal will damage the existing finish on surfaces, or physically damage the structure.
3. Remove wiring from abandoned conduits and raceways from the work area outlet back to the corresponding termination point in the Telecommunication Room. Place a trailer string in vacated conduits and raceways.
4. Remove labeling at both ends for abandoned cables/wiring.
5. The collected abandoned cables/wiring shall be collected and removed from site by Contractor.

D. Perform the work in neat and workmanlike manner in accordance with the applicable codes, standards and the Authority Having Jurisdiction (AHJ).

E. Removal and replacement of existing ceilings:

1. Carefully remove existing ceilings as required to perform the work. Store removed tiles in an area designated by the Owner. Modify and augment existing suspension systems as necessary. Restore ceiling systems to their original finish.
2. Repair any damage to ceilings due to modifications, removal, and replacement of same. Replace damaged ceiling tiles, including tiles with holes or openings left as a result of demolition, with materials of like kind.

F. Existing equipment or material shall not be reused without specific approval of the Owner's Representative except as noted below:

1. Existing cable terminal housings may be reused if in good condition.

G. Equipment and materials to be removed and not desired by the Owner shall be removed from site promptly.

H. Equipment and material to be removed and that is desired by the Owner shall be moved to an on-site storage location as directed by the Owner.

3.10 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

B. Performance Requirements

1. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.

2. Where non- mechanical products are utilized, provide products that upon curing do not re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.

3. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re-enterable products that do not cure or dry.

4. Openings for cable trays shall be sealed using re-enterable firestopping pillows.

C. Quality Assurance

1. Products/Systems: Provide firestopping systems that comply with the following requirements:

2. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop system acceptable to authorities having jurisdiction.

3. Firestopping products bear the classification marking of qualified testing and inspection agency.

4. Installer Qualifications: Experience in performing work of this section who is qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products in accordance with specified requirements.

D. Project Conditions

1. Do not install firestopping products when ambient or substrate temperatures are outside limitations recommended by manufacturer.

2. Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.

3. Maintain minimum temperature before, during, and for a minimum 3 days after installation of materials.

4. Do not use materials that contain flammable solvents.

5. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

6. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

7. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

3.11 DOCUMENTATION

A. See Section 270100, Paragraph 3.03.

3.12 GENERAL TESTING REQUIREMENTS

A. See Section 270100, Paragraph 3.04.

3.13 MAINTENANCE AND SUPPORT

A. See Section 270100, Paragraph 3.08.

3.14 CLEANING

A. See Section 270100, Paragraph 3.09.

3.15 TRAINING

A. See Section 270100, Paragraph 3.10.

3.16 ACCEPTANCE

A. See Section 270100, Paragraph 3.11.

END OF SECTION 270500

SECTION 270526

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section 270100 contains the technical specifications for Grounding and Bonding for Communication Systems at the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project.

B. This Section includes grounding and bonding products and installation methods for communications systems.

C. Performance Requirements: Grounding and Bonding system shall comply with all referenced codes and standards.

1. The primary purpose of the Grounding and Bonding for Communication Systems is to improve personnel safety and decrease risk from equipment fire by facilitating operation of over current devices.

2. The Grounding and Bonding system shall:

a. Maintain zero volts to all equipment enclosures during normal operation.

b. Provide an intentional fault current path.

c. Provide a zero voltage reference for end use power supplies.

3. Grounding and Bonding for Communication Systems shall function in concert with the provided cabling topology, pathways, administrative labeling, outside plant, and comply with all referenced codes and standards.

1.02 REFERENCES

A. See Section 270100, Paragraph 1.02

B. BICSI Information Transport Systems installation Methods Manual (ITSIMM)

C. BICSI Telecommunications Methods Manual (TDDM).

D. IEEE Standard 1100-1992.

E. National Electric Safety Code (NESC).

F. NFPA-70 National Electric Code (NEC) (2011).

G. NFPA 780 Lightning Protection.

H. TIA J-STD-607-B Commercial Building Grounding and Bonding Requirements for Telecommunications.

1.03 RELATED SECTIONS

A. See Section 270100, Paragraph 1.03.

1.04 SCOPE OF WORK

A. See Section 270100, Paragraph 1.04

B. Contractor shall extend the existing telecommunications grounding and bonding system, to components added in this Contract, with all necessary components in accordance with the related Specifications, Drawings, Manufacturer's recommendations and requirements, including:

1. Telecommunication grounding busbars.
2. Telecommunications ground bond wire.
3. Ground bond connection to electrical panel ground bus.
4. Ground bond connectors.
5. Project Management, including coordination and planning.
6. Installation, terminations, exothermic welds, and labeling.
7. Testing.
8. All other work, equipment and accessories required to provide a complete and fully operational system.

C. Acronyms and Definitions

1. ASTM ASTM International.
2. AWG American Wire Gauge.
3. BCT Bonding Conductor for Telecommunications.
4. GE Grounding Equalizer.
5. NEC National Electric Code.
6. RBC Rack Bonding Conductor.
7. RGB Rack Grounding Busbar.
8. SRG Signal Reference Grid.
9. TBB Telecommunications Bonding Backbone conductor.
10. TEBC Telecommunications Equipment Bonding Conductor.
11. TGB Telecommunications Grounding Busbar.
12. TMGB Telecommunications Main Grounding Busbar.
13. UBC Unit bonding Conductor.
14. UL Underwriters Laboratories.

1.05 QUALIFICATIONS

A. See Section 270100, Paragraph 1.05.A.

B. Project Qualifications:

1. Successful installation completion of at least three similar and comparable Telecommunications Grounding and Bonding Systems as indicated for this project, within the most recent three year period.

1.06 SUBMITTALS

A. See Section 270100, Paragraph 1.06.

B. Each product submittal shall include a summary listing each manufacturer, model, part number and cut sheet reference page(s).

1.07 INTELLECTUAL PROPERTY

A. See Section 270100, Paragraph 1.07.

1.08 WARRANTY

A. See Section 270100, Paragraph 1.08.

1.09 QUALITY ASSURANCE

A. See Section 270100, Paragraph 1.09.

1.10 DELIVERY STORAGE AND HANDLING

A. See Section 270100, Paragraph 1.10.

1.11 RADIO/TELEVISION INTERFERENCE

A. See Section 270100, Paragraph 1.11.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers shall meet all specifications requirements and shall be approved by the Engineer. Manufacturers that may be incorporated in the work, include, but are not limited to the following:

1. Cable Manufacturers

a. Houston Wire and Cable Company

b. Okonite Company

c. General Cable

d. Pirelli Cable Corporation

e. Triangle Wire and Cable, Inc

f. Approved Equivalent

2. Grounding Connector Manufacturers

a. Thomas & Betts

b. FCI Burndy Electrical

c. O-Z/Gedney

d. Approved Equivalent

2.02 MATERIALS

A. General Requirements

1. All grounding and bonding components including conductor wire, busbars, ground rods and conduit shall be UL listed. Connectors shall be UL listed for the application.

B. Grounding and Bonding Conductors

1. Grounding and bonding conductors shall be green insulated copper American Wire Gauge (AWG) wire following ASTM-B3, ASTM-B8 and ASTM-B33.

2. Grounding and bonding conductors installed in plenums or air-handling spaces shall meet UL 910 and shall be marked CMP (communications multipurpose plenum) in accordance with the NEC.

3. Grounding and bonding conductors installed in non-plenum riser-rated spaces shall meet UL 1666 and be marked CMR (communications multipurpose riser) in accordance with the NEC.

4. Minimum acceptable ground wire size shall be No. 6 AWG.

C. Grounding and Bonding Connectors

1. Grounding and bonding connectors shall be a copper alloy two-hole compression lug type at all connecting ends.

2. Conduit grounding bushings or ground clamps shall be provided for ground wire connection.

PART 3 - EXECUTION

3.01 EXAMINATION

A. See Section 270100, Paragraph 3.01.

3.02 INSTALLATION

A. See Section 270100, Paragraph 3.02.

B. Install work following specification requirements, drawings, manufacturer's instructions and approved submittal data.

C. General

1. All ground bonding conductor wire, busbars and conduit shall be UL listed.

2. Ground bonding conductor sizing shall comply with the BICSI TDMM.

3. Ground bonding conductor sizing shall be minimum #6 AWG and maximum #3/0 AWG.

D. Grounding Busbars

1. Provide TMGB and TGBs as indicated in the Drawings.

E. Ground Bond Conductors

1. Provide Telecommunications Equipment Bonding Conductor (TEBC) sized at #6 AWG and not to exceed 100 feet in length, from the nearest TMGB or TGB to all telecommunications pathways, enclosures, and lightning protection devices located within or entering the room area and provided under this contract, including:

a. Equipment cabinets.

b. Racks.

c. Enclosures.

d. Consoles.

e. Conduits.

f. Cable tray and raceways.

g. Metallic cable shield, sheath and strength members.

h. Splice cases.

i. Vertical steel columns.

F. Ground Bond Conductor Routing and Connections

1. Bonding conductors shall be routed parallel and at right angles to architectural components using minimum wire lengths, bends and changes in direction. Terminations shall be made directly to the points being bonded.

2. Route ground bond conductors under raised floor where available, following designated telecom pathways.

3. Avoid placement of ground bond wire in conduit. Where ground wire is placed in a metallic conduit section in excess of 3 feet in length, the ground wire shall be bonded to both ends of the conduit.

4. Ground bonding is not required for short sections of wall and floor sleeves less than 3 feet in length.

5. Bonding connections shall only utilize two hole compression lug type connectors or exothermic welding (see NEC Article 250) for parts of a grounding system that are subject to corrosion, that must carry high currents reliably or for locations that require minimum maintenance.

6. Make connections to dry surfaces only. Where busbar ground connection points are not provided, remove paint, rust, oxides, scales, grease and dirt from surfaces before making connection. Sand clean a one square inch area, drill, tap or provide nut, and bolt 2 hole conductor lug to sanded area. Ensure proper conductivity.

7. Ground wire ends shall have a minimum amount of insulation removed from each weld or terminating ground lug and a minimum amount of wire end protruding from the weld.

8. Wire sizes larger than No. 2 AWG shall be exothermically welded at connecting ends.

G. Labeling shall be provided in compliance with Section 270553 Identification for Communication Systems.

3.03 DOCUMENTATION

A. See Section 270100, Paragraph 3.03.

3.04 GENERAL TESTING REQUIREMENTS

A. See Section 270100, Paragraph 3.04.

3.05 MAINTENANCE AND SUPPORT

A. See Section 270100, Paragraph 3.08.

3.06 CLEANING

A. See Section 270100, Paragraph 3.09.

3.07 ACCEPTANCE

A. See Section 270100, Paragraph 3.11.

B. Owner acceptance of the completed Customer Acceptance Plan.

END OF SECTION 270526

SECTION 270528

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. See Section 270100, Paragraph 1.01.

B. Section 270528 contains the technical specifications for Communication Pathways at the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project.

C. This Section includes the following:

1. Conduit, fittings and bodies, including multi-cell conduit
2. Plenum and Riser rated flexible raceway (innerduct) and fittings
3. Measured pull tape
4. Junction boxes, pull boxes and gutters

1.02 REFERENCES

A. See Section 270100, Paragraph 1.02.

1.03 RELATED sections

A. See Section 270100, Paragraph 1.03.

1.04 SCOPE OF WORK

A. All Telecommunication spaces and pathways shall be provided in accordance with ANSI/TIA 569-B Commercial Building Standard for Telecommunications Pathways and Spaces and the BICSI Telecommunications Distribution Methods Manual (TDMM).

1.05 QUALIFICATIONS

A. Project Qualifications: See Section 270100, Paragraph 1.05.A.

B. Organization Qualifications: See Section 270100, Paragraph 1.05.B.

1.06 SUBMITTALS

A. See Section 270100, Paragraph 1.06.

1.07 INTELLECTUAL PROPERTY

A. See Section 270100, Paragraph 1.07.

1.08 WARRANTY

A. See Section 270100, Paragraph 1.08.

1.09 QUALITY ASSURANCE

A. See Section 270100, Paragraph 1.09.

1.10 DELIVERY, STORAGE, AND HANDLING

A. See Section 270100, Paragraph 1.10.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers shall meet all specifications requirements and shall be approved by the Engineer.

2.02 MATERIALS

A. All conduits, fittings, junction and pull boxes shall be UL listed.

B. All conduits, fittings, junction and pull boxes shall comply with the NEC.

C. All conduit fittings, junction and pull boxes shall provide minimum cable bend radius as required.

D. All conduit fittings shall have plastic bushings on all exposed conduit ends.

E. Rigid Steel Conduit:

1. Conduit to be seamless, hot dipped galvanized rigid steel.
2. Threads to be cut and ends chamfered prior to galvanizing.
3. Galvanizing to provide zinc coating fused to inside and outside walls of conduit.
4. Provide an enamel lubricating coating on the inside of the conduit.
5. Conduit to conform to ANSI C80.1 and listed and labeled under UL 6

F. Rigid Aluminum Conduit:

1. Conduit to be seamless, 6063 alloy, T-1 temper.
2. Conduit to conform to FS WW-C-581d, ANSI C80.1, and UL 6.
3. Pass bending, ductility, and thickness of zinc coating in ANSI C80.1.

G. Intermediate Metal Conduit: Conduit to be seamless, hot dipped galvanized rigid steel. Threads to be cut and ends chamfered prior to galvanizing. Galvanizing to provide zinc coating fused to outside walls of conduit. Provide an enamel lubricating coating on the inside of the conduit. Conduit to be listed and labeled under UL 1242.

H. Electrical Metallic Tubing (EMT):

1. EMT fittings shall be formed steel compression ring type. Die cast fittings are not allowed.
2. EMT shall be UL listed and conform to NEC Article 300.22.
3. Shall be used inside buildings only.
4. Only manufacturer's fittings, transition adapters, terminators and fixed bends shall be used.
5. All transition junction and pull boxes, fittings terminators and adapters shall be a metallic material.

I. Raintight Sealing Hubs: Two piece type with outer internally-threaded hub to receive conduit, inner locking ring with bonding screw, insulated throat, and V shaped ring or O-ring.

1. Manufacturers: Thomas & Betts H series or Bridgeport

J. Conduit Bodies: Not permitted.

K. Conduit Fittings

1. All fittings shall be compression or threaded.
2. Fittings shall provide a secure connection for pulling communications cables.
3. Setscrew fittings are not permitted.
4. ANSI/NEMA FB 1; material to match conduit.
5. Couplings for rigid steel conduit and IMC to be single piece threaded, cadmium plated malleable iron. Conduit bodies may be aluminum.
6. Couplings for rigid aluminum conduit to be of aluminum construction, 6063 alloy.
7. Hubs for box connection to be two-piece with outer internally threaded hub to receive conduit and inner locking ring with bonding screw.
8. Expansion fittings shall allow for a minimum of four inches of movement and shall be similar to O-Z Gedney AX series, complete with bonding jumpers and hardware.

L. Flexible conduit is not permitted unless otherwise noted in a detail.

M. Non-metallic conduits are not permitted in above ground installations. Conversion fittings are required for non-metallic (below ground) to metallic (above ground) transitions.

N. Measured Pull Tape

1. Pre-lubricated, woven polyester, low friction, and high abrasion resistant yarn
2. Minimum average tensile strength shall be 1250 lbs. for 2 inch and smaller conduits and innerduct.
3. Minimum average tensile strength shall be 1800 lbs. for conduits larger than 2 inches.

O. Pull Boxes, Junction Boxes and Gutters

1. All junction boxes, gutters and pull boxes shall comply with NEC Article 314.
2. All junction boxes, gutters and pull boxes shall meet the following minimum material requirements:
   a. 16-gauge steel or heavier.
   b. Seams shall be continuously welded and grounded smooth.
   c. External screws and clamps.
   d. External mounting feet (where possible).
   e. Oil-resistant gasket and adhesive.
   f. ANSI 61 gray polyester powder coating inside and out over phosphatized surface.
   g. UL 50 type 12.
3. All junction boxes, gutters and pull boxes shall be provided with bushings for conduits and/or cabling.

4. All junction boxes shall be provided with a hinged cover. Where clearances do not allow full opening of hinged cover, bolt on covers with captive nuts shall be provided.
5. All junction boxes, gutters and pull boxes shall be securely installed.
6. All junction boxes, gutters and pull box configurations and sizes for single and multiple conduit runs shall comply with BICSI TDMM.

PART 3 - EXECUTION

3.01 EXAMINATION

A. See Section 270100, Paragraph 3.01.

B. Contractor's RCDD supervisor shall review and approve all shop drawings, coordination drawings and record drawings.

C. Verify conduit system is properly sized for cables (minimum 1 inch, unless otherwise noted in Drawings).

D. Verify general conduit route following Drawings.

E. Verify substrates to which work is connected and determine detail requirements for proper support.

F. Verify proper location and type of rough-in for conduit terminations.

3.02 INSTALLATION

A. See Section 270100, Paragraph 3.02.

B. All conduit couplings, and junction/pull box covers shall be painted white.

3.03 DOCUMENTATION

A. See Section 270100, Paragraph 3.03.

3.04 GENERAL TESTING REQUIREMENTS

A. See Section 270100, Paragraph 3.04.

3.05 MAINTENANCE AND SUPPORT

A. See Section 270100, Paragraph 3.08.

3.06 CLEANING

A. See Section 270100, Paragraph 3.09.

3.07 ACCEPTANCE

A. See Section 270100, Paragraph 3.11.

END OF SECTION 270500

SECTION 270553

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. See Section 270100, Paragraph 1.01.

B. Section 270553 contains the technical specifications for Identification for Communications Systems at the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project.

C. This section includes the following:

1. Identification for raceway and metal-clad cable.
2. Equipment identification labels.
3. Identification for enclosures.

1.02 REFERENCES

A. See Section 270100, Paragraph 1.02.

1.03 RELATED SECTIONS

A. See Section 270100, Paragraph 1.03.

1.04 SCOPE OF WORK

A. All telecommunication components, areas, and cables shall be labeled, including but not limited to:

1. Telecommunications Rooms.
2. Fiber Optic Cables and Individual Strands and bundles.
3. Metallic Cable.
4. Ground Points.
5. Cross-connect Fields.
6. Exterior Enclosures.
7. Cable Tray.
8. Conduit Ends (pathways).
9. Pull Boxes and Junction Boxes.
10. Equipment Racks and Cabinets.
11. Copper and Fiber Patch Panels.
12. Cables in Pull Boxes.
13. Patch Cables/Jumpers.

B. Pathways shall be defined but not limited to: any conduit, innerduct, underground duct bank, wiring troughs, pull boxes, and any wiring systems used to enclose cabling of any type.

C. Labeling guidelines shall be TIA/EIA 606-A Administration Standards for Telecommunication Infrastructure of Commercial Buildings with Owner specific asset nomenclature.

D. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

E. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

F. Coordinate installation of identifying devices with location of access panels and doors.

G. Install identifying devices before installing acoustical ceilings and similar concealment.

1.05 QUALIFICATIONS

A. Project Qualifications: See Section 270100, Paragraph 1.05.A.

B. Organization Qualifications: See Section 270100, Paragraph 1.05.B.

1.06 SUBMITTALS

A. See Section 270100, Paragraph 1.06.

1.07 INTELLECTUAL PROPERTY

A. See Section 270100, Paragraph 1.07.

1.08 WARRANTY

A. See Section 270100, Paragraph 1.08.

1.09 QUALITY ASSURANCE

A. See Section 270100, Paragraph 1.09.

1.10 DELIVERY, STORAGE, AND HANDLING

A. See Section 270100, Paragraph 1.10.

1.11 COMMISSIONING

A. See Section 270100, Paragraph 1.11.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers shall meet all specifications requirements and shall be approved by the Engineer.

2.02 GENERAL REQUIREMENTS

A. Labeling guidelines are TIA/EIA 606-A Administrative Standard for Commercial Telecommunications Infrastructure and all active Addendums with Owner specific asset nomenclature.

B. All label material shall be suitable for intended usage and environment, meeting the legibility, defacement and general exposure requirements listed in UL 969 for indoor and outdoor use. Where insert labels are used the insert label shall be covered with clear cover and securely held in place.

C. Interior labeling: printer shall be of the thermal transfer type capable of printing self laminating labels of various size up to and including 1.5"by 1.5" printable area with a 4.5" self laminating tail. No non-self-laminating labels shall be approved.

D. All labels shall be permanent, i.e. shall not fade, peel, or deteriorate due to environment or time.

E. Handwritten labels are not acceptable.

2.03 CONDUITS AND PATHWAYS

A. Conduits: General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive, trade name, "Mondo Bondo" (Brady) or Approved Equivalent. Label size shall be appropriate for the conduit size. Font size shall be easily visible from the finished floor.

B. Innerduct: Polyethylene general-purpose tagging material, Brady part number PTL-12-109 (.75 X 3.00) used with an R4310 ribbon or approved equivalent. This tag shall be attached using tie wraps.

C. Junction boxes (larger than four-inch x four-inch): General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive, trade name, "Mondo Bondo", Brady part number PTL-43-483 (1.90 X continuous) used with an R6010 ribbon or approved equivalent Font size shall be easily visible from the finished floor.

D. Junction boxes (four-inch x four-inch): General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive, trade name, "Mondo Bondo", Brady part number PTL-42-483 (1.00 X continuous) used with an R6010 ribbon or approved equivalent.

2.04 BACKBONE AND HORIZONTAL CABLE AND TERMINATIONS

A. Fiber termination hardware (cover): General purpose label designed for powdered coated surfaces, trade name, "Mondo Bondo", Brady part number PTL-42-483 (1.00 X continuous) used with an R6010 ribbon or approved equivalent.

B. Fiber termination hardware (designation strip): Thermal transfer printable label with a permanent acrylic adhesive, Brady part number PTL-10-423 (.75 X .25) used with an R6010 ribbon or approved equivalent.

C. Patch panels: Gloss white film with a permanent acrylic based adhesive, Brady part number PTL-39-422 (.375 X .60) used with an R6010 ribbon or approved equivalent.

D. 110 Copper termination hardware: Laser printable, non-adhesive label designed for 110 terminal block marking, Brady part number LAT-177-124 (available in various colors) or approved equivalent.

E. Modular Faceplate: Highly durable, non-adhesive, polypropylene tag stock used for thermal transfer printing of faceplate designation strip, Brady part number PTl-40-412 (1.938 x .375) used with an R6210 ribbon or approved equivalent.

F. Horizontal cabling, patch cords, inside copper and low pair count (12 strands or less) fiber optic cable: Permanent acrylic adhesive, self-laminating vinyl wire and cable identification, Brady part number PTL-31-427 (1.00 X 1.50 X .50) used with an R4310 ribbon or approved equivalent.

G. Outside plant copper cable: Permanent acrylic adhesive, self-laminating vinyl wire and cable identification, Brady part number PTL-34-427 (1.50 X 6.00 X 1.50) used with an R4310 ribbon or approved equivalent.

H. Inside and outside plant fiber cables: Permanent acrylic adhesive, self-laminating vinyl wire and cable identification, Brady part number PTL-33-427 (1.50 X 4.00 X 1.00) used with an R4310 ribbon or approved equivalent.

PART 3 - EXECUTION

3.01 EXAMINATION

A. See Section 270100, Paragraph 3.01.

3.02 INSTALLATION

A. See Section 270100, Paragraph 3.02.

B. Verify identity of each item before installing identification products.

C. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

D. Apply identification devices to surfaces that require finish after completing finish work.

E. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

F. System Identification Color Banding for Raceways: Each color band shall completely encircle conduit. Locate bands at changes in direction, at penetrations of walls and floors, and at 20-foot maximum intervals.

G. Painted Identification: Prepare surface and apply paint according to Division 09 painting Sections.

H. Conduits and Junction/Pull Boxes:

1. All conduits, innerduct, junction boxes, gutters and pull boxes shall be labeled.

2. Conduits shall be labeled with the word "communications" and the conduit's origination room number and destination room number. Permanent room identifiers shall be used.

3. Label conduit every 50 feet, at each wall and floor penetration and at each conduit termination, such as outlet boxes, pull boxes, and junction boxes, or as otherwise specified in other Sections.

4. Junction boxes, gutters and pull boxes shall be labeled with identification name or number as determined by Contractor and submitted for approval.

5. Labels on conduits, junction boxes, gutters and pull boxes shall be machine-generated and easily visible from the finished floor.

I. Labeling System:

1. Premises and station cabling and wiring shall include all copper, fiber, and coaxial cable within a building from a building entrance terminal, (BET) through communications rooms and closets up to a point proximate of a tenant demarcation, if a tenant is involved, or to the operating jack if no tenant is involved.

2. Horizontal and vertical fiber and copper cable and wire connecting IDFs are identified by the building number, by the originating and terminating IDF, and by the type and number of fibers or copper wires. Cables are numbered sequentially. The 12-character labeling format is as follows:

a. aa - 2-character identifier for type cable

1) "fs" for SM fiber
2) "fm" for MM fiber
3) "sm" for combined SM and MM fiber
4) "cp" for copper premises
5) "cx" for coax

b. xx - 2-digit number of the originating IDF room or closet, normally the IDF closet to the MDF.

c. xx - 2-digit number of the terminating IDF room or closet

1) Temporary room identifiers may be used during building construction
2) Final as-built drawings must show room numbers assigned by the Design Consultants or Owner's representative in order for the drawing to be accepted

d. xxxx - 4-digit number indicating the number of fibers or copper wires

e. xx - 2-digit sequential cable number, e.g., 01, 02, etc.

3. The following 12 character labeling procedures apply to station cable and wiring:

a. aa - 2-character station identifier for type of cable

1) "cs" for copper station
2) "fs" for fiber station
3) "cf" for copper and fiber service
4) "xs" for coax station
5) "xc" for coax and copper service
6) "sf" for coax and fiber service

b. xxxx - 5-digit numerical room number

1) Temporary room identifiers may be used during building construction
2) Final as-built drawings must show room numbers assigned by the Design Consultants and/or Owner's Representative in order for the drawing to be accepted

c. x - 1-digit number identifying the purpose of the cable

1) 1 for data
2) 2 for voice
3) 3 for analog video
4) 4 for digital video

d. aa - 1-character or 2-character alpha or alphanumeric identification of a wall jack, beginning with "A" or "AA" and sequentially proceeding clockwise around their room from the main room entrance

e. xx - 2-digit number of the station termination

3.03 DOCUMENTATION:

A. See Section 270100, Paragraph 3.03.

3.04 GENERAL TESTING REQUIREMENTS

A. See Section 270100, Paragraph 3.04.

3.05 MAINTENANCE AND SUPPORT

A. See Section 270100, Paragraph 3.08.

3.06 CLEANING

A. See Section 270100, Paragraph 3.09.

3.07 ACCEPTANCE

A. See Section 270100, Paragraph 3.11.

END OF SECTION 270533

SECTION 271500

COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. See Section 270100, Paragraph 1.01.

B. Section 271500 contains the technical specifications for Communications Horizontal Cabling at the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project.

C. This Section includes copper horizontal cabling, termination hardware and patch cables.

1. UTP Copper: Category 6 rated horizontal cabling with related components.

2. Fiber Optic: Single mode and 50 µm Laser Optimized Multimode (horizontal distribution).

D. Performance Requirements: Horizontal cabling system shall comply with transmission standards listed in Section 270100, Paragraph 1.2.

E. Contractor shall obtain the most recent version of the H-JAIA Cabling Standards prior to starting work. This document will supersede any other document or instructions by any non DOA individual, Owner's Representative and/or Design Consultants.

1.02 REFERENCES

A. See Section 270100, Paragraph 1.02.

1.03 RELATED SECTIONS

A. See Section 270100, Paragraph 1.03.

1.04 SCOPE OF WORK

A. Provide all horizontal cabling, terminating hardware, adapters, and cross-connecting hardware necessary to connect work area outlets to the structured cabling system (SCS).

B. Horizontal cable and its connecting hardware shall provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.

2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.

3. Bridged taps and splices shall not be installed in the horizontal cabling.

4. Splitters shall not be installed as part of the optical fiber cabling.

C. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) in the horizontal cross-connect.

D. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.05 QUALIFICATIONS

A. Project Qualifications: See Section 270100, Paragraph 1.05.A.

B. Organization Qualifications: See Section 270100, Paragraph 1.05.B.

1.06 SUBMITTALS

A. See Section 270100, Paragraph 1.06.

B. Product Data: Include data sheets on features, ratings, and performance for each component specified.

C. Shop Drawings: Include dimensioned plan and elevation views of each individual component. Show equipment assemblies, method of field assembly, workspace requirements, and access for cable connections.

1. System labeling schedules, including electronic copy of labeling schedules, as specified in Part 3, in software and format selected by the Design Consultants or Owner's representative's Technical Representative.

2. Wiring diagrams. Show typical wiring schematics including the following:

a. Workstation outlets, jacks, and jack assemblies.

b. Patch cords.

c. Patch panels.

D. Cable Administration Drawings: As specified in Part 3.

E. Samples: For workstation outlets, jacks, jack assemblies, and faceplates for color selection and evaluation of technical features.

F. Product Certificates: For each type of cable, connector, and terminal equipment, signed by product manufacturer.

G. Qualification Data: For firms and persons specified in Quality Assurance Section, provide evidence of applicable registration or certification.

H. Field quality-control test reports.

I. Operation and Maintenance Data: For voice and data communication cabling to be included in emergency, operation, and maintenance manuals.

1.07 INTELLECTUAL PROPERTY

A. See Section 270100, Paragraph 1.07.

1.08 WARRANTY

A. See Section 270100, Paragraph 1.08.

1.09 QUALITY ASSURANCE

A. See Section 270100, Paragraph 1.09.

B. Contractor Qualifications: System installer must have on staff a registered communication distribution designer, (RCDD), certified by Building Industry Consulting Service International (BICSI).

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70.

1.10 DELIVERY, STORAGE, AND HANDLING

A. See Section 270100, Paragraph 1.10.

B. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system (where applicable) is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

C. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.01 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden Inc.
2. CommScope, Inc.
3. Mohawk
4. Panduit
5. Approved equivalent

B. Horizontal copper cable shall be Category 6 four pair UTP as specified in the Drawings.

C. Cable jacket shall comply with NEC Article 800 for use as a plenum cable and shall be UL and c (UL) Listed Type CMP (communications multipurpose plenum).

D. Cable shall terminate on an eight-pin modular jack at each outlet. All horizontal cabling shall meet or exceed the ANSI/EIA/TIA-568-C

E. Cables shall be marked as UL verified with a minimum of Category 6A rating.

F. The cable shall support Voice, Analog Baseband Video/Audio, Fax, Modem, Switched-56, T-1, ISDN, RS-232, RS-422, RS-485, 10BASE-T Ethernet, Token Ring, 100Mbps TP-PMD, 100BASE-T Ethernet, 10 Gbps Ethernet, , as well as all 77 channels (550 MHz) of analog broadband video.

G. The maximum horizontal cable length for horizontal copper UTP cable from the termination of the cable in the communications room to the outlet is 90 meters.

H. Cables for outlets at equipment and anesthesia booms shall have stranded conductors.

2.02 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden Inc.
2. Hubbell Premise Wiring.
3. Leviton Voice & Data Division.
4. Panduit Corp.
5. Ortonics
6. Other Approved Equivalent

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair UTP cable indicated.
2. Printed port numbers and label holder.
3. Rear cable management bar.
4. Installation of patch panels shall include bonding patch panels to telecommunications room grounding system and follow manufacturer's standard practices for terminating shield in F/UTP cable connectors and accessories.

F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

G. Patch Cords: Factory-made, four-pair cables; terminated with eight-position modular plug at each end. Provide 9-foot lengths for patch cords in communications rooms. Provide 48-inch patch cords at outlets.

1. Retain one of two subparagraphs below; retain first for Category 6, second for Category 5e patch cords.
2. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
3. Patch cords shall have color-coded boots for circuit identification.

4. Provide patch cord at each terminated horizontal cable, in communications room and at outlet.
5. Patch cords at outlets for wireless access points and cameras shall be plenum rated.

2.03 COPPER TERMINATION HARDWARE

A. Copper Patch Panels

1. Component certified to meet or exceed Category 6 standards.
2. Configuration: Modular RJ-45 non-keyed 8-position jack port to 110 printed circuit board, factory pre-wired, Category 6 standards, EIA/TIA T568A, active pins: 1 through 8, connection hardware: IDC PCB (printed circuit board) mounted connector for 22-26 AWG.
3. Individual patch panel size not to exceed 48 ports, black finish.
4. The termination block on the patch panel shall support the appropriate Category 6 applications and facilitate cross connection and inter connection using modular patch cords.
5. All modular cross connect panels shall be UL listed.

B. Work Area Outlets

1. 8P8C non-keyed modular outlets ANSI/TIA/EIA-568-A compliant for Category 6 transmission requirements
2. T568A eight-position jack pin/pair assignments
3. Faceplates shall be white, ivory or stainless steel to match electrical outlets.
4. Wall Phone Plates: Single jack wall plates shall be stainless steel, contain RJ45 eight conductor jacks and accept standard wall phones.
5. 2.5 inch deep depending on application to provide adequate clearance for cable bend radius.

2.04 COPPER PATCH CABLES

A. Provide a Category 6 Modular Patch Cord for each installed port at field devices and at Communications Room connection of field device ports to network switches.

B. Provide a Category 6 Modular Patch Cord for connecting equipment in the Communications Rooms to network switches.

C. Patch cables shall be performance and impedance matched with horizontal cables and provided by the same manufacturer of the horizontal cable.

D. All Category 6 patch cables shall conform to the referenced requirements and standards.

E. Cords shall be equipped with an eight-pin modular connector on each end and shall be of appropriate length for application.

F. All Category 6 cordage shall be round, and consist of 24 AWG minimum copper, stranded conductors, tightly twisted into individual pairs.

G. Maximum equipment cable length from the work area outlet to the device should be limited to 3 meters (9 feet). Maximum cable length for jumpers and patch cords in the communications room should be limited to 7 meters (21 feet).

H. Provide patch cables sized to routing requirements.

2.05 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden Inc.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Corning Cable Systems.
5. General Cable Technologies Corporation.
6. Superior Essex Inc.

B. Horizontal Fiber Optic Cable General Requirements

1. Fiber optic cable shall be of tight buffered, non gel-filled design, provided in counts as indicated on the Drawings.
2. Fiber optic cable shall be certified to meet all parts of TIA/EIA-455 and comply with TIA/EIA-492, ISO/IEC 11801, ANSI/ICEA S-83-596 and ANSI/ICEA S-83-640 and the NEC.
3. Fibers shall have D-LUX coating or approved equivalent to ensure color retention, minimize microbending losses and improve handling. The coating shall be mechanically strippable.
4. Cable installed in plenums or air-handling spaces shall meet UL 910 and shall be marked OFNP (optical fiber non-conductive plenum) in accordance with the NEC.
5. Plenum-rated cable consisting of multiple fibers shall have a Plenum PVC outer jacket. Each group of fibers shall have a color-coded Low Smoke PVC buffer. The buffered fibers are organized in subunits of fibers, reinforced with aramid yarn for extra strength and surrounded with a color-coded low smoke tube.
6. No cabling shall be placed in plenum without written permission from the Owner.
7. Fiber optics conductors shall follow standard color code schemes. Fiber numbers and binders shall correspond to the color codes as follows:

a. Fiber/Binder No. 1 – blue.
b. Fiber/Binder No. 2 – orange.
c. Fiber/Binder No. 3 – green.
d. Fiber/Binder No. 4 – brown.
e. Fiber/Binder No. 5 – slate.
f. Fiber/Binder No. 6 – white.
g. Fiber/Binder No. 7 – red.
h. Fiber/Binder No. 8 – black.
i. Fiber/Binder No. 9 – yellow.
j. Fiber/Binder No. 10 – violet.

k. Fiber/Binder No. 11 – rose.

l. Fiber/Binder No. 12 – aqua.

8. The fiber optic cable shall be shipped on reels in lengths as specified with a minimum overage of 10 percent.

9. The cable shall be wound on the reel so that unwinding can be done without kinking the cable.

10. Two meters of cable at both ends of the cable shall be accessible for testing.

11. Marking: Each reel shall have a permanent label attached showing length, cable identification number, cable size, cable type, attenuation, bandwidth, and date of manufacture. Labels shall be water resistant and the writing on the labels shall be indelible.

12. Cable Minimum Bending Radius:

a. During Installation: 20 times cable diameter

b. After Installation: 10 times cable diameter

13. Operating Range: -76°F to 185°F (-60°C to 85°C).

14. Storage Temperature Range: -40°F to 149°F (-40°C to 65°C).

15. All fiber optic cable outside of communications rooms not encased in conduit or innerduct must be armor-jacketed with proper outer covering.

C. Multimode Fiber Requirements

1. Multimode fiber shall be OM3 grade and meet the requirements of EIA/TIA-492AAAC-A, "Detail Specification for 850-nm Laser-Optimized, 50 micron Core Diameter/125 micron Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers."

2. Fibers shall have dual wavelength capability; transmitting at 850 and 1300 nm ranges.

3. Laser optimized 50 micron ± 2.5 micron core.

4. 125 micron ± 2 micron cladding diameter.

5. Cladding non-circularity: ≤ 1%.

6. Colored coating diameter: 250 micron ± 10 micron.

7. Minimum tensile strength: 100,000 psi.

8. Maximum Attenuation: 3.5 dB/km at 850 nm and 1.5 dB/km at 1300 nm.

9. Minimum Bandwidth: 2000 MHz at 850 nm and 500 MHz at 1300 nm.

D. Single Mode Fiber Requirements

1. Single mode fiber shall be Reduced Water Peak grade and meet EIA/TIA-492CAAB, "Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak," ITU recommendation G.652, "Characteristics of a single-mode optical fiber cable," and IEC 60793-2-50 Type B1.3.

2. Fibers shall have dual wavelength capability; transmitting at 1310 and 1550 nm ranges.

3. 8.3 micron core
4. 125 micron ± 0.7 micron cladding diameter
5. Cladding non-circularity: ≤ 1%
6. Core/cladding concentricity error: ≤ 0.5 micron
7. Colored coating diameter: 250 micron ± 10 micron
8. Maximum Attenuation: 0.70 dB/km at 1310 nm and 0.70 dB/km at 1550 nm

2.06 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. ADC.
   2. Berk-Tek; a Nexans company.
   3. Corning Cable Systems.
   4. Leviton Voice & Data Division.
   5. Hubbell Premise Wiring.

B. Cross-Connects and Patch Panels: Modular panels housing multiple adapter plates.
   1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
   2. Adapter plates shall contain 24 LC terminations each.

C. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths with LC connectors.

D. Cable Connecting Hardware:
   1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-C.3.
   2. Quick-connect, simplex and duplex, Type LC connectors. Insertion loss not more than 0.75 dB.

2.07 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-C.1.

B. Workstation Outlets: One, two, three, four or six-port-connector assemblies mounted in single or multigang faceplate.
   1. Plastic Faceplate: High-impact plastic. Coordinate color with Division 26 Section "Wiring Devices."
   2. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
      a. Flush mounting jacks, positioning the cord at a 45-degree angle.
   3. Legend: Machine printed, in the field, using adhesive-tape label.
   4. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.08 GROUNDING

A. Comply with requirements in Division 27 Section "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.09 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A. and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Division 27 Section "Identification for Communications Systems."

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-C.0.

C. Factory test UTP cables according to TIA/EIA-568-C.0.

D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-C.0.

E. Cable will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 EXAMINATION

A. See Section 270100, Paragraph 3.01.

3.02 INSTALLATION

A. See Section 270100, Paragraph 3.02.

B. Wiring Methods:

1. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

a. Install plenum cable in environmental air spaces, including plenum ceilings.

b. Comply with requirements for raceways and boxes specified in Division 27 Section "Pathways for Communications Systems."

2. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

3. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

C. Comply with NECA 1.

D. General Requirements for Cabling:

1. Comply with TIA/EIA-568-C.1.

2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:
   a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
   b. Locate consolidation points for UTP at least 49 feet (15 m) from communications equipment room.
5. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
11. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

E. UTP Cable Installation:
   1. Comply with TIA/EIA-568-C.2.
   2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.
   3. F/UTP cable shields shall be terminated at information outlets according to manufacturer installation instructions.

F. Optical Fiber Cable Installation:
   1. Comply with TIA/EIA-568-B.3.
   2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

G. Open-Cable Installation:
   1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.

2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

H. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

I. Group connecting hardware for cables into separate logical fields.

J. Firestopping

1. Comply with requirements in Division 07 Section "Penetration Firestopping."
2. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
3. Comply with BICSI TDMM, "Firestopping Systems" Article.

K. Grounding

1. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
2. Comply with ANSI-J-STD-607-A.
3. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
4. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.03 DOCUMENTATION

A. See Section 270100, Paragraph 3.03.

3.04 GENERAL TESTING REQUIREMENTS

A. See Section 270100, Paragraph 3.04.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-C.0.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C.0. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

    b. Link End-to-End Attenuation Tests:

        1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
        2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

6. UTP Performance Tests:

    a. Test for each outlet. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

        1) Wire map.
        2) Length (physical vs. electrical, and length requirements).
        3) Insertion loss.
        4) Near-end crosstalk (NEXT) loss.
        5) Power sum near-end crosstalk (PSNEXT) loss.
        6) Equal-level far-end crosstalk (ELFEXT).
        7) Power sum equal-level far-end crosstalk (PSELFEXT).
        8) Return loss.
        9) Propagation delay.
        10) Delay skew.

7. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to TIA/EIA-568-C.0 and TIA/EIA-568-B.3.

8. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.

    a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.

b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.05 PERFORMANCE TESTING

A. Test all cables in accordance with referenced standards and manufacturer's recommended testing procedures

B. Test all Fiber cables in accordance with referenced standards and manufacturer's recommended testing procedures.

1. OTDR testing shall be performed for each fiber strand in each direction.

3.06 MAINTENANCE AND SUPPORT

A. See Section 270100, Paragraph 3.08.

3.07 CLEANING

A. See Section 270100, Paragraph 3.09.

3.08 ACCEPTANCE

A. See Section 270100, Paragraph 3.11.

END OF SECTION 271500

SECTION 273000

VOICE COMMUNICATIONS SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. See Section 270100, Paragraph 1.01.

B. Section 273000 contains the technical specifications for the Voice Communications systems for the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project.

1.02 REFERENCES

A. See Section 270100, Paragraph 1.02.

B. Acronyms and Definitions.

1. ABBH Average Bouncing Busy Hour.
2. ATA Analog Telephone Adapter.
3. AIOD Automatic Identification of Outward Dialing.
4. CLID Calling Line Identification.
5. CNID Calling Number Identification.
6. CSU Channel Service Unit.
7. DID Direct Inward Dialing.
8. DN Directory Number.
9. DSCP Differentiated Services.
10. DHCP Dynamic Host Configuration Protocol.
11. DTMF Dual Tone Multi-Frequency.
12. IETF Internet Engineering Task Force.
13. ID Identification.
14. LAN Local Area Network.
15. LCD Liquid Crystal Display.
16. MAC Moves, Adds and Changes.
17. MPLS Multi-Protocol Label Service.
18. PBX Private Branch Exchange.
19. PoE Power over Ethernet.
20. PSAP Public Safety Answering Point.
21. PSTN Public Switched Telephone Network.
22. QoS Quality of Service.
23. SCP Secure Copy Protocol.

24. SCCP Skinny Client Control Protocol.
25. SIP Session Initiated Protocol.
26. SNMP Simple Network Management Protocol.
27. SNTP Simple Network Time Protocol.
28. SSH Secure Shell Protocol.
29. STS Shared Tenant Services.
30. TDM Time Division Multiplexing.
31. VLAN Virtual Local Area Network.
32. VoIP Voice over Internet Protocol.
33. VPN Virtual Private Network.
34. TDD Telephone Device for the Deaf.
35. TDM Time Division Multiplexing.
36. UM Unified Messaging.
37. XML Extensible Markup Language.

1.03 RELATED SECTIONS

A. See Section 270100, Paragraph 1.03.

1.04 SCOPE OF WORK

A. Provide telephone handsets at specified locations and associated programming to add the handsets to the telephone system.

B. Structured communication infrastructure and LAN data networking provided by other Contractors shall be utilized. Deficiencies impacting Voice Systems functionality or Warranties shall be coordinated with the appropriate Contractor for resolution.

1.05 QUALIFICATIONS

A. See Section 270100, Paragraph 1.05.

1.06 SUBMITTALS

A. See Section 270100, Paragraph 1.06.

B. The Contractor shall provide one sample of each type of the following for approval:

1. Each Telephone Set type.
2. The Contractor shall provide the following for approval:
3. Telephone Configuration Plan.
   a. Implementation Plan.
   b. Testing Plan.
   c. Warranty and optional Extended Warranty.

C. Record inventory data shall be provided for:

1. All systems, components and spares to include manufacturer name, model number, version/vintage, quantity, location.

2. Hardware and equipment documentation.
3. Software documentation.
4. System administrator documentation and system manuals.

D. As Built information shall include:

1. Equipment manufacturer name, model number, version/vintage, quantity, location.
2. Hardware and equipment documentation.
3. Software documentation.
4. System administrator documentation and system manuals.
5. All cable cross-connections, cable pair and patching provided.
6. All equipment installed, including: assigned telephone number, telecommunications outlet port, equipment location, model, and software version.

1.07 INTELLECTUAL PROPERTY

A. See Section 270100, Paragraph 1.07.

1.08 WARRANTY

A. See Section 270100, Paragraph 1.08.

1.09 QUALITY ASSURANCE

A. See Section 270100, Paragraph 1.09.

1.10 DELIVERY, STORAGE AND HANDLING

A. See Section 270100, Paragraph 1.10.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, utilize the MHJIT existing telephone system manufacturer.

2.02 TELEPHONE REQUIREMENTS

A. Telephone handsets shall be Avaya 9640 series.

B. VoIP devices, software and handsets shall support the following industry based, standard protocols and specifications:

1. 10/100 Mbps Ethernet built-in port.
2. 1000 Mbps Ethernet built-in port optional.
3. 802.1p/Q VLAN Tagging and QoS.
4. DHCP.
5. SNTP.
6. IETF SIP.
7. DTMF relay capabilities.
8. Wideband audio.
9. Audio Codecs: G.711, G.722, G.729a.

10. Multi-lingual support.
11. 802.3af Power over Ethernet (PoE).
12. Extensible Markup Language (XML) browser.

PART 3 - EXECUTION

3.01 EXAMINATION

A. See Section 270100, Paragraph 3.01.

B. Contractor shall ensure adequate environmental conditions, telecommunications infrastructure, LAN, electrical power, grounding, physical security, access and other requirements are provided as necessary before installation of Voice Communications Telephone Sets.

3.02 INSTALLATION

A. See Section 270100, Paragraph 3.02.

B. Install all equipment hardware and software in accordance with contract specifications and drawings, manufacturer requirements and approved submittal data.

C. Provide patch cords for interconnection of Voice System head-end equipment in lengths as required and in compliance with Specification 271000.

D. The Contractor shall coordinate with the Network Contractor to provide the following:

1. LAN configurations required for proper VoIP communications.

E. All system components shall be clearly labeled per ANSI/TIA 606-B and Owner specific nomenclature.

3.03 DOCUMENTATION

A. See Section 270100, Paragraph 3.03.

3.04 GENERAL TESTING REQUIREMENTS

A. See Section 270100, Paragraph 3.04.

B. The Contractor shall coordinate with the Owner to develop an approved Test Plan to address all testing requirements.

C. Testing shall follow the manufacturer's installation guide and recommend testing.

D. Testing shall address all requirements identified in this specification and test all contractor supplied cabling and hardware components. The plan shall follow accepted industry testing practices and have a method of independent verification described.

E. The Test Plan shall provide specific testing procedures and expected results to verify performance parameters and requirements of each voice communications system has been achieved, to include:

1. All manufacture recommended testing.
2. Each telephone set and PBX line for proper location, telephone device type, out-calling capability, correct extension number labeling, and confirm CPND function.

F. The Test Plan shall include simulated disaster survivability and include failure of each major component and trunk group. Survivability testing shall be limited to complete failure of only one component or link at a time.

G. Any specified item that does not satisfy the requirements of this specification shall be replaced, upgraded, or added by the contractor as necessary to correct the noted deficiencies. After correction of a noted deficiency, re-testing shall be performed to verify the effectiveness of the corrective action.

H. The Contractor shall perform all tests and adjustments prior to the system demonstration and acceptance testing.

I. The Contractor shall provide previously submitted and approved test instrumentation. Permanent trained personnel shall perform all tests with no exceptions.

J. All test procedures, expected results, individual test results, corrective actions, retesting and related information shall be included as part of the as-built documentation.

3.05 MAINTENANCE AND SUPPORT

A. See Section 270100, Paragraph 3.08.

B. On-site and remote Voice Communications and adjunct systems monitoring, maintenance and repair service shall be available 24 x 7 x 365 with access to site diagnostics within 15 minutes, and repair equipment and on-site technician assistance provided within four (4) hours from the initial outage report.

C. Routine periodic software patches and point updates shall be provided for each software application and operating system.

D. Provide depot repair service option for telephone sets.

3.06 CLEANING

A. See Section 270100, Paragraph 3.09.

3.07 ACCEPTANCE

A. See Section 270100, Paragraph 3.11.

END OF SECTION 273000

SECTION 274216

MULTI-USER FLIGHT INFORMATION DISPLAY SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. See Section 270100, Paragraph 1.01.

B. Section 274216 contains the technical specifications for Multi-User Flight Information Display System to be provided in the Concourse F Gate 3 project at Hartsfield-Jackson Atlanta International Airport. (HJAIA).

C. This Section includes the following:

1. This Section includes the description for installation of displays which are and extension of the existing Multi-User Flight Information Display System (MUFIDS) provided by INFAX.

1.02 REFERENCES

A. See Section 270100, Paragraph 1.02.

1.03 RELATED SECTIONS

A. See Section 270100, Paragraph 1.03.

1.04 SCOPE OF WORK

A. Contractor: The Contractor shall perform the following services and provide the following equipment, services, and documentation:

1. Contractor shall perform all Work, integration, engineering design, and testing, and shall provide all products required in order to ensure a fully operative system and proper installation of equipment. System operability and proper installation shall be verified via successful completion of all Test Plans.

2. Provision and installation of hardware, servers, display devices, LCDs, PCs, DDCs, video extenders and other equipment as specified for the MUFIDS.

3. Provision and installation of conduit, cabling, patch cords, and other equipment as specified in specification section 271500 – Communications Horizontal Cabling.

4. Integration with Public Address system for sending and receiving data.

5. Final design work for the MUFIDS such that the implemented systems meet the functional, operational, and performance requirements specified herein.

6. Installation, programming and setup of the MUFIDS (hardware and software).

7. Documentation (hardware and software).

8. System Warranty as specified.

9. System Final Testing and Acceptance Plan as specified.

10. Maintenance and support as specified.

11. Coordination with other system providers and Contractors to ensure all external system interfaces are fully functional.

12. Provide all project documentation and Submittals.
13. Provide calculations and/or analysis to support design decisions.
14. Provide and pay for all labor, materials and equipment. Pay required sales, gross receipts and other taxes.
15. Secure and pay for plan check fees, permits, fees and licenses necessary for execution of Work as applicable for the Project.
16. Give required notices.
17. Comply with all codes, ordinances, regulations, and other legal requirements of public authorities that bear on performance and execution of the work.
18. Contractor shall provide weekly progress status reports to engineer of record.

B. Others: The following services and equipment will be provided by others:

1. All millwork for displays and equipment structures (the Contractor will coordinate hardware selection and installation with the related millwork provider to ensure proper fit, ventilation, cable routing, etc.).
2. LAN equipment. Contractor shall coordinate with LAN contractor to ensure LAN is provisioned for MUFIDS.

1.05 QUALIFICATIONS

A. Project Qualifications: See Section 270100, Paragraph 1.05.A.

B. Organization Qualifications: See Section 270100, Paragraph 1.05.B.

C. The Contractor must have been in the business of selling and installing INFAX systems at airports for a minimum of five (5) years. The firm must have been actively engaged in installing, maintaining, and operating similar systems and services as outlined in this document.

D. The firm must have a minimum of three (3) sites that are actively using INFAX systems, and each of those sites must be currently in operation, and have been in operation for at least the preceding twelve (12) months. The Contractor is required to submit information regarding a minimum of three (3) reference sites that are actively using the same or similar systems. The sites should be for airports of a similar size in terms of number of displays, airlines, and operations. This reference information shall include the contact name, address, telephone number, and date of original installation for each reference site listed. Additionally, for each reference site detail the features that make it a qualified site (e.g., final system acceptance date, number of workstations, etc.).

1.06 SUBMITTALS

A. See Section 270100, Paragraph 1.06.

1.07 INTELLECTUAL PROPERTY

A. See Section 270100, Paragraph 1.07.

1.08 WARRANTY

A. See Section 270100, Paragraph 1.08.

B. General: The Contractor shall provide a joint written Warranty of the manufacturer(s) and the installer(s), on a single document, which shall warrant complete installation of the equipment, system, and software to be free from defects in materials and workmanship for a period of no less than sixty (60) months. The contractor shall

warrant the system supplied does not use the intellectual property of any third party without appropriate license for the use of said intellectual property. The starting point for the warranty shall be from the final system acceptance after all punch lists items have been satisfactorily met.

C. Hardware Warranty:

1. The Contractor shall warrant that the proposed equipment will conform to its description and any applicable Specifications, and shall be of good quality for the known purpose for which it is intended.

2. The warranty shall allow for the contractor to perform either a repair or replacement of defective equipment which is not covered by the contractor's service offering. The choice of repair or replacement will be at the discretion of Owner.

D. Software Warranty:

1. The Warranty shall allow for replacement or repair at the discretion of Owner. All software necessary to compile, modify, and maintain software developed for this Specification shall be included in this Warranty.

2. The Warranties shall include the price of all software upgrades during the Warranty period.

E. Software License:

1. All required software licenses shall be identified and supplied by the Contractor.

2. All software licenses and warranties shall be registered in the name of the Owner. The licenses shall include all executable, library, object, and source code required to maintain and modify the delivered product.

3. Commercial software packages shall have all registration and licensing documentation indicating Hartsfield-Jackson Atlanta International Airport as the Owner of the software.

1.09 QUALITY ASSURANCE

A. See Section 270100, Paragraph 1.09.

B. Materials and equipment: Equipment shall be rated for continuous operation under the ambient environmental temperature, humidity, and vibration conditions encountered at the installed location. The equipment shall meet the following requirements:

1. Interior controlled environment: 60 to 100-degrees F dry bulb and twenty to ninety percent (20% to 90%) relative humidity, non-condensing.

2. Interior, uncontrolled environment: 0 to 130-degrees F dry bulb and ten to ninety-five percent (10% to 95%) relative humidity, non-condensing.

3. Exterior environments:

a. Minus 30-degrees to 130-degrees F dry bulb and ten to one hundred percent (10% to 100%) relative humidity, condensing.

4. Hazardous environment: All system components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or filings, shall be rated and installed according to Chapter 5 of the NFPA 70 and as shown.

C. Standard products: Equipment and materials supplied for the MUFIDS shall be standard products of manufacturers regularly engaged in the manufacture of computing systems and MUFIDS devices, and shall be the manufacturer's latest standard design.

1. Electrically powered equipment shall be UL approved.
2. Items of the same classification shall be identical. This requirement includes equipment, modules, assemblies, parts, and components.
3. All similar types of devices shall be of the same manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

A. See Section 270100, Paragraph 1.10.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Unless noted otherwise, the stated requirements shall apply to all modules and equipment of the MUFIDS.

B. Technology Equivalence Requirement: The hardware and software selected shall meet the operational, functional, and performance requirements specified herein. Due to the rapid advancement and antiquation of hardware and software technology, the supplied hardware and software shall be the latest released version. "Contemporary technical equivalent" shall be based on a comparison of the hardware and software at the time of publication of the specification to the hardware and software at the time of system implementation. Contractor shall submit products, as required by other sections of the specification, for approval by Engineer and Owner.

C. The MUFIDS shall facilitate integration of other applications.

D. The MUFIDS shall facilitate the implementation of any federally mandated applications.

E. The Contractor shall configure the system as described and shown.

B. The system shall include equipment and appurtenances necessary for a fully functional system.

F. The system shall have integral multi-lingual capabilities, including the English and Spanish languages included for all components and modules.

2.02 MANUFACTURERS

A. MUFIDS Software:

1. INFAX INC. (678) 533-4000

B. Operating software for Servers, Display Device Integral Controllers, and Workstations:

1. Microsoft Windows

C. Computers (including server and workstations):

1. Dell
2. Hewlett Packard
3. Lenovo

D. LCD Displays:

1. Sony

E. Video Extenders:

1. Xtendex

F. LCD Display Mounts:

1. Chief Manufacturing, Inc.
2. Peerless

G. LED Signs:

1. Adaptive Micro Systems
2. Daktronics
3. Approved Equal

2.03 OPERATING REQUIREMENTS

A. The system shall be an extension of the existing Multi-User Flight Information Display System (MUFIDS). Data shall be updated in the MUFIDS database directly from the selected Flight Data Source. Additionally, authorized users shall be able to input manual updates via system workstations. Each display shall be fully addressable so displayed information is infinitely selectable. The system shall be a Network Based System operating on a Local Area Network (LAN).

B. The MUFIDS implemented (installed, tested, and made fully operational) shall include the equipment and software necessary to display flight, baggage, advertising, and full motion video information as well as other types of displayed information of the Airport's choosing. Software programs, modules and necessary enhancements shall be provided as necessary to meet all of the functionality requirements. The equipment provided shall include application and database servers, video display processors also known as Display Device Controllers (DDCs), LCD displays, workstations, and any other required equipment necessary to make the system fully operational and resilient.

C. The format for a display and set of displays (display bank) shall be fully dynamic. The format of an individual display or set of displays shall change as required to accommodate various conditions.

D. The correct time of day shall be displayed on each display within an MUFIDS display. The system shall receive a redundant timing signal (+/- 0.5 seconds) from master clock system provided by others.

E. The system shall be able to display video advertising information to any display or set of displays.

F. The system shall provide database fields for airlines or other approved tenant use in addition to publicly displayed information.

G. Network failure shall leave the last updated information displayed on each affected display.

2.04 CONFIGURATION REQUIREMENTS

A. The controllers and the system workstations shall be the clients to the existing MUFIDS primary/secondary servers. The MUFIDS application server(s) shall be the server to the clients. All information shall be communicated between the server(s) and the clients via the LAN.

2.05 SOFTWARE

A. The Contractor shall deliver all required system and application software for a fully functioning MUFIDS. Each shall be identified by the generic, off-the-shelf name. The software provided by the Contractor to operate the system shall be delivered in a ready-to-run form, including all necessary utility programs and documentation.

B. The software shall be fully date compliant.

C. The system shall use industry standard components. The system shall not contain any proprietary interfaces or components. The system shall use industry standard application development software such as Java, Visual Basic, C/C++ and XML.

D. Spares: The bid shall include a minimum of eight percent (8%) software spares for all software. The 8% spare capacity shall be in addition to the required software for the MUFIDS system. The 8% spare capacity shall be included in the base bid.

2.06 USER INTERFACE

A. The MUFIDS displays used in this project shall have an interface to manage data and select contents types. The user interface shall provide a common look and feel for all MUFIDS modules. Via the user interface, authorized users have the ability to select authorized application(s) to execute.

B. Software modules shall have a Graphical User Interface (GUI) and use a true windowing (i.e., not DOS-based windows) navigation interface. MS Windows is acceptable.

C. The system shall support both a pointing device and keyboard interface. Standard pointing device actions shall have a "hot key" equivalent.

D. The system shall provide context sensitive, on-line help capabilities. The online help system shall contain enough information to inform the user of the nature of the current form/window, and provide a reference for the user to gather further information. The Contractor shall populate the on-line help messages prior to the Functionality Testing and provide a facility for maintenance and update of online help.

2.07 OPERATING SYSTEM

A. The operating system and database system software for the servers and clients shall be provided as the latest version compatible with the existing INFAX MUFIDS system.

1. All software shall be compatible and compliant with existing INFAX MUFIDS as approved by HJAIA.

2. Latest version (except as noted) and service pack of the operating system as of ninety (90) days prior to initiation of system testing.

B. User Workstations:

1. All software shall be compatible and compliant with existing INFAX MUFIDS as approved by HJAIA.

C. Display Device Controllers (DDC):

1. All software shall be compatible and compliant with existing INFAX MUFIDS as approved by HJAIA.

2. DDC's shall use the Windows 7 Professional or Windows Embedded operating system. Latest version (except as noted) and service pack of the operating system as of ninety (90) days prior to initiation of system testing.

2.08 SYSTEM ARCHITECTURE

A. The system shall adhere to a Client / Server model. The end devices shall be the clients to the primary/secondary servers. All information shall be communicated between the server(s) and the clients via the Local Area Network (LAN).

B. Network communications shall utilize TCP/IP network communications protocol.

C. End device addressing shall be performed by the contractor or manufacturer's representative.

D. The system shall synchronize the date and time on the end devices. The system servers shall receive a synchronization signal from a common time source.

2.09 DISPLAY FORMAT REQUIREMENTS

A. General: Display formats for the MUFIDS shall be fully configurable and dynamic.

B. Screen Formats: The Contractor shall supply screen formats for each location and display function as applicable for the project (arrivals, departures, gate backwall desk, and video advertising). Both a primary and alternate display shall be created for each location and display function. The final version of all displays shall require Owner approval (multiple comment rounds should be anticipated). The following screen formats shall be provided as a minimum:

1. Gate Back Wall Information Screens (unique display format for each airline).

C. Refresh: Information refresh on the displays shall meet the performance criteria as specified. Refresh shall be on a per field basis verses a full screen refresh. Except for the changed data, refresh shall be imperceptible (e.g., screen shall not flicker) by viewers.

D. Information Consistency: The Contractor is responsible to ensure display information uses a consistent format regardless of the data's original source. The system shall reformat received / input information as required for consistency of display.

E. Code Shares: The system shall fully accommodate airline code share flights in both the database and the display functionality. The Contractor shall propose a minimum of three different methods for addressing code shares. The Owner shall make final selection of the implemented method.

F. Multiple Cities:

1. For flights with multiple origination or destination cities where it is desired to show multiple city names, the following requirements shall be used:

a. At least one city name is required.

b. No more than three (3) city names will be allowed.

c. The MUFIDS shall default to one line of flight information for each flight. The MUFIDS System Administrator shall be able to modify this setting.

d. An authorized user shall be allowed to abbreviate city names and separate them with a delimiting character so that multiple city names can be shown on a single line within the space allocated for displaying the city name.

e. The system shall allow, via a setting by the MUFIDS System Administrator, the ability to display multiple city names on separate lines. This method is applicable when flight information is displayed sorted by time. For example,

using flight XX123 that is departing to Minneapolis and continuing to Denver, that flight would consume two lines of display information as follows:

1:00 PM	Minneapolis	XX Airlines	123	A5	On Time
	Denver				

f. In the example above, the MUFIDS software shall ensure, if multiple display devices are used to display arriving or departing flight information, that the first line of the example above does not display on the last line of monitor #1, and then the second line from the example above shows as the first line on monitor #2.

g. The system shall allow, via a setting by the MUFIDS System Administrator, the ability to display a flight with multiple cities associated by displaying the flight on separate and unconnected lines. This method is applicable when flight information is displayed sorted by destination/origin city. For example, using flight XX123 that is departing to Minneapolis and continuing to Denver, that flight would consume two lines of display information as follows:

Denver	XX Airlines	123	1:00 PM	A5	On Time
------	-----	-----	-----	-----	-----
Minneapolis	XX Airlines	123	1:00 PM	A5	On Time

G. Fonts: The system shall be able to display video monitor screens in a variety of fonts. Contractor shall supply a minimum of twelve (12) different font styles with the MUFIDS. The default font shall be approved by the Owner.

1. The user shall be able to specify the font to be used and the size of the font, per field.
2. The capability shall exist to use multiple fonts within one display format.
3. Fonts shall be scalable.

H. Colors: The authorized user shall be able to specify the colors to be used in any screen format from a palette of no less than 16 million colors.

1. Color shall be specified for the format background and foreground.
2. Colors shall be assigned on a per-field basis, defaulting to the specified foreground color.
3. Colors shall be assigned based on field content. For example, color coding within a field may be used where "On Time" is color #1, "Delayed" is color #2, and "Canceled" is color #3.

I. Graphics: The authorized user shall specify graphic images to be used within a video monitor display format.

1. The graphic image shall be stored in an industry-standard graphic format. Approved formats include BMP, GIF, JPEG, JPEG2000, PNG, or TIFF.
2. The user shall specify the size of the frame for the graphic image. The graphic image shall auto scale to fit the frame.
3. The system shall provide a graphic image as a screen "wallpaper" (i.e., a full screen graphic that data, including text and/or other graphics, are overlaid onto).

4. Multiple graphics shall be displayable simultaneously within a single display format.

J. Video Clips: The authorized user shall specify video images to be used within a video monitor display format. A variety of video clip formats shall be supported including AVI and MPEG formats.

K. Multiple Formats/Split Screen: The MUFIDS shall display multiple formats on a display device using both of the following methods:

1. A "split screen" where two separate displays are resized to fit on the same monitor display. An example would be a video monitor displaying flight data for a specific airline with limited flights, with an Arriving Flights window shown in the upper half of the monitor and Departing Flights window shown in the lower half of the monitor.

2. A display device that has been designated to display certain formats in a rotating fashion. For example, Format ‘A' would be shown for a user-defined number of seconds, then Format ‘B' would be shown for a user-defined number of seconds, then repeat. Rotating formats shall allow up to eight (8) different formats to continuously cycle.

L. Field Triggers: The authorized user shall specify a number of parameters or "triggers" that define how and when data will be displayed using any specific display format (e.g., color change, text appear/disappear, graphic appear/disappear, font change). These parameters or triggers include but are not limited to the items below:

1. Length of time a flight is displayed with a "DEPARTED" (or similar) status after the flight has actually departed. This shall be definable both on a system-wide basis, and on an airline-specific basis and by display location or page definition.

2. Length of time before a flight arrives to display the arriving flight information. This shall be definable both on a system-wide basis, and on an airline-specific basis and by display location or page definition.

3. For flight departures, the authorized user shall specify how long before departure time the flight status changes to "Boarding" and/or "Final Boarding". This shall be definable both on a system- wide basis, and on an airline-specific basis and by display location or page definition.

4. In conjunction with this trigger, there shall be a parameter, changeable by the authorized user, which indicates whether or not to utilize this automatic timing feature, or to require manual input, electronic input or timed to departure input from an authorized user or carrier.

5. For flight arrivals, an electronic input, ASDI input, timed to scheduled arrival input, or the authorized user shall manually specify the estimated time of arrival and the flight status will change to "In Range" and/or "Landing", and finally "At Gate". This shall be definable both on a system-wide basis, and on an airline-specific basis and by display location or page definition.

M. Sort Order: The authorized user shall specify the sort order for data being displayed where there is more than one data record being displayed.

1. The authorized user shall specify either ascending or descending order. The default shall be ascending order.

2. The system shall allow multiple fields for the sort and user shall select the sort priority of each field. If more than one field is specified, each may be designated as either ascending or descending order.

3. The fields which may be specified to be sorted include, but are not limited to: Flight number, Airline, Domestic/International, Gate, City name (origin/destination), Scheduled time of arrival/departure, Actual time of arrival/departure.

N. Override of Automatic Status Updates: The authorized user shall have the capability to override any of the automatic update flight status remarks. If the scheduled time of a flight is changed, the default Remark for that flight shall be automatically changed to show "ARR AT <new time>" for an arriving flight, or "DEP AT <new time>" for a departing flight. The authorized user shall edit the remark and not be limited to "canned" remarks.

O. Display Format Re-Assignment: Any monitor or set of monitors that is displaying a specific format shall be capable of displaying a different format both automatically and manually. There shall be no restrictions in format reassignment. State any deviations to this requirement in the bid response. Shutting down or rebooting of any equipment shall not be required in order to change the format being displayed.

1. Manually, an authorized user shall be able to select a different screen format from an input device (i.e., MUFIDS server, workstation, BIC). The authorized user shall be able to view the name of the format that is currently being displayed on any display device by accessing the particular record in the Device Table. When the user makes a change to the format being used by that device, the DDC is notified of the change via the network. The device shall use the new format immediately.

2. The system shall also provide for automatic re-assignment of a screen format or set of screen formats at a given location. The format changes shall occur based on various triggers including changes in the number of flights for a given flight window. The number of flights shall be configurable. The specific set of flights shall be configurable (e.g., arrival, departure, both, specific airline(s), terminal). The format change shall reset based on a system define time period (1 sec to indefinite) or based on another defined trigger. Multiple triggers shall be definable for each display location and format type.

P. Timing Windows: The term "timing window" is used to refer to the amount of time prior to a scheduled event that an item becomes eligible for display. It is typically used for monitors showing flight arrivals or flight departures. For arrivals, the timing window is the amount of time prior to the scheduled arrival time of a flight before the flight is considered eligible for display. For departures, the timing window is the amount of time prior to the scheduled departure time before a flight is considered eligible for display. For example, if the current time is 11:00 a.m. and the timing window for departures is set to 30 minutes prior and 90 minutes post, flights scheduled for departure between 10:30 a.m. and 12:30 p.m. would be displayed, while those departing after 12:30 p.m. would not yet be eligible for display on departures monitors. The timing window shall be automatically and dynamically adjustable to allow the MUFIDS displays to utilize the full set of screens in a monitor bank at all times.

1. The MUFIDS shall support two types of timing windows: a static mode and a dynamic mode.

2. The static mode timing window shall be definable by the authorized user. A separate time window shall be definable for both arriving and departing flights. There shall be an option to allow these timing windows to be set on both a system-wide basis and on an airline-specific basis.

3. When operating in dynamic mode, the timing window shall automatically adjust based on the number of flight operations at a given time. For a grouped set of

monitors (e.g., monitor bank, portion of monitor bank), the MUFIDS shall keep all monitors filled with flight records. In order to accomplish this, the MUFIDS shall dynamically adjust the timing window to be a higher or lower value, as required. The minimum range of timing window adjustment will be from fifteen (15) minutes (prior or post) to twenty-four (24) hours (prior or post) in increments of one (1) minute. For example, a four monitor bank may be able to display twenty departing and twenty arriving flights. During a busy time this may equate to a 90 minute window while during a slow time this may equate to a 5 hour window. The dynamic mode shall still allow flights to be sorted by the various fields and not just by time.

4. The system shall default to dynamic mode timing window.

5. When in static mode and a monitor is not in use, the system shall be capable of automatically displaying a graphic or video clip.

6. In the case that a DDC fails in a monitor bank, the other monitors in the bank shall be reconfigured to display all of the flight data (both arriving and departing). A shorter timing window may be required in this scenario.

Q. Free-Text Formats

1. The MUFIDS shall allow a free-text format to be displayed on a monitor or multiple monitors. This format is different from other formats in that there may be no data coming from the MUFIDS databases to update the contents of the display. The authorized user shall determine the text or graphics to be displayed.

2. The authorized user shall enter and format text, choosing font style, type, and size in the same manner as is allowed with other formats.

3. The user shall also be allowed to insert graphic image(s) into the free-text format, resizing the graphic image(s) to fit the defined location(s) as is allowed with other formats.

4. The MUFIDS shall allow any number of free-text formats to be used and shown simultaneously on different monitors, or in a "slide show" format on the same monitor. The parameters of the “slide show” shall be user definable (i.e., show x number of screens for x seconds each).

5. The system shall allow a location for free-text to be predefined on a display format. Check-in agents or other authorized users shall have the ability to change the free-text message displayed. The system input devices (e.g., MUFIDS server(s), VIDS workstation) shall be capable of updating the free-text message.

2.10 FULL MOTION VIDEO

A. The MUFIDS shall have the capability to display full-motion video (minimum 30 frames per second) on all video monitors throughout the system. The video functions can be managed from the MUFIDS System Administrator Workstation.

1. The system administrator shall specify a section of the video monitor format (where "section" may be a subset of the entire screen or may be the entire screen) for displaying full motion video.

2. The video source shall be from a video data file that was previously downloaded from the host computer system to the hard disk of the DDC.

3. In no instance shall any video monitor display a video data file that is not locally stored (i.e., run a video from the host servers via the network).

B. The system shall provide the ability to define a schedule for running videos. The scheduler shall allow one-time and recurring schedules. The recurring options shall include various built-in functionalities to simplify video scheduling.

2.11 GATE INFORMATION DISPLAY SYSTEM (GIDS)

A. The Gate Information Display System (GIDS):

1. The Gate Information Display System (GIDS) shall be an integrated part or module of the EVIDS using the same database of flight information.

2. The GIDS shall utilize display devices located in gate areas for the purpose of displaying information regarding flights scheduled to depart through the associated gate. Information determined by the airline operating from the gate to communicate information to passengers shall also be displayed.

3. The GIDS shall utilize the same departure timing window rules detailed above. The GIDS shall display all flights scheduled for a gate within the timing window. If no flights are scheduled, then the display shall show the appropriate airline or airport logo.

4. A change in the gate assignment field of the flight information database shall prompt the system to automatically update the affected gate monitors with the new information.

2.12 DATABASE

A. Database Requirements:

1. The existing INFAX database(s) shall be configured to account for and provide contents to MUFIDS displays indicated in the project drawings,

2.13 PERFORMANCE REQUIREMENTS

A. General:

1. Capacity - The system expansion shall not degrade performance of the existing HJAIA MUFIDS All work shall be coordinated with existing software and INFAX systems programmers.

2. The system shall be capable of supporting all end devices as specified in this document within the performance requirements as outlined herein.

B. System Availability: At any given time, the overall MUFIDS shall be considered unavailable if 10 percent or more of the end devices are non-operational, not fully functional, or do not meet response time criteria. Software and system devices shall execute, without degradation, at the scheduled periods and response times for the system to be considered available. The system shall operate as specified twenty-four (24) hours per day, seven 7 days per week. Availability of the overall MUFIDS shall be at least 99.99 percent (downtime not to exceed 52 minutes per year). A software based testing tool shall be available to the system administrator and field technician for display diagnostics.

C. Device Availability: A system server and workstation shall be considered available only if all components are operating and fully functional. A peripheral device shall be considered unavailable if it cannot be placed on-line and perform its intended function(s). Besides scheduled downtime, as identified below, individual device availability shall exceed 99.8 percent (downtime not to exceed 17.5 hours per year).

D. Scheduled Downtime: Downtime to update the computer operating system or repair a component shall be acceptable reasons for downtime, but at no time shall more than 10 percent of the system be non-operational. The following reasons are acceptable causes of downtime:

1. If the operating system of the servers require maintenance or updates, or if the servers require system maintenance, each server shall be brought down individually to be updated/maintained, such that at no time is more than one server down at the same time.

2. If the operating system of the end device computer requires maintenance or updates, or if the end device computers require system maintenance, the end device that requires the maintenance shall be brought down during non-peak hours of operation.

E. Response Time: Response time criteria shall be met under maximum capacity conditions as defined above.

1. Workstation Input: For 95% of all transactions, there shall be no more than a 1.0 second delay between the time that a user presses a key or makes a mouse click and the system responds in some way that the input has been received. The remaining 5% of transactions shall not exceed 3.0 seconds.

2. Display response time: For 95% of transactions, there shall be no more than 15 seconds elapsed between the time that an authorized user requests a change in display on a public monitor and the time the updated data is displayed on the assigned device. The remaining 5% of transactions shall not exceed 30 seconds.

3. Public display refresh rate: Public displays shall refresh changed data fields every 15 seconds as a minimum.

2.14 SYSTEM MANAGEMENT

A. All devices connected to the network shall have SNMP management capability.

B. System failures of all network devices shall be viewable at a central control point (e.g., the system administrator's workstation or system server). A failure shall initiate an alarm and add a failure record to the failure database table. Additionally, the system administrator shall receive a warning message on the system administrator workstation or server, notifying him of the failure. The system shall also be capable of providing pager notification.

C. Network devices shall have remote administration and monitoring capabilities. This capability shall allow the specific machine to be remotely configured and to provide a status report to the management system. Data included in the reporting capabilities shall include: data pertaining to the machine's memory, storage devices, network connections, and general health of the machine.

D. In the event that a workstation or end device goes out of service, the central control log shall be updated. Therefore, where practical, a positive relationship (e.g., system heart beat) shall exist between all components of the system at all time.

E. The system shall include remote software management tools. The remote software tools shall allow workstations to be rebooted remotely and for remote software upgrades at a minimum.

2.15 NETWORK REQUIREMENTS

A. The MUFIDS shall utilize the LAN to provide services to all end users and workstations.

B. End users (e.g. MUFIDS workstations, DDCs) shall be connected to the LAN via 10/100/1000 Mbps Ethernet NICs (auto-negotiating). The end users shall communicate with the MUFIDS applications utilizing the TCP/IP network protocol.

2.16 INTERFACES AND EXTERNAL CONNECTIVITY:

A. Maintain the system's existing external interfaces.

2.17 HARDWARE REQUIREMENTS

A. All hardware requirements given are the minimum requirements. The Contractors product shall meet or exceed these requirements. Additionally, the hardware selected shall meet the operational, functional, and performance requirements specified herein.

B. The MUFIDS shall include all configured hardware necessary for a fully functional system. The Contractor shall supply all cabling, connectors, adapters, and termination equipment necessary to interconnect all system hardware. All hardware and materials shall be new.

C. Environmental Rating: Equipment shall be rated for continuous operation under the ambient environmental temperature, humidity, and vibration conditions encountered at the installed location. For devices located in harsh environments such as interior uncontrolled or exterior environments, the Contractor shall provide the necessary industrialization or enclosures to ensure proper equipment operation and performance.

D. Hardware Structures: The Contractor shall review case work to ensure proper fit of equipment, ventilation, etc. The Contractor shall coordinate casework requirements with the casework designer.

E. Contractor is responsible for providing fans, shelves, drawers, special power wiring, ground connections, cables, connectors, appurtenances, and adapters of any kind necessary to accommodate the system installation, operation, testing, or maintenance.

F. Spares: The bid shall include a minimum of eight percent (8%) hardware spares for all hardware that has a quantity of five or more in operation, minimum of (1) one. The 8% spare capacity shall be in addition to the quantities shown in the drawings. The 8% spare capacity shall be included in the base bid.

G. Servers:

1. Existing INFAX system servers shall support the work defined herein.

H. Display Device Integral Controllers: The controllers shall be compatible with the latest INFAX version approved for use in the existing HJAIA MUFIDS to control the display output of LCD displays. Each controller shall have a unique TCP/IP address and shall communicate via the LAN via an Ethernet NIC.

I. Workstations: The MUFIDS workstations shall meet the following minimum requirements:

1. TBD.

J. LCD Displays:

1. The 40" LCD displays shall meet the following minimum requirements:

a. Sony FWD-40LX2 or Owner approved equivalent model.

2.18 PAGE FORMAT REQUIREMENTS

A. LCD Screens – Gate Desk Backwall

1. Orientation: Landscape.
2. Extent of Coverage: Contents shall be developed to support gate desk backwall display.
3. Content: Contents shall be developed to support HJAIA and airline approved departing passenger information. Coordinate layout and content with HJAIA and project design team during system implementation, providing Owner with several layout options from which to choose.
4. Font Size: Flight information lines shall be a minimum of 5/8" tall, with header and footer text differing as appropriate.
5. The following information fields shall be provided:
    a. Departing To.
    b. Airline Logo or Airline Name if logo is not available.
    c. Flight Number.
    d. Gate.
    e. Scheduled Time of Departure.
    a. Status (actual time, boarding, delayed, canceled, etc.).

PART 3 - EXECUTION

3.01 EXAMINATION

A. See Section 270100, Paragraph 3.01.

3.02 INSTALLATION

A. See Section 270100, Paragraph 3.02.

B. Cable Installation

1. Cabling installation requirements are specified in Section 271500.

C. Hardware Installation

1. The Contractor shall install and inspect all hardware required in this Specification in accordance with the manufacturer's installation instructions. The Contractor shall create plans that show the placement and arrangement of the required hardware. Final placement of hardware is subject to Owner approval.
2. The Contractor shall be responsible for any and all loss or damage in the shipment and delivery of all material until transfer of title to the Owner.
3. The Contractor shall obtain written permission from the Owner before proceeding with any Work which requires cutting into or through any part of the building structures such as, but not limited to, girders, beams, concrete, carpeted or tiled floors, partitions or ceilings. The Contractor shall also consult with the Owner before cutting into or through any part of the building structures where fireproofing or moisture-proofing could be impaired.
4. The Contractor shall take all steps necessary to ensure that all public areas remain clear or are properly marked during installation or maintenance.
5. The Contractor shall coordinate installation with the Owner, to minimize disruption of existing business functions at the airport.

6. The Contractor shall place materials only in those locations that have been previously approved. Any other locations shall be approved, in writing, by the Owner.

7. The Contractor shall provide all tools and test equipment required to install, verify, and test the installation and to determine that it meets the specifications. The Contractor shall furnish all necessary materials required to implement and to achieve the required work performance.

D. SOFTWARE INSTALLATION

1. The Contractor shall install all custom and packaged software in the development and production environments.

2. The Contractor shall provide a migration plan for all new and updated software to be migrated within the development and production environments.

3.03 DOCUMENTATION

A. See Section 270100, Paragraph 3.03.

3.04 GENERAL TESTING REQUIREMENTS

A. See Section 270100, Paragraph 3.04.

B. Phases of Testing:

1. Performance Verification Testing.

2. On-Site Endurance Testing.

C. Project Testing: The overall MUFIDS shall not be considered complete until Performance Verification and On-Site Endurance Testing are completed on the entire system. In general these tests shall verify (refer to test sections for full testing requirements):

1. Proper function and information display on public displays.

2. Proper function and information display on 'back of house' displays.

3. Proper function of all workstations.

4. Airline user and workstation access permissions are correct.

5. External Interfaces are verified and accepted.

6. System is performing within defined parameters.

D. Test Plan/Procedure: The Contractor shall provide six (6) copies of the test plan/procedures for each testing phase for the review and approval of the Owner. The test plan for each phase of testing shall detail the objectives of all tests. The tests shall clearly demonstrate that the system and its components fully comply with the requirements specified herein. The test plan shall be provided at least thirty (30) days prior to the scheduled start of each test. Test plans shall contain at a minimum:

1. Functional procedures including use of any test equipment.

2. Test equipment is to be identified by manufacturer and model.

3. Interconnection of test equipment and steps of operation shall be defined.

4. Test records shall include test equipment serial number, calibration date and calibration certification of test equipment.

5. Expected results required to comply with specifications.
6. Traceability matrix referencing Specification requirements with specific test procedures.
7. Record of test results with witness initials or signature and date performed.
8. Pass or fail evaluation with comments.

E. The test procedures shall provide conformity to all Specification requirements. Satisfactory completion of the test procedure is necessary as a condition of system acceptance.

F. The Contractor's Quality Assurance organization shall review all formal test procedures prepared by the Contractor and deliverable under the contract to assure the tests cover all requirements and that there is conformity between the conducted test, the test results and Specification requirements.

G. Documentation verification, both interconnects and operationally, shall be part of the test. Where documentation is not in accordance with the installed system interconnect and operating procedures, the system shall not be considered accepted until the system and documentation correlate.

H. The Contractor shall provide the Owner the opportunity(s) to participate in any or all of tests.

I. Test Reports: The Contractor shall prepare, for each test, a test report document that shall certify successful completion of that test. Six (6) copies of the test report shall be submitted to the Owner for review and acceptance within seven (7) days following each test. The test report shall contain, at a minimum:

1. Commentary on test results;
2. A listing and discussion of all discrepancies between expected and actual results and of all failures encountered during the test and their resolution;
3. Complete copy of test procedures and test data sheets with annotations showing dates, times, initials, and any other annotations entered during execution of the test; and
4. Signatures of persons who performed and witnessed the test.

J. Test Resolution: Any discrepancies or problems discovered during these tests shall be corrected by the Contractor at no cost to Owner. The problems identified in each phase shall be corrected and the percentage of the entire system re-tested determined by the Owner before any subsequent testing phase is performed.

K. Test: The purpose is to test the complete computer software package and equipment of the system and demonstrate that all specified features and performance criteria are met. All requirements of the Specification shall be tested including:

1. Functionality including reporting and response.
2. System capacity.
3. Hardware interaction.
4. Hardware and software interaction.
7. Display performance.
5. Demonstrate report generation.

L. Acceptance: Acceptance of system to perform sufficiently and provide specified functions shall be determined by the Owner.

1. Acceptance Criteria: Performance of system shall equal or exceed criteria stated in individual Specification sections.

2. If system does not perform satisfactorily, the Contractor shall make corrections and modifications and schedule a new test with the Owner.

M. Completion:

1. At successful completion of test, dismantle equipment so as to prevent damage. Replace all defective or worn items.

2. Re-pack in original containers all equipment to be delivered to site for installation.

N. Reporting:

1. Record all test procedures and results.

2. Submit report in accordance with reporting requirements in the previous General Testing Requirements section.

3.05 MAINTENANCE AND SUPPORT

A. See Section 270100, Paragraph 3.08.

B. General:

1. The Contractor shall provide maintenance and support of all hardware and software associated with this system at no additional charge during the Warranty period.

2. The Contractor shall commit to make available support for the MUFIDS for ten (10) years after the warranty period. Use of Contractor provided post warranty maintenance will be at the discretion of the Airport Authority.

3. All lead technicians performing installation and maintenance shall have a minimum of two (2) years experience on the proposed system and be manufacturer certified on all hardware/software applications. All maintenance technicians shall be provisioned to attend a one (1) week manufacturer training class each year. Pre-assigned backup technicians shall be available to backfill for onsite technicians who are on vacation, in training or who are out sick.

C. Special Tools: The Contractor shall supply a list of special tools, test equipment, and outside inventory required for this Project.

D. Telephone/On Call Support: The Contractor shall provide twenty-four (24) hour/seven (7) days a week telephone support as a minimum maintenance and support agreement. The Contractor shall provide 2 hour on site response for any incident the Owner deems critical. Additionally, the Contractor shall specify a maximum amount of time to get the system up and operational in the event of a system failure. This time period shall be subject to Owner approval.

E. Spare Components and Parts Replacement:

1. The Contractor shall provide, at the outset of the onsite testing a store of consumables and spare parts as required in Section 2.17.F. Those consumables and spare parts shall be available to the Contractor for use during the equipment demonstration test, and warranty period in order to maintain system response time criteria as detailed below.

2. The Contractor shall replenish the store as it is used, so that at the end of the test and warranty periods, the store shall be equal to that initially provided.

3. Based upon the maintenance experience of the warranty period, the Contractor shall recommend, at the end of the warranty period, any changes in spare component and small part stores that may prove to be appropriate.

4. The Contractor shall maintain the spare component store during any extended support period.

F. Hardware Support:

1. Hardware support shall be supplied by the Contractor directly or by a Sub-Contractor approved by the Owner. Support shall cover all equipment and system referenced in this Specification.

2. The Contractor shall assume full responsibility for the performance of all equipment supplied by HJAIA, provided that such equipment meets the specifications set forth by the Contractor.

G. Software Support:

1. All software support for the system shall be provided by the manufacturer designing the software.

H. All software shall be delivered with an installable backup.

3.06 CLEANING

A. See Section 270100, Paragraph 3.09.

3.07 ACCEPTANCE

A. See Section 270100, Paragraph 3.11.

END OF SECTION 274216

SECTION 275116

PUBLIC ADDRESS SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. See Section 270100, Paragraph 1.01.

B. Section 275116 contains the technical specifications for the Public Address System at the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project.

C. Drawings and general provisions of the Contract, including Contractual Conditions and Division 0 and Division 1 specifications sections apply to this section.

1.02 REFERENCES

A. See Section 270100, Paragraph 1.02.

1.03 RELATED SECTIONS

A. See Section 270100, Paragraph 1.03.

1.04 SCOPE OF WORK

A. The Work shall include expanding the existing airport-wide Audio Paging System (manufactured by Baker Audio of Norcross, GA) into the MHJIT. The system shall be a digital public address system with redundancy indicated herein and shown on the Drawings. The system shall interface with the following systems:

1. Delta-provided "Cornerstone" automated gate boarding system.
2. CNN Airport Network.
3. Bombardier AGTS public address system interface.

B. All 70V speaker cable shall be installed in metal raceway system.

1.05 QUALIFICATIONS

A. See Section 270100, Paragraph 1.05.

1.06 SUBMITTALS

A. See Section 270100, Paragraph 1.06.

1.07 INTELLECTUAL PROPERTY

A. See Section 270100, Paragraph 1.07.

1.08 WARRANTY

A. See Section 270100, Paragraph 1.08.

1.09 QUALITY ASSURANCE

A. See Section 270100, Paragraph 1.09.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Personnel certified Level III Special by NICET as Audio Systems Technician.

C. Testing Agency Qualifications: Qualified agency, with the experience and capability to conduct testing indicated.

1. Testing Agency's Field Supervisor: Currently certified by NICET at Level III to supervise on-site testing.

D. Source Limitations: Obtain audio paging systems from single source from single manufacturer.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Codes: Comply with NFPA 70 National Electrical Codes (NEC).

1.10 DELIVERY, STORAGE, AND HANDLING

A. See Section 270100, Paragraph 1.10.

1.11 DEFINITIONS

A. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.

B. Zone: Separate group of loudspeakers and associated supply wiring that may be arranged for selective switching between different channels.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturer of the existing audio paging system shall be selected to expand the system into the new MHJIT project.

2.02 GENERAL EQUIPMENT AND MATERIAL REQUIREMENTS

A. System shall be an extension of the existing Audio Paging System as installed in the rest of the Hartsfield Jackson Atlanta International Airport (HJAIA).

B. System shall ride on a dedicated network as part of DOA's Airport Data Network (ADN).

C. Compatibility of Components: All components shall match the existing Audio Paging System unless otherwise indicated. If a manufacturer's model has been superseded, the newer model shall be utilized. Contractor is responsible to ensure that no functionality is lost or degraded from the original equipment.

D. Equipment: Comply with UL 813. Equipment shall be modular, using solid-state components, and fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

E. Equipment Mounting: Where rack, cabinet, or console mounting is indicated, equipment shall be designed to mount in a 19-inch (483-mm) housing complying with TIA/EIA-310-D.

F. Weather-Resistant Equipment: Listed and labeled by a qualified testing agency for duty outdoors or in damp locations.

2.03 PAGING STATIONS

A. Paging Station shall consist of the following:

1. Dynamic microphone, with cardioid-polar characteristic.
2. Push-to-talk (PTT) switch and PTT status LED
3. Four (4) programmable, momentary buttons, each with a status LED.
4. Balanced line preamplifier.
5. RS-485 data network interface.
6. Operate on AC or DC power.
7. Direct Interface to the CobraNet Bridge.
8. Provide units where shown on the drawings.

B. Basis of Design:

1. Paging Station: Peavey Media Matrix, PCU3
2. Slave Microphone: Peavey Media Matrix RMP-1

2.04 LOUDSPEAKERS

A. Cone-Type Loudspeakers:

1. Ceiling mounted:

a. Minimum Axial Sensitivity: 87 dB at one meter, with 1-W input.

b. Frequency Response: Within plus or minus 3 dB from 100 to 12,000 Hz.

c. Size: 4 inches (100 mm) with 1-inch (25-mm) voice coil and minimum 13-oz. (364g) magnet.

1) Cone: Polypropylene with Butyl Rubber surround with ported bass-reflex enclosure.

d. Minimum Dispersion Angle: 100 degrees.

e. Rated Output Level: 16 Watts.

f. Matching Transformer: Full-power rated with five taps; 1, 2, 4, 8 & 16 Watts. 8Ω to 70.7V line voltage.

g. Backbox: Injection-molded plastic with an internal volume of 85 in^3 with press-fit grille and tile bridge assembly for mounting in 2 x 2 or 2 x 4 ceiling tiles.

h. Baffle:

1) Baffle shall install with torsion spring hardware.

2) Finish shall be matte white.

3) The 4" baffle shall measure 7-3/8"(187.3mm) in diameter.

4) Construction shall be welded 22 ga. CRS.

i. Basis of Design:

1) Ceiling Speaker: Atlas FAP40T

2. Surface-Mounted Units:

a. Wall or column mounted in single or dual (mini cluster) configuration, as indicated on the drawings, in steel back boxes, acoustically dampened. Front face of at least 0.0478-inch (1.2-mm) steel and whole assembly rust proofed and shop primed for field painting.

b. Size: Dual 6 inch low frequency drivers with a 1 inch high frequency driver.

c. Minimum Axial Sensitivity: 94 dB at one meter, with 1-W input.

d. Frequency Response: Within plus or minus 10 dB from 60 to 20,000 Hz

e. Minimum Dispersion Angle: 100 degrees.

f. Minimum Dispersion Angle: 100 degrees.

g. Dispersion: 100° horizontal by 80° vertical.

h. Rated Output Level: 300 Watts.

i. Matching Transformer: Full-power rated with four taps; 7.5, 15, 30 & 60 Watts. 8Ω to 70.7V line voltage.

j. Maximum Sound Pressure Level (SPL) 118dB.

k. Basis of Design:

1) Wall Speaker: ElectroVoice EVID 6.2, EVID 4.2, or EVID 3.2 as called out on the drawings.

2.05 CONDUCTORS AND CABLES

A. Jacketed, twisted pair and twisted multipair, untinned solid copper.

1. Insulation for Wire in Conduit: Thermoplastic, not less than 1/32 inch (0.8 mm) thick.

2. Microphone Cables: Neoprene jacketed, not less than 2/64 inch (0.8 mm) thick, over shield with filled interstices. Shielded No. 18 AWG, tinned, soft-copper strands formed into a braid or approved equivalent foil. Shielding coverage on conductors is not less than 60 percent.

3. Plenum Cable: Listed and labeled for plenum installation.

4. Speaker Cable: Listed under NEC 725 for Class 1, 2, & 3 remote-control, signaling and power-limited circuits and suitable for professional sound, speaker circuits shall be 14 AWG minimum.

2.06 RACEWAYS

A. Conduit and Boxes: Comply with Division 27 Section "Pathways for Communications Systems."

1. Outlet boxes shall be not less than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

2.07 NETWORK REQUIREMENTS

A. The Public Address System shall utilize the Campus LAN to provide services to all devices and workstations. The primary and backup servers for the system shall be

located in two different main communication rooms and shall be connected to the LAN switches via 1000-BaseT Ethernet. Clients shall be connected to the LAN via 10/100/1000 Mbps Ethernet (auto-negotiating). The clients shall communicate with the system applications utilizing the TCP/IP network protocol. As per Cobranet requirements, all audio communications shall be accomplished over Layer 2 via a VLAN.

B. All systems shall be capable of being SNMP managed, and monitored by the centralized remote management system.

PART 3 - EXECUTION

3.01 EXAMINATION

A. See Section 270100, Paragraph 3.01.

3.02 INSTALLATION

A. See Section 270100, Paragraph 3.02.

B. General

1. Install equipment and cable/wires in accordance with manufacturer's instructions.
2. Install equipment, cables, and speakers as required to comply with all applicable requirements of the references and/or regulatory requirements called for under PART 1 of this section of specifications, as a minimum installation requirement. Exceed this minimum requirement when called for herein.
3. Install all electrical basic materials per applicable sections of these specifications.
4. Connect reproducers to amplifier with matching transformers.
5. Arrange equipment cabinets to provide adequate ventilation and access.
6. Properly ground system per applicable specification sections.
7. Support backboards and cabinets under the provisions of Division 27 or, if more restrictive as required by manufacturer's instructions.
8. Install Public Address system wiring away from any surface that may become hot, including and not limited to, hot water piping and heating ducts.
9. Raceway for Public Address system wiring shall not be shared by power or any other electrical wiring that is not part of the low-voltage Public Address systems.
10. Final connections, balancing, adjustments, testing, etc. shall be by factory trained technicians. When system is complete, it shall be demonstrated to Employer's representative who shall be given complete instructions, part, manuals and maintenance information.
11. Make cable shields continuous at splices and connect speaker circuit shield to equipment ground only at amplifier.
12. Install input circuits in separate cables and raceways from output circuits.
13. Provide protection for exposed cables where subject to damage.
14. Use suitable cable fittings and connectors.

15. All cables shall be cut to the length dictated by the run. No splices shall be permitted in any pull boxes. For equipment mounted in drawers or on slides, the interconnecting cables shall be provided with a service loop of appropriate length.

C. Speakers

1. Provide all required mounting hardware and/or accessories.
2. Speakers mounted in acoustical tile ceilings shall have a support bridge.

D. Cable/Wire

1. Splice cable only at building block units.
2. Make cable shields continuous at splices and connect speaker circuit shield to equipment ground only at building surge protection devices and at amplifier and/or as otherwise required by applicable codes.
3. Install input circuits in separate cables and raceways/pathways from output circuits.
4. Install all cables no closer than 305 mm from any horizontal or backbone cabling, power system cable/raceway, or fluorescent/ballasted light fixtures.
5. Leave 305 mm excess cable at each termination at speaker and termination blocks.
6. Leave 3658 mm excess cable at the central system equipment/rack.
7. Provide protection for exposed cables where subject to damage.
8. Use suitable cable fittings and connectors.
9. Label cable at both ends indicating the originating and terminating location of each end. This labeling/identification shall be fully documented in as-built drawings.
10. Cables shall not be installed with a bend radius less than that specified by the cable manufacturer.

3.03 DOCUMENTATION

A. See Section 270100, Paragraph 3.03.

3.04 GENERAL TESTING REQUIREMENTS

A. See Section 270100, Paragraph 3.04.

B. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:

a. Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio.

b. Repeat test for each separately controlled zone of loudspeakers.

c. Minimum acceptance ratio is 50 dB.

C. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call

amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.

D. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.

E. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.

F. Signal Ground Test: Measure and report ground resistance at pubic address equipment signal ground. Comply with testing requirements specified in Division 27 Section "Grounding and Bonding for Communication Systems."

G. Audio paging systems will be considered defective if they do not pass tests and inspections.

3.05 MAINTENANCE AND SUPPORT

A. Refer to Section 270100, Paragraph 3.08.

3.06 CLEANING

A. Refer to Section 270100, Paragraph 3.09.

3.07 ACCEPTANCE

A. Refer to Section 270100, Paragraph 3.11.

END OF SECTION 275116

SECTION 275300

DISTRIBUTED ANTENNA SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Refer to Section 270100, Paragraph 1.01.

A. Section 275300 contains the technical specifications for Distributed Antenna System (DAS) at the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project.

1.02 REFERENCES

A. Refer to Section 270100, Paragraph 1.02.

B. National Fire Protection Agency (NFPA) 72 National Fire Alram and Signaling Code.

1.03 RELATED SECTIONS

A. Refer to Section 270100, Paragraph 1.03.

1.04 SCOPE OF WORK

A. The work shall include the design; installation and testing of an expansion of the existing Distributed Antenna System (DAS) at MHJIT. The DAS supplied under this package shall include the appropriate host units, expansion units, and other equipment compatible with the network management of the existing system in use by the Airport.

B. The DAS shall support all major wireless technologies including but not limited to GSM, GPRS, EDGE, WCDMA, UMTS, HSDPA, HSUPA, CDMA 2000, 1xRTT, EVDO, EvDO RevA, LMR, trunked and conventional radio SMR systems, iDEN, AWS, technologies on 700 MHz band, WiMAX and others.

C. The Contractor shall provide all patch cords as required for interconnection from the DAS equipment to the backbone infrastructure including any patch cables to accommodate transition from the standard outlet types to special connectors on equipment.

D. The Contractor must provide all design, DAS components, installation, manufacturer's recommended spares, documentation, technical training, and warranty services to provide a turnkey extension of the existing DAS in the areas designated on the drawings.

E. The Contractor shall provide and install the necessary items to properly ground all components.

F. The Contractor shall provide and install surge protection devices for AC power connections.

G. All required cabling connections provided under this project shall be subject to inspection/approval by the Authority's representatives.

H. It shall be the Contractor's responsibility to identify actual quantities and locations of the equipment required to meet the coverage specifications.

I. The Contractor shall label all new equipment as directed by the Authority.

J. The Contractor shall provide as-built drawings in Authority specified format for maintenance purposes.

K. The Contractor shall assign a Project Manager to this project and he/she shall be the focal point of communications with the Owner/Design Consultant.

L. ISD shall assign IP addresses for all DOA networks.

1.05 QUALIFICATIONS

A. Refer to Section 270100, Paragraph 1.05.

1.06 SUBMITTALS

A. Refer to Section 270100, Paragraph 1.06.

B. Provide the following for approval:

1. All documents coordinated with the Owner for Owner approval.
2. Wireless carrier signal survey.
3. Approval of DAS components by the authority having jurisdiction (AHJ).
4. Predictive In-building wireless survey.
5. System layout and link budget calculations based on the equipment selected.

1.07 INTELLECTUAL PROPERTY

A. Refer to Section 270100, Paragraph 1.07.

1.08 WARRANTY

A. Refer to Section 270100, Paragraph 1.08.

1.09 QUALITY ASSURANCE

B. Refer to Section 270100, Paragraph 1.09.

A. Depending on state and local regulations, Qualified personnel shall meet at least one of the following requirements:

1. Registered, licensed, or certified by the state or local authority.
2. Certified by a national certification organization acceptable to the AHJ.
3. Factory trained and certified for design of the specific type/brand of system and are acceptable to the AHJ.

B. System Installers shall be qualified or supervised by persons qualified in the installation, inspection and testing of the system.

C. Service personnel shall be qualified and experienced in the inspection, testing and maintenance of the system. Service personnel may also be qualified by employment with an organization listed by a nationally recognized testing laboratory and performing the servicing of the specific type/brand system.

1.10 DELIVERY STORAGE AND HANDLING

A. Refer to Section 270100, Paragraph 1.10.

1.11 RADIO/TELEVISION INTERFERENCE

A. Refer to Section 270100, Paragraph 1.11.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers shall meet all specifications requirements and shall be approved by the Engineer.

2.02 MATERIAL REQUIREMENTS

A. The Contractor shall provide all material for this project, including:

1. Remote Access Units shall be ADC units with the required pass-band to meet the performance requirements of the Authority. All DAS System Monitoring and Management shall be interfaced with the overall DOA/ISD Network Operations Center (NOC).

2. For installations within the train tunnel and train vehicle maintenance areas, the RAU shall be mounted in a NEMA 3R enclosure (Hoffman A18R186HCR or A36R3012HCR as appropriate or equivalent) with a locking clasp to install an Authority provided padlock. The enclosure shall include an internal mounting panel (Hoffman A18P18PP or A36P30 as appropriate or equivalent) for mounting of the RAU. Conduit entry into the side of the enclosure shall be via one of the following two approved methods, other methods require approval of the Owner/Design Consultant:

a. Conduit Entry Above Live Parts:

1) Use only U.L. listed rain tight or liquid tight conduit hubs.

2) Install hubs and conduit according to the hub manufacturers' instructions.

b. Conduit Entry Below Live Parts:

1) Punch or drill the correct hole for the size of conduit to be used (see table below) or use the appropriate knockout (where provided).

2) Secure the conduit with locknuts inside and out, or with a locking bushing on the inside and a locknut on the outside.

Conduit	Hole
¾"	1 1/8"
1"	1 3/8"
1¼"	1 ¾"
1½"	2"

3. Connectors shall be as recommended by the cable manufacturer

4. Omni-directional and directional antennas shall be specific to provide the required coverage and blend into the environment of an airport. Unless otherwise directed, omnidirectional antennas for PCS, Cellular, 700 MHz and WiMAX shall be Laird SL69273PTL36NM (or equivalent). Unless otherwise directed, omnidirectional antennas for AWS and Public Safety/SMR shall be Huber and Suhner (H+S) SWA-0860/360/4/0/V-2 (or equivalent) for indoor locations and H+S SWO-764/360/6/30/V (or equivalent) for outdoor locations.

5. Surge protection devices for AC and RF interconnections shall be public safety quality.

6. Coaxial cable shall comply with the following:

a. Coaxial Cable required for the DAS installation shall conform to the product installation guidelines. Special care shall be exercised not to exceed the specified bending radius at any time during installation. Any cable which is bent beyond this radius shall be replaced in its entirety at no cost to the Authority.

b. All coaxial cable shall be as shown on the contract drawings unless otherwise approved by the Owner/Design Consultant. Cable jumpers less than 10' long shall be of a diameter that meets the installation and signal loss requirements.

c. Any coaxial cable which has any portion of its length inside plenum spaces shall have a plenum rated outer jacket.

7. System Monitoring and Management System and other non-coaxial cabling shall meet manufacturers' requirements and shall comply with Division 16, Section 16120, "Conductors and Cabling".

8. All cabling supplied by the Contractor, their terminations, and inter-connections shall be of new manufacture and shall comply with relevant EIA/TIA specifications for these products. All wiring and cabling where indicated shall be installed in EMT conduit. The Contractor shall also provide all general-purpose miscellaneous hardware associated with cabling and wiring necessary to complete all work specified herein. General purpose hardware includes but is not limited to screws, washers, nuts and D-rings of various sizes types and sizes; tie wraps; lag bolts; wire nuts; lugs; tape; cable pulling compound; encapsulate; et al as required for complete and proper installation.

B. Conduit/Raceways Work involving the installation of new conduits and raceways shall be conducted in accordance with the requirements of the Contract Drawings and Section 16130. The minimum conduit size is ¾" and in all cases shall comply with code/standards requirements.

2.03 SIGNAL COVERAGE

A. Wireless Carrier usable off-air signal shall be defined as receive signal strength greater than -95dBm and acceptable noise floor as measured at the donor antenna site or as required by the AHJ.

B. Radio rebroadcast coverage shall be provided as usable signal for minimum 90% of all building floor areas as shown on the Drawings.

C. Radio rebroadcast coverage shall be provided as usable signal for minimum 99% of critical building floor areas as shown on the Drawings to include: emergency command centers, fire pump rooms, exit stairways, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations and other areas deemed critical by the AHJ.

D. 2-way Radio usable signal shall be defined as receive signal strength greater than -85dB; or as required by the AHJ. Usable signal shall also provide minimum Digital Audio Quality (DAQ) of 3.4 as defined by speech understandable with repetition only rarely required, and with some noise and/or distortion.

E. Wireless Carrier rebroadcast signal coverage shall follow radio rebroadcast coverage requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 270100, Paragraph 3.01.

B. Contractor shall coordinate with the other system vendors and trades as required to ensure adequate environmental conditions, telecommunications infrastructure, Service Provider services, electrical power, grounding, physical security, access and other requirements are provided as necessary before installation of Data Communications systems.

C. The Contractor shall coordinate and submit plans and equipment components for approval by the AHJ, prior to installation. A renewable permit for the public safety radio enhancement shall be obtained where required by the AHJ.

3.02 INSTALLATION

A. Refer to Section 270100, Paragraph 3.02.

B. Provide and install components in accordance with contract documents, manufacturer's guidelines and installation instructions, and approved submittal data.

C. System installation and construction methods shall conform to the requirements of the Federal Communications Commission (FCC), NFPA 70 (NEC) and NFPA 72.

D. Contractor shall adhere to the following during installation of the system:

1. Underwriters Laboratory (UL) listing for restricted access installations in business and customer premises applications. Listing is required by the National Electric Code for customer premise installations.

2. Fire resistance requirements specified by Underwriter's Laboratories in UL 1459, 2nd edition.

E. Provide the following:

1. Approval of DAS components by the Authority Having Jurisdiction (AHJ).

2. Predictive In-building wireless survey using industry standard software tools and the approved wireless carrier technologies to optimize antenna placement indicated on the Drawings.

3. DAS configuration to support frequencies and technology for rebroadcast.

4. Antenna isolation between the donor antenna and any in-building antenna shall be at least 15 dB measured at the highest operating gain setting of the signal booster.

5. System layout, and coax and fiber optic link budget calculations.

6. Mitigation of wireless interference affecting DAS functionality and generation of interference affecting other systems.

7. Testing to optimize in-building antenna locations and quantities necessary to provide the required usable signal coverage and wireless roaming.

8. Coordination with Construction Manager and Architect prior to ceiling construction for revised or additional in-building antenna locations and mountings.

F. Contractor shall perform physical installation of all system components including furnished equipment, and appurtenances in accordance with the manufacturer's instructions, and shall furnish all cables, connectors, terminators, interconnections, supports, hangers, services, and adjustments required for a complete and operable system.

G. Provide minimum 12 feet separation and 4-20dBm signal separation between antennas. Locate in-building antennas to minimize signal interferences.

H. Utilize minimum gain and lowest power levels necessary to provide required coverage.

I. The Contractor shall be responsible for providing all conduit, hangers, supports, penetrations, sleeves, firestopping and cabling to all antenna locations. Cable shall be continuously supported, or at intervals of no more than 3 feet. The Contractor shall make note of ceiling conditions and provide means (conduit) to support cable over inaccessible ceilings and any other inaccessible locations.

J. In-building cable tray provided under other Sections shall not be utilized for DAS coaxial cable.

K. Permanent external filters and attachments shall not be permitted.

L. Where undefined by codes and standards, Contractor shall apply a safety factor of at least two (2) times the rated load to all fastenings and supports of system components.

M. Apply the latest patches and security updates. Register system equipment with the manufacturer under the Owner's name.

N. System grounding shall be installed per applicable standards and as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.

O. All system components shall be clearly labeled in compliance with ANSI/TIA 606-B and Owner specific nomenclature per Section 270100.

3.03 DOCUMENTATION

A. Refer to Section 270100, Paragraph 3.03.

3.04 GENERAL TESTING REQUIREMENTS

A. Refer to Section 270100 Paragraph 3.04.

B. The Contractor shall coordinate and prepare an Owner approved Test Plan to include:

1. Confirmation of minimum required signal separation between DAS in-building signal rebroadcast and donor antenna signalling.

2. Confirmation of usable wireless signal strength is provided as specified throughout the coverage area for each Wireless Carrier and the 2-way Radio system.

3. Confirmation of usable wireless signal strength is provided as specified at each critical coverage area for each Wireless Carrier and the 2-way Radio system.

4. Confirmation of seamless Wireless Carrier signal roaming between all adjacent in-building antenna cells.

C. Testing shall include:

1. A grid cell measurement approach, as more fully described in NFPA 72, for testing within the building.

2. Downlink testing shall include:

a. Calibrated spectrum analyzer or calibrated automatic signal level measurement recording system to measure signal strength in dBm.

b. Receiving antennas of equal gain to the agency's standard portable radio antenna, oriented vertically, with a centerline between 3 ft (0.91 m) and 4 ft (1.22 m) above floor.

c. Resolution bandwidth nearest the bandwidth of the channel under test.

d. Levels recorded while walking an "X" pattern, with the center of the pattern located approximately in the center of each grid area.

e. Linear distance of each side of the "X" equal to at least 10 percent of the length of the grid's side and a minimum length of 10 ft (3.0 m).

f. Measurement sampled in averaging mode to include a minimum of one sample per each 5 ft (1.52 m) traveled, recorded with not less than five samples per measurement recorded per side of the "X".

3. A spectrum analyzer shall be utilized to ensure spurious oscillations are not being generated or unauthorized carriers are being repeated in violation of FCC regulations.

4. Measurements shall be analyzed for correct gains on both unlink and downlink paths, noise floor elevation from active components, intermodulation, and other parameters determined necessary by the AHJ.

5. Backup batteries and power supplies shall be tested under load for a period of 1 hour to verify proper operation during an actual power outage.

6. Testing of both uplink and downlink signal performance.

7. All manufacture recommended systems testing.

2. Verification of overall DAS operation.

8. Obtain Wireless carrier and 2-way Radio provider verification of the system. Each carrier on the system shall conduct a test on the system and certify that the coverage is acceptable.

9. Record all test procedures and results.

10. Record in tabular form all test results, deficiencies, and corrective measures.

D. The Test Plan shall address all requirements identified in this specification and test all contractor supplied cabling and hardware components. The plan shall follow accepted industry testing practices, NFPA 72 and have a method of independent verification described.

E. Any specified item that does not satisfy the requirements of this specification or the AHJ shall be replaced, upgraded, or added by the contractor as necessary to correct the noted deficiencies. After correction of a noted deficiency, re-testing shall be performed to verify compliance with the requirements of this specification or the AHJ..

3.05 MAINTENANCE AND SUPPORT

A. Refer to Section 270100, Paragraph 3.08.

3.06 CLEANING

A. Refer to Section 270100, Paragraph 3.09.

3.07 ACCEPTANCE

A. Refer to Section 270100, Paragraph 3.11.

END OF SECTION 275300

SECTION 275416

COMMON USE TERMINAL EQUIPMENT SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. See Section 270100, Paragraph 1.01.

B. Section 275416 contains the technical specifications for expansion of the existing Common Use Terminal Equipment (CUTE) system, which is now know in the industry as "CUPPS" with the evolution of IATA RP 1797. For the purposes of this project the term "CUPPS" shall be considered the same terminology as the legacy term "CUTE".

1. The existing Common Use system is provided and maintained by SITA Information Networking USA Inc. Local contact phone: (770) 850-4500

C. Drawings and general provisions of the Contract, including Contractual Conditions and Division 0 and Division 1 specifications sections apply to this section.

1.02 REFERENCES

A. See Section 270100, Paragraph 1.02.

1.03 RELATED SECTIONS

A. See Section 270100, Paragraph 1.03.

1.04 SCOPE OF WORK

A. Provide a complete integrated expansion of the existing CUPPS as required to provide multiple airline use of the Gate Desk equipment sets for interface to airline departure control systems (DCS), Local DCS and the existing SITA system Core equipment and firewalled interface to the world networks.

B. The CUPPS equipment sets shall provide full function departure gate passenger process for each of the airlines scheduled to use the gate defined in the project drawings.

C. The installation of CUTE/CUPPS equipment and programming of system functionality. All programming, system configuration and set up is proprietary and is to be completed by the existing CUPPS service and maintenance service provider, SITA.

D. Provide and expansion of the Existing Local Departure and Control System (LDCS)

1. TBD

E. Work defined for this Section includes, but is not limited to:

1. Expansion of the existing HJAIA Common Use system the project boarding gate desks as indicated in drawings.
2. Coordination with Networking and Premise Wiring Trades
3. Coordination with Millwork Trades
4. Coordination with Electrical Power Trades
5. Coordination with Airlines scheduled to use the project gate
6. System Implementation Phasing

7. Systems Programming
8. Systems Testing
9. Systems Training

F. Installation shall include all software licenses, provisioning of equipment, software and programming, associated with installation of the equipment for a fully functional extension of the existing SITA common use system

G. Contractor is responsible for providing all data cabling information and closely coordinating with data cabling trades to ensure that all conduit and communication cabling is provided for gate desks and associated peripherals including board pass readers.

H. Contractor is responsible for providing all power load information and closely coordinating with electrical subcontractor to ensure that all conduit, cabling, power circuits.

I. Contractor shall include all labor, materials, tools, transportation, storage costs, training, equipment, insurance, temporary protection, permits, inspections, taxes, installation, software licenses, software, software integration, all required testing/documentation and all necessary and related items required to provide complete and operational system shown in project drawings and described in the Specifications.

J. The Contractor is responsible for providing and coordinating final equipment arrangements, locations, phased activities and construction methods that minimize disruption to operations at adjacent gates and airport in general while and providing complete and operational systems.

1.05 QUALIFICATIONS

A. See Section 270100, Paragraph 1.05.

B. Common Use system programming and configurations shall be completed by SITA certified programmer sand technicians.

1.06 SUBMITTALS

A. See Section 270100, Paragraph 1.06.

1.07 INTELLECTUAL PROPERTY

A. See Section 270100, Paragraph 1.07.

1.08 WARRANTY

A. See Section 270100, Paragraph 1.08.

1.09 QUALITY ASSURANCE

A. See Section 270100, Paragraph 1.09.

1.10 DELIVERY, STORAGE, AND HANDLING

A. See Section 270100, Paragraph 1.10.

1.11 DEFINITIONS

All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of the telecommunications industry, as well as federal, state and local governmental agencies, including, but not limited to the following:

1. IATA RP 1797 Common Use Passenger Processing Systems Technical Specification
2. IATA RP 1797 Common Use Passenger Processing Systems Technical Requirements
3. Latest Version of IATA CUPPS Specification and Recommended Practices as posted at http://www.cupps.aero/documents
4. IEEE 802.11 (a, b/g, n) - Information Technology - Telecommunications And Information Exchange Between Systems - Local And Metropolitan Area Networks - Specific Requirements Part 11: Wireless LAN Medium Access Control (MAC) And Physical Layer (PHY) Specifications
5. ANSI/TIA/EIA-568-C.1 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements, 02/02/09
6. ANSI/TIA/EIA –569-B Commercial Building Standard for Telecommunications Pathways and Spaces, May 2009
7. ANSI/TIA/EIA -606-A Administration Standard for Commercial Telecommunications Infrastructure, 11/24/08
8. ANSI/TIA/EIA -607 - Commercial Building Grounding and Bonding Requirements for Telecommunications, August 1994
9. ANSI/TIA/EIA 862 Building Automation Systems Cabling Standard for Commercial Buildings, 2002
10. FCC 47 Part 68 -Code of Federal Regulations, Title 47, Telecommunications
11. IEEE - National Electrical Safety Code (NESC); 2007
12. ISO/IEC 11801 Information Technology - Generic Cabling For Customer Premises
13. LAHJ – Local Authority Having Jurisdiction- Building and Safety Electrical Code
14. NEMA 250 - Enclosures for Electrical Equipment (1000 V Maximum)
15. NFPA-70 - National Electric Code; 2008
16. UL 1863 - Underwriters Laboratories Standard for Safety – Communications Circuit Accessories

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide all components, equipment, parts, accessories and associated quantities required for complete CUTE/CUPPS support of passenger processing. Provide equipment using all solid-state components fully rated for continuous duty at the ratings indicated or specified. The basis of design is for provisioning of the latest HJAIA approved SITA Airport Connect CUPPS equipment and software versions to be fully

compatible with the existing SITA CUTE/CUPPS system installed at HJAIA. the Work include, but are not limited to the following:

1. SITA certified CUPPS Departure Gate Equipment sets

B. Departure Gate Equipment Sets shall include, but are not limited to the following:

1. CUPPS Workstations
2. OCR/MCR CUPPS compliant keyboards
3. Bar Code Scanners (Hand Held)
4. Board Pass Readers
5. Automated Ticket and Boarding Pass Printers (ATB)
6. Baggage Tag Printers (BTP)
7. General Purpose Document Printer
8. Patch cables, printer and reader cabling and power cords as required.

2.02 SOFTWARE GENERAL

A. All software installed shall be latest version of SITA CUPPS as approved for use at HJAIA with backwards compatibility to CUTE and previous CUPPS versions as required for supporting airlines planned to use the project boarding gate.

B. System software required for the complete operation of this system shall be provided, installed on the system hard disk and tested, including software to build and maintain the required databases.

2.03 COMMON USE WORKSTATIONS

A. Workstations provide for airline use at the project gate shall be fully compliant with the existing Common Use system and meet or exceed the following features and options:

1. Workstation Computer -TBD

2.04 COMMON USE WORKSTATION PERIPHERALS

A. Workstation Display/ Monitor

1. The Common Use workstations shall include an LCD display screen meeting or exceeding the following specifications:

a. TBD

B. SPECIALTY KEYBOARD

1. The Common Use workstations shall include user friendly keyboards that are fully compliant with IATA CUPPS and certified by SITA. The keyboards shall include:

a. OCR reader for scanning optical code
b. MSR reader for reading magnetic strip data
c. Pointer/Trackball for curser interface

C. AUTOMATED TICKETING AND BOARDING PASS (ATB) PRINTER

1. The Common Use workstations shall include ATB printers that are fully compliant with IATA CUPPS and certified by SITA. The printers shall include:

a. TBD

D. BAGGAGE TAG PRINTER (BTP)

1. The Common Use workstations shall include Baggage Tag Printers (BTP) that are fully compliant with IATA CUPPS / IATA Standards and certified by SITA. The printers shall include:

   a. TBD

E. GENERAL PURPOSE DOCUMENT PRINTER

1. The Common Use workstations shall include General Purpose Document (GPD) Printers that are fully compliant with IATA CUPPS / IATA Standards and certified by SITA. The printers shall include:

   a. TBD

F. BOARDING GATE READER (BGR)

1. The Common Use workstations shall include Boarding Gate Readers (BGR) that are fully compliant with IATA CUPPS / IATA Standards and certified by SITA. The readers shall include:

   a. TBD

PART 3 - EXECUTION

3.01 EXAMINATION

A. See Section 270100, Paragraph 3.01.

3.02 INSTALLATION

A. See Section 270100, Paragraph 3.02.

B. General

1. Install equipment and cable/wires in accordance with manufacturer's instructions.
2. Install equipment, cables, and speakers as required to comply with all applicable requirements of the references and/or regulatory requirements called for under PART 1 of this section of specifications, as a minimum installation requirement. Exceed this minimum requirement when called for herein.
3. Install all electrical basic materials per applicable sections of these specifications.
4. Arrange equipment cabinets to provide adequate ventilation and access.
5. Properly ground system per applicable specification sections.
6. Coordinate with millwork trades for proper fit and functionality of CUPPS gate equipment sets with the Gate desk millwork and associated ticket reader units.

C. Programming

1. Provide expansion of existing SITA CUTE/CUPPS to include new workstations, CUPPS peripherals and airline users scheduled to operate out of the project gate.
2. Configure CUPPS equipment sets (workstations and peripherals) to be compatible with the existing SITA systems and function in compliance with IATA CUPPS and Airline Users.
3. Printer pec tabs and network monitoring of peripherals shall be configured to integrate new equipment with existing Common Use system and airline users.

3.03 DOCUMENTATION

A. See Section 270100, Paragraph 3.03.

3.04 GENERAL TESTING REQUIREMENTS

A. See Section 270100, Paragraph 3.04.

3.05 MAINTENANCE AND SUPPORT

A. Refer to Section 270100, Paragraph 3.08.

3.06 TESTS AND ADJUSTMENTS

A. The Contractor shall perform all tests and adjustments prior to the system demonstration and acceptance test.

3.07 CLEANING

A. Refer to Section 270100, Paragraph 3.09.

3.08 ACCEPTANCE

A. Refer to Section 270100, Paragraph 3.11.

END OF SECTION 275416

SECTION 275900

GATE MONITORING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the furnishing of all labor, equipment, materials, and performing all operations in connection with the installation of the Gate Monitoring System at the Maynard H. Jackson Jr. International Terminal (MHJIT) as indicated on the Drawings and in this Specification. This includes all components and equipment necessary to provide a complete and operational system including start-up services, and warranties as specified.

B. Related Work Specified Elsewhere:

1. Passenger Boarding Bridges and Fixed Walkways: SECTION 347713.
2. Preconditioned Air Direct-Expansion Air Handling Units and Accessories: SECTION 335444.
3. Ground Power Units (400Hz): SECTION 263543.

1.02 REFERENCES

A. Applicable Standards:

1. National Fire Protection Association (NFPA):
   a. 70 - National Electrical Code.
2. Underwriters Laboratories (UL).

1.03 SYSTEM DESCRIPTION

A. The Gate Monitoring System (system) shall include all software and hardware (including modifications) necessary to monitor the Passenger Boarding Bridge (PBB), Preconditioned Air Unit (PCA), and 400Hz Ground Power Unit (GPU) at Gate F3A. Data transmission from each piece of equipment at MHJIT Gate F3A will be over copper and fiber communication lines, as indicated in the PBB drawings and specifications, as well as in the communications drawings and specifications. The system shall transmit data transmissions to the existing gate monitoring system workstation in Terminal E.

1.04 SUBMITTALS

A. General: All items shall be submitted to Owner and Engineer for approval before purchase and installation. Submit manufacturer's technical data, including specifications and installation instructions, for each of, but not limited to, the following items, in accordance with DIVISION 01.

1. System architecture drawing (system block diagram) showing modifications to all monitored points, communications interfaces, and data storage devices.
2. Each modified screen in system program, in color.

1.05 QUALITY ASSURANCE

A. All equipment and material shall be the latest design, new, and the first quality standard product of manufacturers regularly engaged in the production of such equipment and material.

1.06 WARRANTY

A. Contractor shall provide a two (2) year parts and labor warranty for the system. Warranty shall commence with Substantial Completion of installation.

PART 2 - PRODUCTS

2.01 GATE MONITORING SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by manufacturers indicated below:

1. Gate Monitoring System

a. JBT Aerotech – Jetway.

B. General System Description:

1. Furnish and install all system equipment as specified in this Section and the drawings, to be wired, connected, programmed, and left in operating condition.

2. The system wiring shall include communication lines (fiber and copper) and networking equipment provided by the building communications contractor. See communications drawings and specifications for details.

C. Gate Monitoring System:

1. Modify the existing gate monitoring system which shall also monitor the PBB, PCA, and GPU at Gate F3A according to the following requirements. The system shall collect data from the PBB, PCA, and GPU at Gate F3A, through the communications network provided by others. The PBB shall gather data from its associated PCA and GPU by means of networked connections provided by others. The system shall obtain all data from each gate from a network connection to the PBB. The system software shall be compatible with the gate equipment (PBB, PCA, and GPU) provided by the appropriate contractors.

2. Coordinate with airport representative for specific requirements before programming and installation of system. The system shall display data from the gate equipment on the computer monitor on screens which shall make all data readable, understandable, and such that it can be worked with. Each data point displayed shall be classified as informational, warning, or alarm. The system shall take appropriate action and display data accordingly. Data points listed below are a minimum, and alarms and warnings based on listed data points shall be provided. Informational, warning, and alarm data shall be treated and displayed according to industry standards for this application.

3. The system shall have a main screen which shall display an updated floor plan of the terminal, showing graphically all pieces of monitored equipment, plus aircraft as required below. Each piece of monitored equipment shall be color coded to indicate status. Clicking on any piece of equipment shown in plan view shall open a screen dedicated to that piece of equipment. There shall also be a general alarm screen which shall show a summary of all alarms which have been logged. The alarm screen shall have a link to an accessible database where all events are

logged. The system shall have all necessary diagnostic and maintenance screens to assure continued operation of the system, as well as setup screens to choose operator preferences. The following indicates the minimum data which shall be available on each screen. Data points comparable to data points listed below may be provided, depending on the information provided by each piece of equipment that is installed by others, but must be approved:

a. Main screen: The main screen shall display all PBB, PCA, and GPU equipment, plus aircraft shown in plan view. A color legend shall be visible on the screen.

(1) The PBB at Gate F3A shall have a different color which shall indicate its status as one of the following:

(a) Logged off

(b) Normal

(c) Warning

(d) Alarm

(2) The PBB at Gate F3A shall show an aircraft in plan view in the appropriate location when an aircraft is docked. When no aircraft is docked, no aircraft shall be displayed. The aircraft shall appear in a different color to indicate one of the following:

(a) Aircraft docked

(b) Normal

(c) Warning

(d) Alarm

b. Typical PBB screen: The PBB at Gate F3A shall have its own display screen which shall display a bridge elevation graphically and indicate the following data:

(1) Autoleveling activated

(2) Autoleveling fault

(3) Cab rotation angle

(4) Cab left rotation switch activated

(5) Cab right rotation switch activated

(6) Canopy up limit activated

(7) Left column limit activated

(8) Right column limit activated

(9) Horizontal motion stop circuit activated

(10) Emergency stop activated

(11) Maximum extension switch activated

(12) Articulating floor in auto

(13) Platform floor heat activated

(14) Forward platform elevation

(15) High limit activated

(16) Low limit activated

(17) Interlock trip

(18) Motor overload

(19) Fault

(20) Control system not logged in

(21) Control system active

(22) Minimum retract switch activated

(23) Rotunda left rotation switch activated

(24) Rotunda right rotation switch activated

(25) Rotation angle

(26) Slope high switch activated

(27) Slope low switch activated

(28) Slow-down circuit activated

(29) Cab rotation fault

(30) Left horizontal drive fault

(31) Right horizontal drive fault

(32) Left vertical motor overload

(33) Right vertical motor overload

(34) Main contactor fault

(35) Smoke detector activated

(36) GPU operating

(37) GPU cable 1 deployed

(38) GPU cable 2 deployed (if applicable)

(39) PCA unit operating

(40) PCA smoke detector activated

c. Typical PCA screen: The PCA at Gate F3A shall have its own display screen and shall display the following data:

(1) PCA on

(2) PCA alarm

(3) PCA smoke detector activated

(4) PCA cabin temperature

(5) PCA discharge temperature

(6) Ambient temperature

(7) Aircraft type

(8) Cool mode activated (if applicable)

(9) Heat mode activated (if applicable)

(10) Blower fault

(11) Dirty air filter

d. Typical GPU screen: The GPU at Gate F3A shall have its own display screen and shall display the following data:

(1) GPU on

(2) GPU alarm

(3) GPU cable 1 deployed

(4) GPU cable 2 deployed (if applicable)

(5) Phase A line voltage (provide separate points for phases B and C also)

(6) Average line voltage

(7) Phase A output voltage (provide separate points for phases B and C also)

(8) Average output voltage

(9) Output frequency

(10) Phase A output current (provide separate points for phases B and C also)

(11) Output current average

(12) kVA

(13) Average kWh

(14) Bypass on

(15) Input overvoltage

(16) Input undervoltage

(17) Output overvoltage

(18) Output undervoltage

(19) Output overload

(20) No E&F present

(21) Neutral fault

(22) DC bus fault

(23) 400Hz contactor fault

(24) Overtemperature fault

(25) 400Hz frequency fault

(26) Processor board fault

e. General alarm screen: A general alarm screen shall display all alarms including their status for a set period of time, going back from present time. All older alarms shall be saved in the database. The screen shall have a link to a database screen.

f. Database screen: The database screen shall have the capability of displaying and printing reports of data from the last 30 days. Data older than 30 days shall be electronically archived. The following reports shall be available from the last 30 days' data:

(1) Gate performance: This report summarizes all events that occurred at a gate following the docking of an aircraft. A new page is created for each new aircraft selection.

(2) All messages: This report provides a summary of all non-fault messages for each gate and each piece of equipment.

(3) All faults: This report provides a summary of all fault messages for each gate and each piece of equipment.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which system equipment is to be installed.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Install the system in accordance with the plans and specifications, all national and local applicable codes, NEC wiring criteria, and the manufacturer's requirements and recommendations.

B. Installation of equipment and devices that pertain to other work in the Contract shall be closely coordinated with the appropriate subcontractors.

3.03 MANUFACTURER'S REPRESENTATIVE

A. The manufacturer's authorized representative shall provide all on-site software modifications and supervision of the complete system installation and perform a complete functional test of the system.

3.04 TESTING

A. The system shall be fully tested by the Contractor in the presence of the Owner's Representative and Engineer. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner and Engineer.

3.05 OPERATION AND MAINTENANCE manual

A. The contractor shall provide five (5) copies of a complete Operation and Maintenance Manual for the Gate Monitoring System, including pertinent system documents, and all items listed below:

1. System architecture drawing (system block diagram) showing all monitored points, communications interfaces, and data storage devices.

2. Description and license information for all software that is part of the system.

3. Each screen in system program, in color.

4. DVD of the training session.

B. The Operation and Maintenance Manual shall be provided in accordance with Closeout Procedures, SECTION 017700.

END OF SECTION 275900

SECTION 280100

GENERAL REQUIREMENTS FOR SECURITY SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. The Security System is the overall project which will extend an Access Control System (ACS) and a Video Surveillance System (VSS) for the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project.

B. Specification Section 280100 contains the general information common to the system sections of the Specifications. This Section is a part of the System Specifications and shall apply to all System Specifications.

C. Division 28 systems work and integration shall be performed by M.C. Dean, contact information: Scott Aamodtt, 404-606-6778.

1.02 RELATED SECTIONS

A. Related Sections:

1. Specification Section 281300 "Access Control and Monitoring System".
2. Specification Section 282313 "Video Surveillance System".
3. Specification Section 087100 "Door Hardware".
4. Specification Section 270100 "General Requirements for Communications Systems", and all related sections (see Section 270100, Paragraph 1.3).

1.03 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

B. Specific reference in Specifications to codes, rules, regulations, standards, manufacturer's instructions or requirements of regulatory agencies shall mean the latest printed edition of each in effect at date of Contract unless the Document is shown dated.

C. Comply with all local codes and requirements of authorities having jurisdiction.

D. Conflicts:

1. Any conflict found shall be brought to the attention of the Owner and Engineer. The Owner and/or Engineer shall provide direction on the resolution.
2. Comply with SP-8.12 in regards to precedence of project documents for conflict resolution.

E. Publication References (as applicable per system):

1. American National Standards Institute (ANSI).
2. ANSI C2 (2007); National Electrical Safety Code.
3. Code of Federal Regulations (CFR).
4. CFR 47 Part 15; Radio Frequency Devices.

5. National Fire Protection Association (NFPA).
6. NFPA 70 (2008) National Electrical Code.
7. International Organization for Standardization (ISO) including:
   a. ISO 9001; Quality Assurance in Design / Development, Production, Installations, and Servicing.
   b. ISO 9003; Quality Assurance in Final Inspection and Test.
   c. ISO 9004; Quality Management and Quality System Elements Guidelines.
8. International Building Code 2006.
9. UL – Underwriters Laboratory.
10. National Electrical Manufacturers Association (NEMA).
11. Building Industry Consulting Services International (BICSI).
12. Internet Engineering Task Force (IETF).
13. American Society for Testing Materials (ASTM).
14. FM - Factory Mutual.
15. IEEE - Institute of Electrical and Electronic Engineers.
16. OT – Comply with all Office of Technology requirements
17. OSHA - Occupational Safety and Health Agency.
18. Local, county, state and federal regulations and codes in effect as of the start of this contract shall be complied with.

F. CODES, STANDARDS, REGULATIONS AND REFERENCES

1. Comply with all applicable codes standards, regulations, and the most current issue of the following publications, including all amendments thereto of the issue that is current on the date of contract award. Applicable requirements of the following publications shall apply to the work under this specification as if fully written herein. Where conflicts exist between the Technical Specification and the referenced publications, local codes shall govern.
   a. American Standards Association (ASA)
   b. Institute of Electrical and Electronic Engineers (IEEE)
   c. National Fire Protection Association (NFPA)
   d. National Electrical Manufacturers Association (NEMA)
   e. Underwriters Laboratories, Inc. (UL)
   f. Federal, State and Municipal Building Codes and all other Authorities having jurisdiction
   g. National Electrical Code (NEC)
   h. Insulated Power Cable Engineers Association Specification (IPCEA)
   i. American Society for Testing Materials Specification (ASTM)
   j. Occupational Safety and Health Administration (OSHA)

k. National Electrical Safety Code (NESC)

2. Special attention shall be made to the following specific codes, standards, and publications where applicable:

a. ANSI B20.1 Conveyor Safety

b. ASTM F.1468-93 Standard Practice For Evaluation

c. Customs and Border Protection Airport Technical Design Standards for Passenger Processing Facilities, August 2006

d. EIA 232-D Interface between Data Terminal Equipment and Data Circuit-Termination Equipment Serial Binary Data

e. EIA RS-310-C Racks, Panel, and Associated Equipment

f. 49 CFR 1520 Protection of Sensitive Security Information

g. 49 CFR 1540 Civil Aviation Security General Requirements

h. 49 CFR 1542 Airport Security

i. 49 CFR 1544 Aircraft Operator Security

j. 49 CFR 1546 Foreign Air Carrier Security

k. 49 CFR 1548 Indirect Air Carrier Security. NFPA 72-D - Installations, Maintenance and Use of Proprietary Protective Signaling Systems

l. NFPA 75 Protection of Electronic Computer Data Processing Equipment

m. NFPA 77 Static Electricity

n. NFPA 78 Lightning Protection Code

o. Transportation Security Administration Recommended Security Guidelines for Airport Planning, Design and Construction, June 15, 2006

p. UL 294 Access Control System Units

q. UL 611 Central Station Burglar Alarm Units and Systems

r. UL 634 Intrusion Detection Units

s. UL 681 Installation and Classification of Mercantile and Bank Burglar Alarm Units

t. UL 796 Electrical Printed-Wiring Boards

u. UL 1076 Proprietary Burglar Alarm Units and Systems

v. UL 1950 Information Technology Equipment, including Electrical Business Equipment References to codes and standards called for in the Specifications refer to the latest edition, amendments, and revisions to the codes and standards in effect on the date of these Specifications.

G. In addition the Security Systems Contractor shall comply with all applicable Security Directives as issued by the TSA.

1.04 DEFINITIONS

A. See individual system specifications for applicable definitions.

1.05 SYSTEM DESCRIPTION

A. See individual system specifications for applicable system description.

1.06 INTELLECTUAL PROPERTY

A. Patents: Should patented articles, methods, materials, apparatus, etc., be used in this work, the Contractor shall acquire the right to use same. The Contractor shall hold the Owner and its agents harmless for any delay, action, suit, or cost growing out of the patent rights for any device on this Project.

B. Copyrights: Should copyrighted software be used in this Work, the Contractor shall acquire the right to use same. The Contractor shall hold the Owner and its agents harmless for any delay, action, suit, or costs stemming from copyrights for any software on this Project.

C. License to Use: All software required for the complete operation of the system as specified herein shall be delivered with either full license transferred to the Owner or a non-time limited License to use on each machine it is installed on, including the right to make backup copies. See individual system specifications for further licensing requirements.

D. Software Master Source Code: The Owner shall be provided with the latest master source code for all proprietary manufacturer specific software, or the manufacturer shall enter into a master source code escrow agreement whereby the source code shall be turned over to the Owner, at no cost, in the event that the manufacturer should enter into bankruptcy or discontinue support of the product. The source code shall be put into escrow along with the base operating system (including all patches and updates at the time of escrow), all tools such as editors, compliers, linkers, etc., which are required to rebuild and operate the system, and any other documentation required. The operating system and utilities and programs can be licensed copies of same, not the source code. The intent is to provide everything required allowing the Owner to install, edit, and re-compile the program with any changes.

1.07 RADIO/TELEVISION INTERFERENCE

A. FCC Compliance: All equipment that uses radio frequency energy shall be certified to comply with Subpart J of Part 15 of Federal Communication Commission rules CFR 47 as those rules define a Class A computing device.

B. Expected RF Environment: These systems are to be installed at the Airport and are subject to background RF levels expected in a major Airport environment. It is the Contractor's responsibility to protect the systems specified here from interference of other systems, and through compliance with Part 1.7.A above, to prevent interference with other systems.

1.08 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract. Unless noted otherwise or agreed upon by the Owner, Contractor shall provide eight (8) copies of any product data or shop drawing submittals and one (1) copy of any product sample submittals. Product samples shall be provided to the Engineer for review, and then will be returned to the Owner. All samples shall become the property of Owner.

B. The Contractor shall not perform any portion of the Work requiring submittal and review of Record Drawings, Shop Drawings, product data, or samples until the Owner or its designated assignee have approved the respective submittal. All Work shall be in accordance with approved submittals.

C. Product Data: Submit manufacturer's data on system components and sub-components including, but not limited to, Product performance Specifications, Electrical Specifications, Mechanical Specifications, physical dimensions and weights, rough-in diagrams, and instructions for installation, operation and maintenance, suitable for inclusion in maintenance manuals.

D. Proposed Product Data Sheets: The Contractor shall submit catalog cut-sheets that include manufacturer, trade name, and complete model number for each product specified. Model number shall be handwritten and/or highlighted to indicate exact selection. Identify applicable Specification Section reference for each product. Product data sheets shall be bound in a three (3) ring binder and shall include a product index listing the model number and description of product.

E. Shop Drawings: Provide Shop Drawings showing equipment, devices, locations, wiring diagrams, mounting, data outlets and applicable arrangements.

F. Provide an assembly drawing of every equipment rack/cabinet and card cage enclosure with location and dimensions shown.

G. Provide wiring diagrams showing all field devices and their connected wiring.

H. Parts List: Provide a complete parts list and breakdowns that identify each component (to the lowest repairable unit) as well as ordering information. The characteristics of each component shall also be shown, where applicable, to aid in obtaining substitute parts.

I. Submit all proposed labeling materials and nomenclature for approval. Labeling shall match nomenclature indicated on design drawings, unless otherwise noted.

J. Program Management Plan: Provide an overall Program Management Plan within thirty (30) days of Notice to Proceed. Plan shall include, at a minimum, team organization and responsibilities, key personnel, schedule management and applicable processes including Safety plan, configuration management, change management, and quality assurance plan. This Plan shall be incorporated into the Critical Path Method (CPM) Schedule produced in Owner approved scheduling program.

K. Work Schedule: Provide a master schedule for proposed system installation and implementation, including dates and milestones, as part of the overall CPM Schedule. See Owner requirements regarding content and timeline. Schedule shall include, at a minimum, the proposed Shop Drawing submission dates, the ordering and manufacture time, the installation schedule, the schedule of values, the programming of the system, and the testing time.

1. Updates to the Work Schedule shall be submitted on a weekly basis to the Owner. Updates shall include technical status and work accomplished; schedule status including variance analysis: risks/opportunities/risk mitigation plans (as required); open action items; accomplishments: planned activities for next week and next month.

2. The Contractor shall be responsible for identifying and coordinating dependencies with other contractors working on-site, including the Contractor's own sub-contractors working on this project, as well as system/sub-system (new and existing) dependencies. Contractor shall notify the Owner of those dependencies as soon as they are identified and shall maintain a list of any and all dependencies for the duration of the project. An updated coordination Document shall be submitted on a weekly basis to the Owner.

3. In order to assure that the LAN is provided in accordance with the system installation requirements, the Contractor shall provide a detailed schedule

indicating the date that each communication room will be ready including, but not limited to, equipment cabinets, UPS units, patch panels, and equipment shown on the plans and on the rack elevations. The Contractor shall provide this schedule to the Owner and allow for a minimum of ten (10) working days for the Owner to install the LAN switch in each closet. The schedule shall be part of the overall project schedule and shall be updated as required above.

L. Testing: Prepare and submit Test Plans, Test Procedures, Test Results, and Test Reports as indicated for each system. The Test Plans, Procedures, and Reports shall be submitted to the Owner and the Engineer for approval and shall be incorporated into the overall Construction Quality Control Plan. The Contractor shall provide all system integration, overseeing and validating all testing and commissioning, and verifying all training and training materials.

1.09 QUALITY ASSURANCE

A. Contractor: The Contractor shall have been in the business of providing similar systems for a minimum of five (5) years. The Contractor shall have been actively engaged in installing, maintaining and operating similar systems and services as outlined in this document. Contractor shall meet all minimum requirements as called out in the General Information (GI) of the RFP documents.

B. The Contractor shall upgrade each software package, firmware, and Operating System (where applicable and as approved by Owner) used in the system to the latest version by the end of the Warranty period, at no additional cost to the Owner. Provide all manpower and vendor support as required to complete this prior to the end of warranty period. All upgrades shall be fully tested and approved by the Owner prior to application at the site. Some upgrades (as directed by the Owner after review of the proposed upgrade) may be required to be done during inactive periods (typically 1 to 4 AM) and coordinated with the Owner and other authorities having jurisdiction. All upgrades shall be approved by the Owner prior to implementation.

1. The Contractor shall notify the Owner in writing of any possible upgrades that are or will be available prior to the end of the warranty period sixty (60) days prior to the end of warranty of which the Owner may select from and approve the upgrade no later than thirty (30) days prior to the end of warranty. The Contractor's notification shall define changes associated with the proposed upgrades and rate each upgrade as major or minor. If the Owner elects not to apply a specific upgrade, the software associated with the upgrade shall be provided to the Owner.

C. NEC Compliance: Comply with NEC as applicable to construction and installation of security system components and accessories.

D. UL Compliance and Labeling: Provide system components, which are UL-listed and labeled.

E. Equipment and materials supplied shall be a standard product from manufacturers regularly engaged in the manufacturing and installation of these types of equipment and shall be from the manufacturer's latest commercial products list. All items identified in the design document with the same classification (e.g. PTZ cameras) shall be manufactured by the same manufacturer and shall be the same series and model. This requirement includes equipment, modules, assemblies, parts, and components. Electrically powered equipment shall be UL approved. Electronic equipment shall meet the requirements of CFR 47 Part 15.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver system components properly packaged in factory-fabricated type containers. Enclose an operating impact sensor in each container that is holding sensitive electronic equipment. The impact sensor shall be capable of recording a 5G rating.

B. Handling: Handle equipment and components carefully to avoid breakage, impact, denting and scoring finishes. Do not install damaged equipment. Replace all damaged equipment with new products.

C. Equipment delivered to the job site shall be opened and inspected immediately upon arriving and compared to the approved Shop Drawing submittal and checked for defects or damage. If the equipment is incorrect or damaged, the equipment shall not be accepted and a new order for approved replacement equipment shall be placed at no cost to the Owner.

D. Equipment and components shall be protected from the weather, humidity, temperature variations, dirt, dust, or other contaminants. Equipment damaged prior to system acceptance shall be replaced at no cost to the Owner.

1.11 SEQUENCING

A. The Contractor shall submit an overall Project Transition/Cutover Plan as part of the overall Work Schedule. See 1.8 for additional information.

B. Site security, access control, and visual surveillance shall be maintained at all times at all locations currently covered by existing VSS and ACS systems.

C. The overall transition/cutover plan provided by the Contractor may be modified with the approval of Owner to suit personnel availability, overall schedule coordination, material deliveries, or unforeseen site conditions.

1.12 WARRANTY

A. Materials and workmanship shall meet or exceed industry standards and be fully guaranteed for a minimum of two (2) years from Final Acceptance.

1. All labor must be thoroughly competent and skilled, and all work shall be executed in strict accordance with the best practices of the trades.

2. The Contractor shall be responsible for and make good, without expense to OWNER, any and all defects arising during this warranty period that are due to imperfect materials, appliances, improper installation or poor workmanship.

B. Period: The Contractor shall guarantee all labor, workmanship, and materials for a period of two (2) years from the date of Final Acceptance unless noted otherwise for specific systems. Should a failure occur within the Warranty period to the system, the Contractor shall provide all labor and materials necessary to restore the system to the condition required for the final test and acceptance for this Contract, at no cost to the Owner. When spare equipment (attic stock) is used to provide system fixes, the Contractor shall replace spare equipment used in order to maintain a constant on-site spare parts inventory.

1. Final Acceptance is defined as the acceptance of all portions of the Security Systems scope including the ACS, VSS, and Digital Recording. The entire scope of the project must be completed in order for acceptance to be granted. Acceptance shall include acceptance of all submittals, delivery and approval of final documentation, successful SAT testing, successful training and demonstration,

including operation of system using the manuals and demonstration of a fully functional system with interfaces, and purging of Contractor User privileges.

C. Warranty work shall include preventative and routine maintenance work in addition to emergency warranty work. Emergency warranty work shall include the repair or replacement of components which fail during the warranty period excluding equipment damaged or rendered unserviceable due to apparent and provable misuse, abuse, vandalism or negligence by Owner's employees, tenants or the traveling public. Apparent and provable as used herein shall mean that the physical evidence indicates what and who caused the damage, e.g., lightning strike, vehicular damage, someone other than the Contractor's technician, etc.

D. Tie-ins: During the Warranty period, components may be connected/disconnected and programmed/deprogrammed into the system as applicable. New devices shall be connected in the same manner as shown on the drawings for this contract and the existence of the new connections shall not void this warranty.

E. Response Times: Repairs shall be made as expeditiously as possible to minimize the time in which components are inoperable. See Maintenance Technical Provisions in Part III of these Technical Provisions for additional specific maintenance priorities and respective required response times.

1. The initial call to the Contractor shall require the type of call to be classified as critical or non- critical. The nature of the problem and the effect on facility operations will be the deciding factor in classifying the problem. For the purpose of defining the priority of the call, the Contractor shall have factory trained and certified personnel accessible to the Owner via phone call-back within one (1) hour of initial call.

2. Non-critical Items: For purposes of this Section, these are defined as failures or problems which do not affect the overall safety, security, or operation of the facility. For example, the failure of a non-critical redundant piece of equipment or the loss of a single camera or a single cardreader would usually be considered non-critical, unless determined critical by the Owner.

3. Critical Items: For purposes of this Section, these are defined as failures or problems which do affect the overall safety, security, or operation of the facility. For example, the failure of a primary server or the loss of a portion of the Security System would be examples of critical items requiring immediate remedy.

4. Non-critical items: The Contractor shall diagnose and remedy the problem during normal working hours of the next working day. The initial response shall be the morning of the next day if received before noon or by the noon the next day if received before close of business. Normal business hours are defined as 8 AM to 5 PM Monday through Friday.

5. Critical Items: Critical Items require the Contractor to respond with all due speed. These will possibly need to be responded to outside of normal business hours.

   a. The Contractor shall be able to use dial-in or VPN access (if allowed by the Owner) to diagnose software problems on the system within one (1) hour of the initial call.

   b. The Contractor shall be able to respond to on-site calls and be on site within two (2) hours of the initial call.

6. Response times for warranty incidents shall meet or exceed response times for maintenance incidents.

7. The Owner has exclusive discretion to determine the level of overall operations disruption due to a failure/outage, and assign the associated incident priority. The Contractor shall be responsible for identifying and requesting all needed information to resolve any problem, and may be required to rely upon Contractor supplied onsite personnel to provide such information.

F. Warranty and Maintenance Log: The Contractor shall maintain a warranty and maintenance log of all services performed. The log shall be in an Owner approved format. The log shall be kept on a component by component basis, with separate Sections or volumes as appropriate for each component. The log shall itemize the history of preventative and corrective/repair activities, stating the character, duration, cause, cure of all malfunctions, date and time of activity, and the individual's name who completed the repair. The log shall record all software and hardware updates.

1.13 TRAINING

A. The Contractor is responsible for training the Owner and other designated personnel in all aspects of the system that are being provided new.

1.14 OPERATION AND MAINTENANCE MANUALS

A. Intent: The intent of this Section is to require complete documentation of the system for the purpose of system operation and maintenance during and after the warranty period. It is intended that the Operation and Maintenance Manuals be exhaustive in the coverage of the system to the extent that they may be used as the sole guide to the troubleshooting, identification, and repair of defective parts.

B. Scope: The Contractor shall provide the Owner with three (3) hardcopy complete drawing books and maintenance and operation manuals on the completed system and six (6) copies of the drawing books and maintenance and operations manuals in PDF format on CD-ROM format. These manuals shall include wiring diagrams, schematics, and functional details such that any component, wire, or piece of equipment in the system may be easily identified by going to the actual equipment and making reference to this manual. Everything in the system shall be neatly labeled and easily identifiable. Every wire, component, or piece of equipment, relay, and other such items shall have a number or letter designation. All of these identification characteristics shall be included in the maintenance and operation manuals. The Contractor shall verify the accuracy and completeness of the drawing books and maintenance and operations manuals and then the Contractor will compile all of the drawing books and maintenance and operations manuals for delivery to the Owner. Coordinate requirements with the Owner or Owner's Representative.

C. The Maintenance Manual requirement of this Section is in addition to shop drawing requirements. Maintenance Manuals and drawing sets shall be compiled after system fabrication and testing, and shall incorporate all changes made after shop drawing submittal. The Maintenance Manuals and drawing books shall be permanently bound in hard plastic covers.

D. Maintenance Manuals, Manufacturer's Literature: Provide manufacturer's standard literature, covering all equipment included in the system. The maintenance manuals shall contain Specifications, adjustment procedures, circuit schematics, component location diagrams, and replacement parts identification. All references to equipment not supplied on this Project shall be crossed out.

E. Provide Pulling/Terminating operation Record and CMS (Cable Management System) As-Built required cable data to the Owner/Engineer no less than thirty (30) calendar days from completion of pulling and /or terminating operation. Electronic record shall be in an

Owner approved format i.e. Excel spreadsheet format) and AutoCAD drawings in .dwg format. Contractor shall be responsible for any delays due to improper documentation or failing to submit within the prescribed time frame.

F. Drawing Books: All drawings developed specifically for this Project shall be reduced to 11" X 17", folded and bound with hard plastic covers. The 11" X 17" Drawings provided shall be easily readable after printing, even if this requires breaking large drawings into several parts. Text shall be no smaller than 1/16-inch. The Drawing book documents shall be produced with AutoCAD 2012 and the electronic files shall be provided to the Airport at the completion of the Project on CD- ROM/DVD in DWG format. Provide component identification and cross reference on the Drawings to allow the maintenance department to understand the function of each item (the block diagram), find the room where the device is mounted (Contract document plans), find its location in a rack (arrangement drawings), find how it is wired (wiring diagrams), and its detailed Specifications (vendor data sheets), and how to repair it (spare part lists). Include the following drawings as a minimum:

1. Functional Block Diagram: Provide an overall Block Diagrams showing the major interconnections between subsystems.

2. Arrangement Drawings: Provide Drawings showing the physical arrangement of all major system components. This shall include:

   a. Elevation Drawings of all equipment racks showing the location of each component in the racks and on wall of each communication room. Components in the racks shall be identified as in the functional block diagrams.

   b. Wiring Diagrams: Provide wiring diagrams showing all field installed interconnecting wiring. Wire identification on the diagrams shall agree with the wire markers installed on the equipment.

G. Spare Parts Lists: Submit cost lists of proposed manufacturers recommended spare parts to maintain the complete system with a minimum of downtime. This list shall include part names, part numbers, and source for additional purchase. The part list shall be cross-referenced to the functional block diagrams and the product data.

H. Special Tools List: Submit a list of special tools required to maintain the systems. Include on the list the name, part number, and source for all special tools. Any special tools required for installation and maintenance of the system that are purchased or paid for as part of this project shall be provided to the Owner at the conclusion of the project.

I. Special Test Equipment: Submit a list of special test equipment required to prove that all system components are functioning per the Specifications. Any special test equipment required for installation and maintenance of the system that is purchased or paid for as part of this project shall be provided to the Owner at the conclusion of the project along with current calibration certificates.

J. Completed Project Digital Photographs: When the project is completed, the Contractor shall photographically document the entire completed system and its components. The final documents shall provide cross-referencing of diagrams with photos. The Contractor shall take photographs showing all equipment, the inside of any cabinets or panels, all rack equipment (both front and back), typical assembly pictures, and any other pertinent areas. The photographs shall be stored on DVD-ROM, with different areas being contained in separate sub-directories. The pictures shall be named indicating the view or an index shall be provided. The pictures shall be cross-referenced to the plans. All pictures shall be in JPEG format with minimum 5 Mega pixel resolutions to view picture details. The pictures may be used in the Elevation Drawings

noted above if the picture is inserted into the drawing file with descriptions and labeling added. A sample shall be submitted to the Owner and Contractor for approval before allowing this approach to be utilized.

1.15 MAINTENANCE AND SUPPORT

A. System Certification: Upon successful completion of the installation and subsequent inspection, Owner shall be provided with a numbered certificate, from the manufacturing company, registering the installation (if applicable).

B. Provide the manufacturer's standard maintenance and support services for all hardware and software associated with this system at no additional charge for a period of not less than one (1) year.

C. Coordination through the Owner shall be required by the installation Contractor to ensure that all documentation for the manufacturer's maintenance and support programs are in place.

D. Contractor shall provide a proposal for an Extended Warranty as noted in Part 1.12.C. of this Specification. The proposal shall include all warranty items noted in Part 1.12.C and all items noted in this Specification Section.

E. All key technicians performing installation shall have a minimum of two (2) years experience on the proposed system and be manufacturer certified on all hardware/software applications. A proof of training shall be submitted to the Owner as part of the Quality Assurance submittals.

F. Any spare parts provided during the warranty, maintenance and support, or extended warranty phases of the project shall be the most current model or version available on the market that is compatible with the system. The spare parts list shall be continuously updated to reflect the current models and quantities.

PART 2 - PRODUCTS (NOT USED)

2.01 GENERAL: SEE RELATED SECTIONS FOR ALL DIVISION 28 SPECIFICATIONS LISTED UNDER PARAGRAPH 1.2 FOR PRODUCT REQUIREMENTS.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor shall be responsible for any and all loss or damage in the shipment and delivery of all material until transfer of title to the Owner. The Owner assumes no responsibility or liability for transportation, storage fees, drayage, import taxes, duty taxes, or other costs associated with the delivery and storage of system components.

B. Contractor shall store products in accordance with manufacturer's instructions, within Contractor's staging area and with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

C. Contractor shall provide coverings to protect products from damage from traffic and construction operations, and remove when no longer needed.

D. Contractor shall ensure that all work performed under these Specifications is in accordance with the requirements and standards defined and referenced in these Specifications. Any work performed in deviation of these Specifications, any of the referenced material, or any applicable standards or requirements, shall immediately be corrected by the Contractor without additional charges, regardless of the stage of completion. The Contractor shall record all inspection observations. As a minimum, the

record shall include the name(s) of personnel conducting the inspection, a brief description of the inspection, date and time of the inspection, and the observations. These records shall be available for the Engineer to review at any time. Also, these records shall be delivered to the Engineer before final acceptance.

E. Installation Inspections: Installation inspections shall be undertaken through the performance of pre- installation, in-progress, and final inspections as follows:

1. Pre-Installation Inspection: The Contractor shall make an inspection of all equipment and material to be used prior to installation. All items shall be verified for compliance with the requirements of these Specifications and all other applicable standards. All equipment, cable, and associated hardware identified for installation shall be inspected for damage and completeness utilizing standard practices to determine integrity and acceptability.

2. In-Progress Inspection: At the Engineer's discretion, the Contractor shall perform in-progress inspections that shall include visual inspections of equipment, wiring practices, cabling, placement of equipment, marking of cables and adherence to safety procedures. In addition, the Owner, or his representative, may conduct additional inspections any time

3. Final Inspection: The Contractor shall conduct a final inspection that encompasses all portions of the installation. This inspection shall be performed to ensure that all aspects of the installation have been performed in accordance with these Specifications, standard industry practices and the publications referenced herein. All non-compliance items shall be noted by the Contractor during this inspection. The Engineer shall witness this inspection.

4. Corrective Action and Verification Inspection: The Contractor shall perform all corrective actions to ensure that all non-compliance items identified during the final inspection have been corrected.

3.02 INSTALLATION

A. General: The Contractor shall investigate the Site and become thoroughly familiar with the construction site. The Contractor shall plan the installation such that all new system processing components are installed and tested for proper communications prior to system operations.

B. Standards: All installation activities shall be performed in a neat and professional manner in accordance with all applicable local and national codes. Additionally, the Contractor and all subsequent Sub-Contractors employed to satisfy the requirements of these specifications shall obtain, or satisfy, the following prior to installation:

1. All licenses and permits.

2. All insurance and bonding as required.

3. All other standards or requirements specified in this document.

C. Contractor shall install and inspect all hardware required in this specification in accordance with the manufacturer's installation instructions.

D. Contractor shall adhere to the following during installation of the system:

1. Underwriters Laboratories (UL) listing for restricted access installations in business and customer premises applications. This listing is required by the National Electric Code for customer premise installations.

2. Fire resistance requirements specified by Underwriters Laboratories in UL 1459, 2nd edition.

E. System installation and construction methods shall conform to the requirements of OWNER.

F. Where undefined by codes and standards, Contractor shall apply a safety factor of at least two (2) times the rated load to all fastenings and supports of system components.

G. Contractor shall install all system components including furnished equipment, and appurtenances in accordance with the manufacturer's instructions, and shall furnish all cables, connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.

H. Rack Mounted Equipment:

1. As a general practice, Contractor shall run power cables, control cables, and high level cables on the left side of an equipment rack as viewed from the rear.

2. The Contractor shall run other cables on the right side of an equipment rack, as viewed from the rear.

3. For equipment mounted in drawers or on slides, provide the rack accessories as well as interconnecting cables with a service loop of not less than three feet and ensure that the cable is long enough to allow full extension of drawer or slide.

I. Contractor shall provide development and production environments including servers, software, and licenses for the development environment. Contractor shall install all custom and packaged software in the development and production environments.

J. Contractor shall provide a migration plan for all new and updated software to be migrated from within the development environment to the production environment.

K. Final hardware selected and installation of hardware shall be submitted for review by the Engineer. Additionally, the Contractor shall review the cabinets and equipment room to ensure ventilation requirements are met or recommend modifications.

L. Contractor shall install and configure all software required in this Specification in accordance with the software manufacturer's installation instructions. Apply the latest patches and security updates. Register the application with the manufacturer under the Owner.

M. The contractor shall facilitate, configure, document and test all network connections required by other systems or other facilities not in contract that require access to the network specified herein.

N. Contractor shall place materials only in those locations that have been previously authorized. Any other locations shall be authorized, in writing, by the Engineer.

O. Contractor shall provide all tools, applications and test equipment required to install, verify, and test the installation and to determine that it meets the specifications. The Contractor shall furnish all necessary materials required to implement and to achieve the required work performance.

3.03 DOCUMENTATION

A. This Section requires complete documentation of all systems for the purpose of system operation and maintenance during and after the Warranty period. It is intended that the operation and maintenance manuals be exhaustive in the coverage of the system to the extent that they may be used as the sole guide to the troubleshooting, identification, and

repair of defective parts. All documentation, as described here-in shall be submitted to the Engineer for approval sixty (60) days prior to final submission.

B. Scope: The Contractor shall provide the Owner with Operation and Maintenance Manuals and other documentation on all installed systems. These manuals shall include basic wiring diagrams, schematics, and functional details such that any component, wire, or piece of equipment in the system may be easily identified by going to the actual equipment and making reference to this manual. It is required that everything in the system be neatly labeled and easily identifiable. Every wire (each end), component, or piece of equipment, and other such items shall have a number or letter designation. All of these identification characteristics shall be included in the maintenance and operation manuals.

C. The maintenance manual requirement of this Section is in addition to Shop Drawing requirements. Maintenance manuals and Drawing sets shall be compiled after system fabrication and testing, and shall incorporate any changes made after Shop Drawing submittal. The maintenance manuals and drawing books shall be permanently bound in hard plastic covers.

D. Maintenance Manuals, Manufacturer's Literature: Provide manufacturer's standard literature, covering all equipment included in the system. The maintenance manuals shall contain specifications, adjustment procedures, circuit schematics, component location diagrams, and replacement parts identification. All references to equipment not supplied on this Project shall be crossed out.

E. Drawing Books: All Drawings developed specifically for this Project shall be reduced to A2, folded and bound with hard plastic covers. The A2 Drawings provided shall be easily readable after printing, even if this requires breaking large Drawings into several parts. Text shall be no smaller than 1/16". The drawing book documents shall be produced with current version of AutoCAD and the electronic files shall be provided to the Owner at the completion of the Project on DVD/CD- ROM. Provide component identification and cross reference on the Drawings to allow the maintenance department to understand the function of each item (the block diagram), find the room where the device is mounted (Contract Document plans), find its location in a rack (Arrangement Drawings), find how it is wired (wiring diagrams), and its detailed Specifications (vendor data sheets), and how to repair it (spare part lists). Include the following drawings as a minimum:

1. System Block Diagram: This drawing shall depict the final Security System overview, including equipment types, location, IP addresses and any special information.

2. System Riser Diagram(s): These drawings shall show all Security System components, wire numbers, color codes, pin numbers, component locations and connections, depicting the "as- built", final configuration.

3. Rack Elevation and Wiring Diagram(s): The elevation diagrams shall depict the front views of the equipment racks identifying all equipment installed within. Complete wiring diagrams of the racks shall also be included.

4. Floor plans of the communications rooms showing the location of all equipment effected as a part of this contract within the communications rooms.

5. Elevation drawings of all wall mounted equipment showing the location of each component on the wall. Components on the walls shall be identified as in the functional block diagrams.

6. Wiring Diagrams: Provide wiring diagrams showing all field installed interconnecting wiring. Wire identification on the diagrams shall agree with the wire markers installed on the equipment.

7. System Administrator Documentation: The Contractor shall supply three (3) hardcopies of administrator documentation and three (3) copies of the documentation in PDF format on CD- ROM that detail the operation of the system. This documentation shall provide complete information on the configuration, business rules, operation, maintenance, and trouble- shooting of the system.

F. Warranty: The Contractor shall supply all warranties as required in the "Warranty" article of this specification.

3.04 INSTALLATION OF SECURITY SYSTEMS

A. General: The Contractor shall investigate the Site and become thoroughly familiar with the construction site. The Contractor shall plan the installation such that all new system processing components are installed and tested for proper communications of the prior to system operation.

B. Standards: All installation activities shall be performed in a neat and professional manner in accordance with all applicable local and national codes. Additionally, the Contractor and all subsequent Sub-Contractors employed to satisfy the requirements of these Specifications shall obtain, or satisfy, the following prior to installation:

1. All licenses and permits.

2. All insurance and bonding as required.

3. All other standards or requirements specified in this contract.

C. The Contractor shall install and inspect all components including furnished equipment and appurtenances in accordance with the manufacturer's written instructions and complying with applicable portions of the NFPA-70 and the Authority Having Jurisdiction regulations. Contractor shall coordinate locations with other trades prior to installation.

D. Where undefined by codes and standards, Contractor shall apply a safety factor of at least two (2) times the rated load to all fastenings and supports of system components. The Contractor shall furnish all cables, connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.

E. Specific system requirements include:

1. Access Control Systems (ACS):

a. The Contractor shall plan the installation such that all new system processing components are installed and tested for proper communications before any portal or door is put under control of the new ACS.

2. Video Surveillance System (VSS):

a. Manufacturer's Instructions: Install VSS and components where indicated, in accordance with equipment manufacturer's written instructions, in compliance with National Electrical Code, and with recognized industry practices, to ensure that the VSS complies with requirements and serves intended purposes.

3. Raceways: Conduits shall conform to the following:

a. All conduits shall be concealed within the building structure where possible. The Owner/Engineer shall approve any exposed conduit routing before installation.

b. Any allowed conduit routed exposed in areas that can be seen by the public shall be painted to match color of the surface where it is attached. Utilize Liquid-tight Flexible Metal Conduit connection to exterior cameras.

c. All wall penetrations shall be sealed and fireproofed to retain original fire rating.

d. Conduit size shall be 3/4" minimum to all ACS and VSS devices and shall be used for no other purpose.

4. Facilities:

a. All debris from the installation process shall be removed from the worksite immediately to minimize the potential for damage to the facility. Care shall be exercised to protect the occupants and the facility from any damage at all times.

5. Approvals:

a. Any variances from the locations shown for the VSS equipment on the plans that exceed 10 feet in any direction shall be brought to the attention of the Engineer before installing the equipment.

b. Any field engineering or modification of standard mounting apparatus shall be brought to the attention of the Engineer for approval before such modification is implemented. Sketches of diagrams of the modification may be requested and shall be considered part of this Contract.

c. Samples of cables including, but not limited to, twisted pair, coax, and/or fiber with installed connectors shall be presented to the Engineer for approval. Once approved, any variance from the submitted samples must be approved by the Engineer.

3.05 INSTALLATION OF CONDUCTORS

A. General: Installation of conductors shall comply with Division 27 Specifications, and meet all applicable manufacturer recommendations, local and national regulations.

B. See individual system specifications for applicable system description.

3.06 GROUNDING

A. See individual system specifications for any additional applicable system requirements.

B. Precaution

1. Properly ground each piece of electronic equipment prior to applying power.

2. Properly ground all shielded wire shields to the appropriate clean earth ground at the equipment end only, not at the remote or device end.

C. Principles

1. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common mode returns, noise pickup, cross talk, and other impairments.

D. Grounding Considerations

1. General
   a. Grounding systems are normally an integral part of the specific signal and telecommunications wiring system that they protect. Besides helping protect personnel and equipment from hazardous voltages, the grounding system may reduce the effect of electromagnetic interference (EMI) on the structured cabling network. Improper grounding can produce induced voltages and those voltages can disrupt other data or telecommunications circuits.
   b. When compatible with required electrical codes, the grounding instructions and requirements of the equipment Manufacturer should also be followed. The grounding requirements of the EIA/TIA 607 shall be followed.
2. Considerations
   a. Ensure that the installation conforms to proper practices and requirements.
   b. Ensure that each cabinet and rack has an appropriate grounding bus bar that is connected to the dedicated building ground by a 35 mm² ground wire.
   c. Ensure that grounding is available for all system equipment and components and equipment required for maintenance and testing.
   d. Ensure that all metal cable trays shall be bonded to ground. Cable tray shall not be used for a ground path.
   e. Ensure coordination with the main electrical contractor Grounding and Bonding work.

3.07 GENERAL TESTING REQUIREMENTS

A. Phases of Testing:
   1. Phased System Testing
   2. Final Testing
   3. System Availability Test

B. Project Testing: The system installation shall not be considered complete until On-Site System Availability Testing is completed. The purpose is to test the complete system and demonstrate that all specified features and performance criteria are met. All requirements of the specification shall be tested, including:
   1. Functionality, including reporting and response
   2. System capacity
   3. Hardware and software interaction
   4. Failure Recovery
   5. Report generation

C. Test Plan/Procedure: Contractor shall provide six (6) copies of the proposed test plan/procedures for each testing phase for the review of the Engineer. The test plan for each phase of testing shall detail the objectives of all tests. The tests shall clearly demonstrate that the system and its components fully comply with the requirements specified herein. The submission of Test Plans shall adhere to the following:
   1. A draft test plan shall be presented to the Engineer at least forty-five (45) days prior to the scheduled start of each test.

2. A workshop for reviewing comments shall be conducted with the Engineer at least thirty (30) days prior to the scheduled start of each test.

3. A final test plan shall be submitted to the Engineer at least fourteen (14) days prior to the scheduled start of each test.

D. Test plans shall contain at a minimum:

1. Functional procedures (step-by-step testing scripts) including use of any test or sample data.

2. Test equipment is to be identified by manufacturer and model including LAN analyzers and packet sniffers.

3. Interconnection of test equipment and steps of operation shall be defined.

4. Expected results required to comply with specifications.

5. Traceability matrix referencing Specification requirements with specific test procedures.

6. Record of test results with witness initials or signature and date performed.

7. Pass or fail evaluation with comments.

E. The test procedures shall provide conformity to all Specification requirements. Satisfactory completion of the test procedure is necessary as a condition of system acceptance.

F. All Test plans must be reviewed by the Engineer. To successfully complete a test, the test document must be signed and dated by both the Contractor and the Engineer.

G. The Engineer will review, witness and validate the execution of all formal test procedures prepared by the Contractor and deliverable under the contract to assure the tests cover all requirements and that there is a conformity between the conducted test, the test results and Specification requirements.

H. Documentation verification both interconnects and operationally, shall be part of the test. Where documentation is not in accordance with the installed system interconnect and operating procedures, the system shall not be considered accepted until the system and documentation correlate.

I. The Contractor shall provide the Owner or Owner representative the opportunity(s) to participate in any or all of tests.

J. Test Reports: The Contractor shall prepare, for each test, a test report document that shall certify successful completion of that test. Six (6) copies of the test report shall be submitted to the Owner representative for review and acceptance within seven (7) days following each test. The test report shall contain, at a minimum:

1. Commentary on test results.

2. A listing and discussion of all discrepancies between expected and actual results and of all failures encountered during the test and their resolution.

3. Complete copy of test procedures and test data sheets with annotations showing dates, times, initials, and any other annotations entered during execution of the test.

4. Signatures of persons who performed and witnessed the test.

K. Test Resolution: Any discrepancies or problems discovered during these tests shall be corrected by the Contractor at no cost to Owner. The problems identified in each phase shall be corrected and the percentage of the entire system that shall be re-tested shall be determined by the Engineer before any subsequent testing phase is performed.

3.08 PHASED SYSTEM TESTING

A. See individual system specifications for applicable phased system testing.

3.09 FINAL TESTING AND ACCEPTANCE PLAN

A. See individual system specifications for specific system testing requirements.

3.10 SYSTEM AVAILABILITY TEST

A. The purpose of the System Availability Test (SAT) is to validate that the fully integrated system meets the High Availability requirements.

B. See individual system specifications for system specific SAT requirements.

C. Integration testing shall be completed on-site at the Airport. All interfaces shall be tested using actual interfaces to other systems (i.e. no stubs or dummy data).

D. Requirements:

1. Provide personnel to monitor system operations 24 hours per day, including weekends and holidays during System Availability Testing.

2. Start test after:

a. Successful completion of all previous testing phases.

b. Training as specified has been completed.

c. Correction of deficiencies has been completed.

d. Receipt of written start notification from the Engineer.

3. Monitor all systems during SAT. Coordinate monitoring with the Engineer.

4. Recording: Record data on forms so as to provide a continuous log of systems performance. Include:

a. Date and time for all entries.

b. Name of individual making entry.

c. Environmental conditions.

d. Airport activities in process.

e. Description of all alarms, responses, corrective actions, and causes of alarms. Classify as to type of alarm.

f. Description of all equipment failures, including software errors.

g. Description of all maintenance and adjustment operations performed on system.

h. Daily and weekly tabulations.

i. Daily entries of performance data shall be reviewed by the Engineer.

5. The Owner may terminate testing at any time when the system fails to perform as specified.

6. Upon termination of testing the Contractor shall commence an assessment period as described in Stage II.

E. Testing

1. Stage I - Initial Phase Testing:

   a. Time: 24 hours per day for 30 consecutive calendar days.

   b. Make no repairs during this stage unless authorized in writing by the Engineer.

   c. If system experiences no failures, proceed to Stage III - Final Testing.

2. Stage II - Initial Phase Assessment:

   a. After conclusion of Stage I, or terminating of testing, identify all failures, determine causes, and repair. Submit report explaining: Nature of each failure, corrective action taken, results of tests performed to verify corrective action as being successful, and recommended point for resumption of testing.

   b. After submission of report, schedule review meeting at job site. Schedule date and time with the Engineer.

   c. At review meeting, demonstrate that all failures have been corrected by performing verification tests.

   d. Based on report and review meeting, the Engineer will direct Contractor to repeat Stage I, restart Stage I, or proceed to Stage III - Final Testing.

3. Stage III - Final Phase Testing:

   a. Time: 24 hours per day for 15 consecutive calendar days.

   b. Make no repairs during this stage unless authorized in writing by the Engineer.

4. Stage IV - Final Phase Assessment:

   a. After conclusion of Stage III or termination of testing, identify all failures, determine causes, and repair. Submit explaining the nature of each failure, corrective action taken, results of tests performed, and recommended point for resumption of testing.

   b. After submission of report schedule review meeting at job site. Schedule date and time with the Engineer.

   c. At review meeting, demonstrate that all failures have been corrected by performing verification tests.

   d. Based on report and review meeting, the Engineer will review Endurance Test or direct Contractor to repeat all or part of Stages III and IV.

F. Adjustment, Correction, and Maintenance:

1. Adjustment and Correction: Make adjustments and corrections to system only after obtaining written approval of the Engineer.

2. Maintenance: Perform required maintenance on systems including provision of replacement parts.

G. Final Inspection and SAT Acceptance

1. After SAT is complete, provide SAT summary report to the Engineer within five (5) days from completion of the conclusion of the SAT.

a. The Summary Report shall compile a list of any and all reported system and functionality problems, including but not limited to:

1) Issue/Incident

2) Severity/Ranking of each Incident

3) Resolution of each Incident

4) Date/Time Incident Reported

5) Date/Time Incident Resolved

6) Follow-up Recommendations (Maintenance Plan updates)

b. After receipt of the SAT Summary Report, the Engineer and Contractor will compile a punchlist of any issues not resolved. A review will be conducted to assign corrective actions and date of expected completion.

2. An approved SAT Summary Report is a condition of final system acceptance. SAT acceptance will be provided to the Contractor in writing once the Engineer has reviewed and approved the SAT Summary Report and all remaining identified issues have been resolved to the satisfaction of the Airport.

3. Contractor will not be responsible for failures caused by:

a. Outage of main power in excess of backup power capability provided that automatic initiation of all backup sources was accomplished and automatic shutdowns and restarts of systems performed as specified.

b. Failure of any Airport furnished power, communications, and control circuits provided failure not due to Contractor furnished equipment, installation, or software.

c. Failure of existing Airport equipment provided failure not due to Contractor furnished equipment, installation, or software.

4. When performance of system does not fall within the above parameters, determine cause of deficiencies, correct, and retest.

5. When requested by the Engineer, extend monitoring period for a time as designated by the Engineer.

6. Period shall not exceed 60 days exclusive of retesting periods caused by termination of Stages I or III and assessment period of Stages II and IV.

7. Submit final report of SAT containing all recorded data.

3.11 MAINTENANCE AND SUPPORT

A. General

1. The Contractor shall provide maintenance and support of all components associated with this system at no additional charge during the warranty period. This extends to systems requiring vendor pre-purchased maintenance agreements.

2. The Contractor shall supply a list of special tools, test equipment, and outside inventory required for this Project. The Contractor may recommend specific items to facilitate long-term support of the system as an option.

3. All lead technicians performing installation and maintenance shall have a minimum of two (2) years experience on the proposed system and be manufacturer certified on all hardware/software applications. All maintenance technicians shall be

provisioned to attend a one (1) week manufacturer training class each year. Pre-assigned backup technicians shall be available to backfill for onsite technicians who are on vacation, in training or who are out sick.

4. The Contractor shall provide twenty-four (24) hours/seven (7) days a week telephone support as a minimum maintenance and support agreement. Additionally, the Contractor shall specify a maximum amount of time to get the system up and operational in the event of a system failure. This time period shall be subject to Engineer's approval.

B. Hardware and Software Support:

1. Hardware and Software support shall be supplied by the Contractor directly or by a Sub- Contractor reviewed by the Owner. Support shall cover all equipment and systems referenced in this Specification.

2. The Contractor shall assume full responsibility for the performance of all equipment supplied by the Owner, provided that such equipment meets the specifications set forth by the Contractor.

3. All software shall be delivered with an installable backup.

C. Definitions

1. Preventive and Routine Maintenance: Preventive and routine maintenance services shall be provided in accordance with the provisions of the maintenance manual for each component. Preventative maintenance services shall include inspection, test, necessary adjustment, lubrication, parts cleaning, and upgrades. Routine maintenance services shall include scheduled overhauls as recommended by the equipment manufacturer.

2. Emergency Failure: A system failure is considered an emergency if any of the key components are inoperative to the extent the system cannot function in a normal manner. Emergency services shall include inspections and necessary tests to determine the causes of equipment or software malfunction or failure. The emergency services shall include furnishing and installing components, parts, or software changes required to replace malfunctioning system elements. The Contractor shall provide telephone support twenty-four (24) hours a day, seven (7) days a week. The Contractor shall provide support on-site within eight (8) hours of request.

3. Support: Support shall be supplied by the Contractor directly or by a sub-Contractor reviewed (and approved) by the Owner. Support shall cover all equipment referenced in this specification.

3.12 CLEANING

A. Upon completion of system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

B. Coordinate with the Owner for security related construction clean-up and patch work requirements. Equipment cabinets, rooms and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of daily Work, remove all waste materials, rubbish, the Contractor's and it's subcontractors' tools, construction equipment, machinery and all surplus materials.

C. The Contractor shall utilize good housekeeping practice with respect to his/her Work including cleanup of all dirt and debris created by the Contractor during his installation operations on a daily basis.

D. The Contractor shall at his own expense collect and dispose of packing and debris at the end of each working shift.

3.13 ACCEPTANCE

A. The Contractor shall not apply power to the system until after:

1. System and components have been installed and inspected in accordance with the manufacturer's installation instructions.
2. A visual inspection of the system components has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.
3. System wiring has been tested and verified as correctly connected as indicated.
4. All system grounding and transient protection systems have been verified as properly installed and connected, as indicated.
5. Power supplies to be connected to the system and equipment have been verified as the correct voltage, phasing, and frequency as indicated.

B. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installations, defective equipment items, or collateral damage as a result of Contractor work/equipment.

C. Final system acceptance will be withheld until the following have been successfully completed for all components:

1. Acceptance of all submittals.
2. Delivery of final documentation, including Operations and Maintenance Manuals.
3. Successful SAT testing for all systems, and delivery of approved test results.
4. Completed Training as per the specifications as well as successful demonstration of the operation of the entire system, including operation of system using the Contractor provided manuals and demonstration of a fully functional system with interfaces.
5. Final cleanup of the system and all work areas.
6. Delivery of all documents including accepted As-built documentation.
7. Purging of Contractor User privileges.
8. System warranty shall not start until final system acceptance is achieved.

END OF SECTION 280100

SECTION 281300

ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. See Section 280100, Paragraph 1.01.

B. The Access Control System (ACS) shall provide access control and monitoring of selected areas in Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project.

C. The Access Control System (ACS) shall be an expansion of the existing ACS currently operating at the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT).

1.02 RELATED SECTIONS

A. See Section 280100, Paragraph 1.02.

1.03 REFERENCES

A. See Section 280100, Paragraph 1.03.

B. References:

1. TSA Recommended Security Guidelines for Airport Planning, Design, and Construction – May 2011.

2. 49 Code of Federal Regulations sections 1520 and 1540.

3. National Institute of Standards and Technology (NIST) 800 series.

1.04 DEFINITIONS

A. See Drawings for applicable definitions.

1.05 SCOPE OF WORK

A. This project shall include the addition of new access control portals and alarm monitoring locations. The existing ACS currently operating at H-JAIA shall be extended and programmed to include the new access control portals and alarm monitoring locations as indicated on the Drawings.

B. General: The Access Control and Monitoring System shall consist of IP Network based Intelligent Field Panels (IFPs) that interface with modules (reader and input/output) that connect specified readers, portal input devices, portal output devices, monitor and control devices. The system is capable of routing individual alarms to specific workstations.

C. The Contractor shall provide hardware and software configurations as required to support the design as shown on the drawings. The Contractor shall provide software licenses capable of supporting the quantity of readers, etc. as required to support the actual quantity of portals, cardreaders, input and output points, etc. as designed and installed as part of this contract. The Contractor shall provide all licenses for cardreaders, access points, etc., as required for all cardreaders and devices, as indicated in the specifications and on the drawings.

D. The Contractor shall provide all system licensing and programming necessary to provide monitoring and control functions on the existing system, and interface with the

existing Video Surveillance System (VSS) for camera call-up and recording functions as required and as specified herein and in the VSS section (Section 282300), and all other components provided under this project for a complete and operational unified system.

E. Contractor shall provide a minimum of four-hour stand-by battery run time for all field panels and lock power supplies. Batteries shall be supervised for failures while on primary power. Battery failure outputs and low battery conditions shall be connected to the ACS to notify the system of the failure. Primary power shall be supervised to indicate an "on battery" condition to the system. All power supplies shall be connected to generator power in addition to the battery back-up indicated where available.

F. Work of this section shall include all labor, materials, and software required for detailed technical design, systems, installation, data entry and importation, programming, graphic entry and importation, testing, commissioning, documentation and warranty of a complete and operating Access Control System (ACS) as shown on the drawings and specified herein.

G. This contract shall provide ACS door devices and equipment, as noted in drawings, all cabling, and conduit rough-in and this contractor shall coordinate with all other trades and systems as needed for a fully functional system.

H. The purpose of the ACS is to ensure the following:

1. Access by authorized individuals to protected areas, areas as required by Owner's Security and TSA regulations, and any other areas the Owner may designate.

2. Prevention of unauthorized access by inadvertent means or unauthorized individuals.

3. Assure that an individual is immediately denied entry to a specified area when that person's access authority for that area is withdrawn.

4. Timely notification to Police Department of all off-normal events or alarmed events.

1.06 INTELLECTUAL PROPERTY

A. See Section 280100, Paragraph 1.06.

1.07 RADIO/TELEVISION INTERFERENCE

A. See Section 280100, Paragraph 1.07.

1.08 SUBMITTALS

A. See Specification Section 280100 Section 1.08.

B. In addition to the standard submittals, Contractor shall provide the following submittals:

1. Door numbering and naming submittal listing current door number and description to allow the Owner to revise door numbers and descriptions prior to programming into the ACS.

2. Door release and fire alarm zoning submittal. Based upon the door list, the Contractor shall submit a full listing of every door controlled by the ACS and provide information as to whether the door will release upon fire alarm and the fire alarm zoning for each door.

1.09 QUALITY ASSURANCE

A. See Specification Section 280100 Section 1.09.

1.10 DELIVERY, STORAGE, AND HANDLING

A. See Section 280100, Paragraph 1.10.

1.11 SEQUENCING

A. See Section 280100, Paragraph 1.11.

B. The Contractor shall provide a Sequencing Plan to show the proposed steps and processes for implementing the new system. The following are recommended steps, but are not intended to dictate the overall process.

1. The Contractor will be required to provide all existing ACS head-end programming and integration with the existing VSS completed, and access levels entered into the system. All remote field panels shall be installed and brought on-line prior to connection of field devices, and then devices installed and operational, prior to scheduling system acceptance testing.

C. The Contractor shall document overall phasing in their submitted Sequencing plan and provide coordination of all aspects of the project as part of overall sequencing. Coordinate all project schedules with the Owner.

1.12 WARRANTY

A. See Section 280100, Paragraph 1.12.

1.13 TRAINING

A. See Section 280100, Paragraph 1.13.

1.14 OPERATION AND MAINTENANCE MANUALS

A. See Section 280100, Paragraph 1.14.

1.15 MAINTENANCE AND SUPPORT

A. See Section 280100, Paragraph 1.15.

1.16 SYSTEM REQUIREMENTS

A. General: The access control system shall provide the following card access control system objectives, utilizing the existing ACS:

1. Access Control.
2. Alarm Monitoring.
3. Intrusion Detection.
4. Data Import.
5. Data Export.

B. The Contractor shall provide all access control and alarm monitoring programming of the existing ACS to accommodate the new ACS installations. Contractor shall coordinate with the Owner for all programming requirements, to provide the same level of access control and alarm monitoring features and functions currently in operation at the Owner's facilities.

C. Access Control:

1. Controlled entry, via access card readers and associated devices, of only authorized personnel to secured areas based on cardholder information entered and

stored in the system database. Contractor shall update the existing system database to accommodate this project.

2. All access requests, both authorized and denied, shall be sent to the existing host for storage and annunciation, as required, with the cardholder number, name, and access point/area where access was attempted or gained.

3. The system shall annunciate all alarms at the existing alarm monitoring workstations within one (1) second of the alarm being initiated.

4. The door position switch shall be indicated as open or closed.

D. All alarm points shall be individually annunciated upon any change of state. Alarm contacts shall not be connected in parallel or series in zones, unless specifically shown on the contract drawings or stated herein. Double doors with alarm contacts on each leaf of the double door unit may be wired in series, for that double door unit.

E. The ACS shall provide an individually selectable door shunt time to allow persons with disabilities additional time to access a portal and an extended shunt time to allow additional time to pass through the door before alarm. This shall be selectable by cardholder and shall meet all of the requirements as set forth in the Americans with Disabilities Act.

F. The ACS shall provide an adjustable door shunt time to allow gate agents to dynamically extend door shunt time, permitting aircraft boarding operations without "door held open" alarms. The gate agent via special PIN code entry on the card reader/keypad shall extend the normal portal shunt time. Door shall operate normally when no special PIN code is used. Refer to Portal detail operational requirements for Portal types that require this feature.

G. Alarms shall be prioritized. The alarm-monitoring screen shall provide information about the time and location of the alarm, along with its priority. The alarm monitoring screen shall be able to sort pending and/or insert new alarms based on any of the following attributes: priority, date/time, IFP, card reader, or card holder. Contractor shall program all priorities for all alarms associated with the T1 terminal as part of this project. The system shall provide for alarm monitoring and/or transaction reporting for specific events, such as, but not limited to the following:

1. Anti-pass back violation.

2. Rejected access request.

3. Card reader tamper.

4. Card reader off-line.

5. Controller cabinet tampers.

6. SNMP network alarms.

7. Commercial AC power failure.

8. Controller communications failure.

9. Low battery at power supplies.

10. Battery or UPS fault at power supplies.

11. Monitoring of door devices (door position, lock sensor, tamper switches, etc.).

12. Monitoring of miscellaneous devices (duress alarm buttons, keyswitch position, and other contact closure devices, etc.).

H. The system shall allow unique emergency instructions to be specified for each type of alarm. If components of the system fail for any reason the system shall be capable of informing the operator of their impact to other down-stream or connected devices, this notification shall be done through the GUI with a change in the graphics of specifically impacted components. For example, the loss of an Intelligent Field Panel shall notify the personnel monitoring the system of what is controlled by that device, shall be programmed with instructions of what to do for this event, and shall show the portals or devices affected as off-line on the graphic maps as well as the system device tree. The contractor shall coordinate all emergency instructions with the Owner and program all emergency instructions into the system.

I. The system shall allow masking and unmasking (shunt/enable) of alarm points manually by the operator, automatically by time zone, automatically by the activation of another alarm point, or, where required, by a cardholder from a reader keypad. The system shall not allow an alarm point to be masked if the alarm point is in a trouble condition.

J. All alarm points shall be individually annunciated upon any change of state. Alarm contacts shall not be connected in parallel or series in zones, unless specifically shown on the contract drawings or stated herein. Portals that include multiple doors or door leafs shall be considered a single location. Double doors with alarm contacts on each leaf of the double door unit may be wired in series for that double door unit. Any alarm contacts, sensor inputs, reset inputs or outputs shall be wired to annunciate any of change of state of the portal as a whole.

K. Access Levels: The access level shall determine the doors and times a cardholder is authorized to pass through an ACS controlled portal. Two (2) methods shall be provided: a global specification for general use and a method specific to individual cardholders, intended for customizing access levels where necessary.

1.17 HARDWARE ARRANGEMENTS

A. The names assigned to the equipment in this section and the methods are intended to describe a generic, distributed intelligence ACS component. The names are not intended to prevent the contractor from bidding any systems that may have different architectures than those described in the following specifications. The intent is to create a hierarchy of components that allow for a distributed intelligence such that the granted/denied decision can be made locally without having to access the head-end for every transaction. The intent of this specification is to utilize Communications Rooms created as part of the terminal base building project that will house the Field Panels and the associated portal interface panels or modules. The use of field modules at the portals or in the field does not meet the intent of this specification.

1. Intelligent Field Panel (IFP): A distributed intelligent processor that stores the cardholder database to grant or deny access, monitors system activity, and provides data communications interface between Input/Output panels, card readers and the existing ACS Host CPUs via Ethernet connection.

2. Portal Interface and Input/Output Panels or module: A modular card that provides for cardreader, input, and output device connection to the ACS. This device is intended to be located in the ACS Communications Rooms/locations.

3. Card Reader: A portal device to read encoded portable cards with some having keypads and/or biometric readers in addition for the purpose of determining access rights.

4. Electrified Door hardware – Door hardware that can provide REX function from one side and electronically allow access.
5. Electrified Panic Hardware – Panic hardware which provides electronic bolt retraction to allow access.
6. Panic Hardware with integral REX function – Panic hardware provided with DPDT contacts integral to the panic hardware to allow egress and REX function for the ACS.
7. Door Position Switch: A device used to monitor the open/closed status of the portal.
8. Request to Exit Device: A device used to allow egress through a secured portal without creating an alarm condition.
9. Audible Alarm: A device used to indicate a breached security condition at the portal. This usually consists of an audible device (horn).
10. Audible/Visual Alarm: A device used to indicate a breached security condition at the portal. This usually consists of an audible device (horn) and a visual device (strobe).
11. Duress Alarm Button: A device used to indicate a breached or emergency security condition.
12. Door Hold Device: A device used to hold a door open. This may be an electromagnetic device or included as part of the door closer assembly. This device is typically used on a dock door or other portal that is required to be held open for long periods for operational reasons.

1.18 SYSTEM ARCHITECTURE

A. General: The ACS's primary function shall be to regulate access through specific portals to secured areas.

B. Access Control System: The system's primary purpose shall be to provide access control.

C. Alarm Monitoring: The system shall be used for graphical alarm monitoring. Alarms are to be prioritized. The alarm-monitoring screen shall provide information about the time and location of the alarm, along with its priority. The alarm monitoring screen must be able to sort pending and/or insert new alarms based on any of the following attributes: priority, date/time, Intelligent Field Panel, card reader, or card holder. Date/time sorts must be user selectable to be either ascending or descending and must have the option of displaying the seconds of the minute in which the alarm arrived into the system. The Contractor shall coordinate alarm level, text descriptions, etc. with the Owner and enter the information into the system as a part of the system expansion. All maps required for the system shall be entered and populated as required for a fully functional system.

D. The system must allow unique emergency instructions to be specified for each type of alarm. The Contractor shall coordinate the instructions with the Airport and enter these into the system as a part of the system installation.

E. Access Levels: The access level will determine the doors and times a cardholder is authorized to pass through an ACS controlled portal. The Owner shall coordinate the access level layout with stakeholders and enter the access levels into the system.

1.19 INTERFACE REQUIREMENTS

A. General: Contractor shall provide all cost associated with the interfaces to other system as specified. All programming, customs configuration, development, implementation, and testing shall be provided. Final Acceptance will not be given until all interfaces have been demonstrated to be fully functional and meeting all requirements stated.

B. Video Surveillance System (VSS): The ACS shall interface with the VSS such that upon alarm, the system shall automatically call up the VSS camera(s) requested by the Owner with live view on a selected monitor(s) and activate PTZ preset (for PTZ type cameras) so that the camera automatically adjusts in the direction of where the alarm occurred. The intent is to provide automatic call-up of the closest camera when an alarm is triggered by the ACS so that responding operators can view and track associated live video activity related to the cause of the alarm. In addition, ACS events shall be associated with related digital video recordings of the alarm area. The intent is to provide tagging of associated recorded video and allow for playback of this video from within the existing ACS alarm monitoring and reporting software applications. The Access Control head end shall be capable of interfacing with the VSS system head end using either database events and triggers or XML interface. Integration utilizing relays or hardwired input/output based method shall not be allowed. IP direct interface via dedicated security system LAN shall occur in the Data Center(s).

C. Interfaces with other systems (elevators, automatic doors, baggage systems): This ACS shall provide monitoring and control functions of various elevators and baggage related operations. The interface requirements (functional operation) are shown in drawing details. This contract shall include all costs associated with investigation of existing systems interface, reconnection, and testing so that all document function and control is operational.

1.20 INTERNAL SYSTEM SECURITY PROVISIONS

A. Equipment Tamper Switches: Provide tamper switches for all field equipment enclosures arranged to detect physical access to any active component of the system.

B. All equipment and wiring terminations shall be provided in enclosed, lockable boxes with key lock keyed similar to existing equipment. All cabinets shall be mounted vertically on a wall and not mounted horizontally on a ceiling. All cabinets shall be monitored with tamper switches. The boxes and cabinets shall be rated for the environment, and all exterior cabinets shall be a NEMA 4X Stainless Steel. Provide blower assemblies as required. If active components are installed in unconditioned, exterior locations, provide cooling as required to protect the components.

C. ACS equipment shall be mounted on the more secure side of any portal that is controlled by the ACS, except where placing that equipment on the more secure side will result in the equipment being outside of the building or in an area that is not suitable architecturally or not accessible. All equipment shall be mounted in accessible locations and in areas not visible to the general public, such as above accessible ceilings but within reach using a 10ft. ladder. Coordinate locations with the Owner for locations that are not able to comply with the conditions noted above or where the equipment locations would be more than three (3) meters from the portal.

D. Supervised Wiring: Selected field wiring shall be supervised. Cutting, shorting or altering connections of any wire listed as supervised below shall be detected, and activate an alarm condition at system workstations. Provide wiring supervision for the following functions:

1. Tamper Switches.

2. Duress Alarms.
3. Door Position Switches.

E. Provide signs for all tamper monitored enclosures warning that an alarm will sound if access is attempted, and giving the telephone number of the security workstation operator.

F. Request for access processing shall consider three (3) modes of operation:

1. Request for access shall normally be processed by the IFP. The IFP panels shall contain all cardholder and configuration data to grant or deny access to the associated portal.
2. In the event that the IFP cannot process the access request, the access request shall be deferred to the Host. The Host shall contain all cardholder and configuration data to grant or deny access to the associated portal.
3. In the event that the IFP cannot process the request for access and cannot communicate with the Host, access granted conditions shall be based solely on a valid code unique to the Owner.

G. Multiple Contractor User privilege levels will likely be established during the installation and testing periods of this Project. As a condition of system final acceptance, all Contractor User privileges shall be removed from the system, unless otherwise authorized in writing, by the Owner.

PART 2 - PRODUCTS

2.01 GENERAL

A. Power: Contractor shall provide lightning surge suppressors on all exterior copper circuits to prevent lightning damage to the equipment.

B. Backup Power: ACS field equipment shall be supplied from UPS units and supervised power supplies with battery backup. Power supplies shall be located within communication rooms and shall be tied onto the emergency power circuits. Both UPS and power supplies with battery backup methods shall provide for a minimum of four (4) hours backup power with 10% spare capacity for future growth.

C. Hardware: Provide a distributed access control system as required for a complete operating system as described herein and shown on the Drawings.

2.02 MANUFACTURERS

A. The Work shall consist of an expansion of the Owner's existing Lenel system.

2.03 SPARE PARTS

A. The Contractor shall furnish spare parts for the ACS. The intent of the spare parts inventory is to allow the immediate replacement of failed or faulty components to the lowest level of field repair to maintain system-operating integrity. Any spare parts used throughout the duration of this Project shall be replaced prior to final acceptance. Furnish spare parts as follows:

1. Processing Devices – I/O and CPU boards, furnish ten-percent (10%) spare of each type but no less than two (2) of each type used in the Project.
2. Devices – Card Readers/Horns/Door Position Sensors, furnish ten-percent (10%) spare of each type but no less than two (2) of each type used in the Project.

3. Power supplies - furnish ten percent (10%) spare of each type but no less than one (1) of each type used in the Project.

2.04 ACCESS CONTROL SYSTEM DEVICES

A. Access Control System devices shall be installed as indicated on the Project Drawings; see portal details for specific devices to be installed for each portal type. ACS shall interface with electric locking mechanisms as indicated on the Drawings, and as required for a fully integrated system.

B. Door Hold Open Units (by Division 8): The door hold open units provided shall have the following characteristics:

1. Operate on 24 VDC power.

2. Hold open devices may be integral to the door closer. Due to door construction, the use of standard magnetic door hold open devices may not be possible. Floor mounted door hold devices which may be trip hazards will not be allowed. All door hold open devices shall be of a single type to simplify maintenance and spare parts stock.

3. The unit shall be remotely controllable to allow doors to be held/released by the ACS as noted in the door detail sequence of operation.

4. See architectural specifications for all additional functional requirements.

C. Exit Door Panic Hardware (by Division 8): Coordinate with door hardware contractor to meet all functional requirements.

D. Electrified Exit Door Panic Hardware (by Division 8): The panic hardware provided shall have the following characteristics:

1. Unit shall have electric bolt retraction to allow control of access from non-panic hardware side of door. Bolt retraction shall be by 24 VDC power. Provide motorized latch bolt retraction hardware type devices with low power requirements (less than 500mA inrush, less than 200 mA continuous at 24 VDC) with extended hold-open capability. Pushpad shall be depressed electrically and held in that position while in operation.

2. Coordinate with door hardware contractor to meet all functional requirements.

E. Special Application Switches (Equipment tamper status): Provide magnetic switches within equipment compartments as indicated on the drawings. All special application general/door position switches, unless otherwise noted in the drawings shall be provided by this contract: Switches shall have the following features and characteristics:

1. Construction: Rugged construction designed for surface mounting within enclosures for detection of opening or tampering.

2. Type: Single reed type switch.

3. Contacts: Normally open coordinated with ACS equipment for monitoring of wiring integrity.

4. Life expectancy: 10,000,000 cycles.

5. Gap distance: ½", maximum.

6. Commercial grade reed contact and magnet suitable for each application.

F. Intelligent Field Panel (IFP) (and associated components as required):

1. Lenel LNL-3300
2. Lenel LNL-ALUL600ULX with integral studs for mounting the controller and I/O modules.

G. Power Supplies

1. Wall Mount
   a. 24VDC Power
      1) A minimum of one (1) 24VDC, 10 Amp power supply shall be provided for each GE M3000 access control panel, with no more than eight (8) doors (including one (1) electric lock and one (1) alarm horn per door) powered from a single wall mount 24VDC power supply.
      2) Each door shall be powered from a dedicated current protected output.
      3) Provide four (4) hours of backup battery power for each 24 VDC power supply (under full load). Batteries shall be12 Volt, 12 Amp Hour sealed gel type batteries.
      4) Altronix AL1024ULACM, or approved equal.
   b. 12VDC Power
      1) Provide as required for 12 volt devices not powered by other sources.
      2) Provide four (4) hours of backup battery power for each 12 VDC power supply (under full load). Batteries shall be12 Volt, 12 Amp Hour sealed gel type batteries.
      3) Altronix, AL1012ULACM, or approved equal.

H. Card Reader Compatibility

1. Card readers and card readers with keypads shall be compatible with Federal Information Processing Standards Publication 201 (FIPS 201).
2. Card readers and card readers with keypads shall be compatible with Owner's issued identification and access control cards.

I. Card Reader

1. HID model RK40 (no substitutions).
2. The firmware shall support both HID I class and PIV card formats.

J. Door Position Switches (Alarm Contacts)

1. Door position switches shall be compatible with the door style and materials.
2. Door position switches shall be magnetic activated and shall be flush mounted wherever possible.
3. Flush Mount
   a. GE 1078/1076 Series, or approved equal.
4. Surface Mount
   a. Surface mounted Door Position Switches shall be high security triple-biased devices.
      1) GE 2700 Series, or approved equal.

K. Audio/Visual Alarm Units

1. Audio/Visual alarm unit shall be installed at the door locations as indicated in the drawings.
2. The Audio/Video alarm unit shall be installed at a height and in a manner consistent with existing audio/visual alarm units.
3. Prior to ordering of the audio/visual alarm unit, the Security Systems Contractor shall coordinate with Owner for selection of the color of the strobe lens and the tone and dB level of the audible alarm signal.
   a. Safety Technology, Inc (STI) model SA5000 with back-box kit SUB-SA504, or approved equal.

2.05 CABLING

A. Contractor shall confirm the manufacturer's recommended cables for the provided system/devices and provide the appropriate cable types. The cables listed below are to be used only as a guide, provided as a reference only and may not include all ACS cable types to be used on the project. Sizing of conduits is the contractor's responsibility.

1. Card Reader Cable: 8 conductor 18 AWG w/ individually shielded pairs.
2. Door Position Switch Cable: 4 conductor 22 AWG Unshielded.
3. Audible/Visual Cable: 4 conductor 18 AWG unshielded.
4. ACS Data Cable: 4 pair 22 AWG each pair individually shielded.
5. Request to Exit / Panic Hardware: 4 Conductor 22 AWG unshielded.
6. Electric Lock or Power Cable: 4 Conductor 16 AWG unshielded.
7. ACS Input / Misc Data Cable: 12 Conductor 22 AWG unshielded.
8. Tamper Switch: 2 conductor 22 AWG unshielded.
9. Ethernet Data Cable: Comply with LAN requirements (refer to LAN system specifications section).
10. Fiber Optic Data Cable: Minimum 6 strand 50 Micron laser optimized indoor/outdoor.

PART 3 - EXECUTION

3.01 EXAMINATION

A. See Section 280100, Paragraph 3.01.

3.02 INSTALLATION

A. See Section 280100, Paragraph 3.02.

3.03 DOCUMENTATION

A. See Section 280100, Paragraph 3.03.

3.04 INSTALLATION OF SECURITY SYSTEMS

A. See Section 280100, Paragraph 3.04.

3.05 INSTALLATION OF CONDUCTORS

A. See Section 280100, Paragraph 3.05.

B. General: Installation of conductors shall comply with Division 27 Specification Section 271500 "Horizontal Cabling", and meet all applicable manufacturer recommendations, local, state and national codes.

C. The cabling provided from the portal to the communication room is a standard homerun that contains spare conductors to allow for the future addition of devices at any given portal. All conductors shall be terminated and labeled to allow for future connections.

3.06 GROUNDING

A. See Section 280100, Paragraph 3.06.

B. Cable Shields: All shields and pair shields shall be grounded at one (1) point only. Cables that originate from processing equipment and serve field devices shall be grounded to the signal ground terminal in the processing equipment.

C. Comply with Section 270526.

3.07 GENERAL TESTING REQUIREMENTS

A. See Section 280100, Paragraph 3.07.

3.08 PHASED SYSTEM TESTING

A. See Section 280100, Paragraph 3.08.

B. General: A phased testing approach shall be implemented to insure that the system is capable of operating as designed. The tests shall be structured to prove that higher-level components are functional prior to connection to lower level components. Successful completion of each testing phase is required before proceeding to the next level of testing. Any problems discovered during these tests shall be documented and brought to the attention of the Owner and corrected at Contractor's expense. The Contractor shall promptly correct all problems encountered, providing field service personnel appropriately trained for the types of problems encountered.

C. Local Test: Upon completion of each portal, test each portal device for specified functionality with the test server. This test shall prove the basic integrity of the Portal Interface and the wiring and terminations between the Portal Interface and the portal devices.

D. Final test and Acceptance: Upon completion of Local Tests, the Micro Control Panels will be migrated to the active server. All ACS functions shall be demonstrated to ensure the entire system is operational as required by these specifications and drawings. The Contractor shall provide a test schedule including the time and dates at least 10 days prior to the proposed test date. The Owner's representative(s) and stakeholders will observe the testing. This test shall be conducted by the final test and acceptance plan as outlined below.

E. In addition to any acceptance testing requirements specified elsewhere, the ACS shall be fully tested and accepted, with test results recorded of individual test reports for review and acceptance. All ACS devices and equipment shall be tested. Test and acceptance reports shall include, but not be limited to:

1. Card reader controlled doors

a. Valid card read

b. Invalid card read

c. Valid request-to-exit

d. Door forced open

e. Door held open

f. Door shunt

g. Local alarm

2. Alarm and monitor points

3. ACS input and output interfaces

4. ACS integration with VSS and cameras

3.09 FINAL TESTING AND ACCEPTANCE PLAN

A. See Section 280100, Paragraph 3.09.

B. The Contractor shall develop a Final Test and Acceptance (FTAA) plan. The plan shall identify each component of the system, intent of test, method or methods of test and expected results. Each component listed in the plan shall include space for test party signatures, brief comments, time of test and pass/fail check boxes. The plan shall be submitted to the Owner for approval or comment. When Owner Test and Acceptance Plan comments are satisfied and the system is operational, the testing may begin. The component tests shall be compared to the transaction log for accuracy, queries shall be made to narrow the test report to the test cards, card holders, operator responses and portals involved in the test. All components must be checked "pass," signed by all parties and agree with the transaction log to be complete.

C. FTAA testing of the ACS shall, at minimum, include requirements listed in the phased testing procedure outlined above.

D. Contractor shall submit database information entered into test server to Owner 30 days in advance of Final Testing for Owner to prepare active ACS server.

3.10 SYSTEM AVAILABILITY TEST

A. See Section 280100, Paragraph 3.10, for additional requirements.

B. Following successful completion of the FTAA, the ACS shall undergo a fourteen (14) day System Availability Test (SAT). The operational demonstration period shall start when all of the Micros are on line with the host CPU, the system is loaded with normal traffic, and shall continue for no less than fourteen (14) consecutive days of successful system operation. Final system acceptance of the entire Project shall be withheld until after successful completion and approval of the fourteen (14) day operational demonstration report. This report shall be submitted to the Owner within five (5) days from completion of the conclusion of the operational demonstration period.

C. The purpose of the SAT is to demonstrate that the system is capable of maintaining a 99.9% availability prior to final acceptance. Percent of system availability will be measured in terms of access point hours. Example: If there are 200 controlled access points in the Project which provide (200 * 24) = 4800 access point hours per day. The 14 day test covers (14 * 4800) = 67,200 access point hours; so the system must be available for (.999 * 67,200) = 67,132 hours, leaving 68 access point hours allowed out of service for the test.

D. All system failures or issues shall be logged and shall include issue or outage, all equipment involved, the issue start time and date, and the issue resolution time and date, and the name and initials of the person recording the event in the log. This log shall be maintained by the personnel monitoring and utilizing the system and shall be

included as part of the SAT documentation. Failure to include this log will be grounds for SAT failure.

E. The SAT will be conducted while the system is in full operation.

F. The SAT shall utilize the Contractor's provided complement of spare parts to minimize downtime due to lack of spare parts. The Contractor at his expense shall replace all such spare parts used by the Contractor during the SAT.

G. Successful completion of the SAT is a prerequisite to final acceptance of the ACS.

3.11 MAINTENANCE AND SUPPORT

A. See Section 280100, Paragraph 3.11.

3.12 CLEANING

A. See Section 280100, Paragraph 3.12.

3.13 ACCEPTANCE

A. See Section 280100, Paragraph 3.13.

END OF SECTION 281300

SECTION 282313

VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. See Section 280100, Paragraph 1.01.

B. This section specifies the minimum requirements for video surveillance camera equipment at the Hartsfield-Jackson Atlanta International Airport (H-JAIA), Maynard H. Jackson Jr. International Terminal – "F" Concourse (MHJIT), Gate F3 Reconfiguration Project. The video surveillance systems and equipment specified in this section shall be an extension to the existing Video Surveillance System (VSS) currently deployed.

1.02 RELATED SECTIONS

A. See Section 280100, Paragraph 1.02.

B. Division 27 Communications (including but not limited to):

1. Section 270500 – Common Work Results for Communications Systems

1.03 REFERENCES

A. See Section 280100, Paragraph 1.03.

1.04 DEFINITIONS

A. See Drawings for applicable definitions.

1.05 SCOPE OF WORK

A. This section includes all labor and materials including, but not limited to, IP/Ethernet based system consisting of Power over Ethernet (PoE) IP fixed cameras and IP cameras with pan, tilt zoom (PTZ) features, camera housings and mounting hardware, and power supplies required to form a fully functional and operational network based VSS. All VSS equipment and cameras provided shall connect to the existing network based VSS and digital video recording system, via the data network (LAN).

B. All provided VSS equipment shall communicate with the existing head-end of the existing VSS, via the LAN, for control, monitoring and recording functions, in accordance with the existing VSS system functions and features. The Contractor shall verify all existing system functions and features with the Owner.

C. Security Systems Contractor shall include in the Bid all labor, materials, tools, plant, transportation, storage costs, installation, programming, configuration, testing, commissioning, training, equipment, insurance, temporary protection, permits, inspections, taxes and all necessary and related items required to provide complete and operational equipment / systems as specified herein and as indicated on the Drawings.

D. The Security Systems Contractor is responsible for providing and coordinating final equipment arrangements, locations, phased activities and construction methods that minimize disruption to operations and provide complete and operational systems.

E. The cameras shall communicate with the existing central video management system via Internet protocol (IP) Ethernet communication over the existing Airport multiprotocol label switching (MPLS) data network.

F. All cameras shall use an unshielded twisted pair (UTP) cable system. Camera video signals and power shall be via the same cable where possible. Cameras that require

greater power than can be provided by the standard 802.3af PoE provided by the network switches shall be powered by centralized rack mounted high power PoE power injectors or centralized rack mounted CCTV power supplies where possible.

G. The existing VSS includes integration with the existing Access Control System (ACS). The functionalities of the existing VSS integration with the existing ACS shall be incorporated into this project, and shall include, but not be limited to: automated PTZ camera positioning upon ACS alarms and events, automated camera call-up and display to existing VSS monitors upon ACS alarms and events, and automatically initiate and/or adjust digital recording upon ACS alarms and events in accordance with video recording requirements utilizing the existing VSS and digital video recording system.

H. The programming, testing, Owner staff training and documentation of the installed VSS as shown on the Drawings and specified herein shall be part of this contract. All costs associated with programming, testing, training and documentation of the system shall be included in this contract.

1.06 INTELLECTUAL PROPERTY

A. See Section 280100, Paragraph 1.06.

1.07 RADIO/TELEVISION INTERFERENCE

A. See Section 280100, Paragraph 1.07.

1.08 SUBMITTALS

A. See Specification Section 280100 Section 1.08.

B. In addition to the standard submittals, contractor shall provide the following submittals:

1. Camera numbering and naming submittal listing the plan camera number and description to allow the airport to revise camera numbers and descriptions prior to programming into the VSS. This submittal or a second submittal shall also include the intended field-of-views for each camera as well as providing the proposed presets for PTZ style cameras.

2. Submit all proposed labeling materials and nomenclature for approval. Labeling shall match nomenclature indicated on design drawings, except as noted below:

a. Cameras shall be labeled "[Camera #]-[IT room #]".

1.09 QUALITY ASSURANCE

A. See Specification Section 280100 Section 1.09.

1.10 DELIVERY, STORAGE, AND HANDLING

A. See Section 280100, Paragraph 1.10.

1.11 SEQUENCING

A. See Section 280100, Paragraph 1.11.

1.12 WARRANTY

A. See Section 280100, Paragraph 1.12.

1.13 TRAINING

A. See Section 280100, Paragraph 1.13.

1.14 OPERATION AND MAINTENANCE MANUALS

A. See Section 280100, Paragraph 1.14.

1.15 MAINTENANCE AND SUPPORT

A. See Section 280100, Paragraph 1.15.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide material of types, sizes, capacities and electrical characteristics indicated. Except as otherwise indicated, provide manufacturer's standard Closed Circuit Television and digital video system components as indicated by their published product information, designed and constructed as recommended by manufacturer. The design intent and design requirement is that all cameras, both fixed and PTZ, shall be provided from the same manufacturer for compatibility, ease of servicing, and a fixed dome housing shall have the same look/style as a PTZ housing.

B. The VSS devices shall be installed as indicated on the Project Drawings; see camera details for specific mounting requirements for each type.

C. Provide and install required conduit, cabling, connectors, patch cords, terminators, and all other miscellaneous items required for a fully functional system.

D. Latest technology available: Products shall be provided as specified. In the event the manufacturer(s) of specified products and materials have upgraded or replaced the specified products and materials with newer or improved technologies at the time of purchase, the newer or improved products or materials shall be provided. Latest technology products and materials shall be operationally and functionally equivalent or superior to the specified products and materials. Products and materials shall be purchased by the Contractor in a timely manner to meet construction schedules, but shall not be purchased so far advanced of the date(s) of installation that they become technologically obsolete or replaced with newer technologies. Discontinued equipment or equipment which has been officially noted as end-of-production or end-of-life prior to the systems final acceptance shall not be acceptable.

E. All visible camera housings and mounts shall be painted to match the surrounding structure or finishes. This contract shall include all costs associated with custom powder coated painting as needed. Only the visible window or 'bubble' shall be the exception to color stated above. All associated brackets, outlets, or other required devices visible to the public shall be painted to match the camera housings including fasteners used.

F. Cameras shall be fixed and PTZ Network IP cameras. In locations where a drop ceiling is available with sufficient clearance above the ceiling, the camera shall be flush ceiling mounted in a mini- dome enclosure. In locations where no ceiling is available or the ceiling depth is not sufficient, the camera shall be wall mounted in a standard enclosure or ceiling pedestal mounted. For drywall ceilings, coordinate with the airport and provide an access panel adjacent to the camera. All cameras shall be installed in an appropriate enclosure, and provided with mounting hardware as indicated on the Drawings, and as specified herein.

G. All fixed IP cameras and interior IP PTZ cameras shall be powered via PoE wherever possible except where specifically noted on the drawings and as required by distance limitations and when utilizing fiber. All other IP cameras shall be powered by 24/28 volts

AC from a multi-output wall or rack mounted power supply provided under this contract and located in the communication room.

H. The fixed Network IP camera shall be furnished with a vari-focal auto-iris lens as required for the desired field-of-view as required by the Owner. Verify field-of-view requirements for each camera location with the airport.

I. Interior fixed cameras shall be identical in appearance to the PTZ cameras (dome type) specified below and have a manual 3-axis position adjustment for pan, tilt and rotation about the lens axis for any angle of view required.

J. Cameras located in unconditioned areas and outside shall be installed within an environmental enclosure, equipped with a thermostatically controlled heater and blower. Provide power supply as required. The housings shall be provided with the following features:

1. Construction: Shall be weatherproof-tamper proof aluminum and shall be UL listed.
2. Viewing window: Shall be optically clear, UV stabilized, extruded polycarbonate, such as General Electric MR5 Lexan.
3. Cable/wiring shall enter the enclosure through compression gland type fittings.
4. Enclosure shall be designed for outdoor use and capable of withstanding temperatures ranges of -10 to 120°F. (minimum equipment temperature operating range per manufacturers specifications sheet listing, see additional equipment operating temperature requirements listed above).
5. Heater and defroster shall be resistive in design, dual element, and thermostatically controlled to turn ON at nominally 40-60°F and to turn OFF at nominally 70-90°F. Heater shall be powered by 24 VAC, 50/60 Hz with a nominal power consumption of 15 watts. Blower shall be thermostatically controlled to turn ON at nominally 70-95°F and to turn OFF at nominally 60-80°F. Blower shall be powered by 24 VAC, 50/60 Hz with nominal power consumption of 3 watts and airflow rating required to maintain temperature range specified above.
6. Enclosure shall be compatible with ceiling and wall mounts.
7. Housing shall be key lockable. Provide lock and all cameras shall be keyed the same.

K. Cameras located in areas viewing changing light conditions shall be equipped with Wide Dynamic Range (WDR) functionality for automatic adjustment to compensate for changing lighting (sunlight) conditions.

L. All cameras shall be capable of providing a minimum of three (3) video streams including configurable unicast and multicast streams simultaneously. The intent is to allow for the camera video to be able to be streamed to more than one video server to allow for a fully redundant system and recording.

2.02 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers shall meet all specifications requirements and shall be approved by the Engineer/Owner.

B. The manufacturers and models listed in the equipment specifications below are intended to indicate approved products that meet the system and/or Owner's requirements for those types. The Contractor may submit alternate manufacturers/models, subject to approval by the Engineer/Owner, unless noted with "no substitutions", whereas Contractor shall only provide that particular manufacturer and/or model indicated.

2.03 SPARE PARTS

A. The Contractor shall provide to the Owner an inventory of security equipment spare parts, materials, consumables, and any other system item in order to meet the specified warranty maintenance requirements and keep the security equipment in a continuous operational mode during the warranty period. The quantity of spare parts shall equal no less than 10% of the items provided and installed under this contract. Any spare parts used throughout the duration of this Project shall be replaced prior to final acceptance.

2.04 CAMERAS

A. All cameras shall be compatible with the existing Video Management System.

B. In addition to any acceptance testing requirements specified elsewhere, cameras shall be fully adjusted and tested to provide optimal video pictures and signals. All camera adjustments and settings available shall be utilized and adjusted. All camera adjustments and settings shall be recorded in individual camera test reports for review and acceptance.

C. PTZ Dome Cameras, Interior:

1. Mounting options shall include:

a. Ceiling Surface Mount

b. Ceiling Flush Mount

c. Pendant Mount

d. Wall / Column Mount

2. Digital Video Compression methods supported shall include:

a. H.264

b. Motion JPEG

3. Video Resolutions shall include:

a. 4CIF or greater for H.264 compression

b. 2CIF

c. CIF

d. QCIF

4. Frame Rate shall be capable of no less than thirty (30) images per second for all required Digital Video Compression methods and all required Video Resolutions.

5. Preset Positions: A minimum of one-hundred (100) PTZ presets shall be supported.

6. Pan Movement:

a. 360° continuous pan rotation.

b. 0.02° to 300° per second, minimum.

7. Tilt Movement:

a. 180°, minimum.

b. 0.02° to 300° per second, minimum.

c. Image shall auto-flip 180° at the bottom of the tilt travel.

8. Zoom Capability: 4.7 ~ 84.6mm 18x optical zoom, minimum with 12x digital zoom minimum.
9. Iris Control: Automatic with manual override.
10. Auto Focus shall be supported.
11. Dome: Dome color shall be "smoked" and shall induce a maximum light attenuation of 0.5 f-stop light loss.

D. PTZ Dome Cameras, Exterior:

1. Mounting options shall include:
   a. Ceiling Surface Mount
   b. Ceiling Flush Mount
   c. Pendant Mount
   d. Wall / Column Mount
   e. Roof Parapet Mount
   f. Day / Night Functionality: Automatic Day / Night functionality shall be supported.
   g. Minimum Illumination
      1) 50 IRE:
         a) Color: 1.0 lux
         b) Black and White: 0.03 lux.
      2) 30 IRE:
         a) Color: 0.4 lux.
         b) Black and White: 0.01 lux.
2. Digital Video Compression methods supported shall include:
   a. H.264
   b. Motion JPEG
3. Video Resolutions shall include:
   a. 4CIF or greater for H.264 compression
   b. 2CIF
   c. CIF
   d. QCIF
4. Frame Rate shall be capable of no less than thirty (30) images per second for all required Digital Video Compression methods and all required Video Resolutions.
5. Preset Positions: A minimum of one-hundred (100) PTZ presets shall be supported.
6. Pan Movement:
   a. 360° continuous pan rotation.
   b. 0.02° to 300° per second, minimum.

7. Tilt Movement:
    a. 180°, minimum.
    b. 0.02° to 300° per second, minimum.
    c. Image shall auto-flip 180° at the bottom of the tilt travel.
8. Zoom Capability: 4.3 ~ 129.0mm 30x optical zoom, minimum with 12x digital zoom minimum.
9. Iris Control: Automatic with manual override.
10. Auto Focus shall be supported.
11. Dome: Dome color shall be "smoked" and shall induce a maximum light attenuation of 0.5 f-stop light loss.
    a. Environmental Housing: Environmental Housing shall be suited for outdoor weather exposed conditions.

E. Fixed CCTV Cameras, Interior:
1. Mounting options shall include:
    a. Ceiling Surface Mount
    b. Ceiling Flush Mount
    c. Wall Surface
    d. Wall / Column Mount
2. Digital Video Compression methods supported shall include:
    a. H.264
    b. Motion JPEG
3. Video Resolutions shall include:
    a. 4CIF or greater for H.264 compression
    b. 2CIF
    c. CIF
    d. QCIF
4. Frame Rate shall be capable of no less than thirty (30) images per second for all required Digital Video Compression methods and all required Video Resolutions.
5. Lens:
    a. Iris Control: Automatic with manual override.
    b. Focus: Manual
    c. Focal Length: 2.8 ~ 10.0 mm, minimum.
6. Dome: Dome color shall be "smoked" and shall induce a maximum light attenuation of 0.5 f-stop light loss.

F. Fixed CCTV Cameras, Exterior:
1. Mounting options shall include:
    a. Ceiling Surface Mount

b. Ceiling Flush Mount

c. Wall Surface

d. Wall / Column Mount

2. Day / Night Functionality: Automatic Day / Night functionality shall be supported.

a. Minimum Illumination

1) 6mm:

a) Color: 0.2 lux

b) Black and White: 0.04 lux.

2) 12mm:

a) Color: 0.3 lux.

b) Black and White: 0.05 lux.

3. Digital Video Compression methods supported shall include:

a. H.264

b. Motion JPEG

4. Video Resolutions shall include:

a. 4CIF or greater for H.264 compression

b. 2CIF

c. CIF

d. QCIF

5. Frame Rate shall be capable of no less than thirty (30) images per second for all required Digital Video Compression methods and all required Video Resolutions.

6. Lens:

a. Iris Control: Automatic with manual override.

b. Focus: Manual

c. Focal Length: Coordinate focal length selection with the Owner or Owner's representative prior to installation.

1) Close View: 2.5 ~ 6.0 mm, minimum.

2) Long View: 3.3 ~ 12.0 mm, minimum.

7. Dome: Dome color shall be "smoked" and shall induce a maximum light attenuation of 0.5 f-stop light loss.

8. Environmental Housing: Environmental Housing shall be suited for outdoor weather exposed conditions.

2.05 CAMERA POWER SUPPLIES:

A. PoE High Power Injector: For cameras requiring PoE power above 802.3af PoE power, provide and install rack mounted high power injectors in the Security Rack(s) as required.

1. Provide with port configurations to support required cameras plus 25% spare capacity, with a minimum of 24 (twenty-four) ports per unit.
2. Shall provide 72 watts per port over four pairs.
3. PoE 802.3af and 802.3at backwards compatible.

2.06 WIRE AND CABLE

A. Low voltage wire and cable shall be provided and installed as required. Refer to Communications Horizontal Cabling specifications (Section 27 15 00) for horizontal cabling requirements.

B. Wire and cable shall be selected and used as appropriate for the device application in accordance with the device manufacturer's specifications, voltage and load, distance of the wire/cable run, and in accordance with the Owner's wire and cable standards.

C. Wire and cable runs shall be "home run". Mid run splices shall not be permitted.

D. Wire and cable shall be Belden, West Penn, Contractors Wire and Cable, or approved equal.

2.07 MATERIALS

A. Color and Finish Selection:

1. In all public areas and in all other areas visible from public areas or from the exterior of the building, colors and finishes shall match the custom color and finish samples on file with the Owner. In all other areas, applicable colors and finishes shall be selected by the Owner from the manufacturer's standard color and finish schedule. For such areas, submit manufacturer's standard color and finish schedule(s).

PART 3 - EXECUTION

3.01 EXAMINATION

A. See Section 280100, Paragraph 3.01.

B. Verify that all conduit, wires, cables, security equipment are installed and ready for connection and integration with the rest of the system.

C. Examine area to be protected and verify that environmental characteristics will not affect effective communication and interfacing. Report observed problems in writing to the Owner.

D. Determine that power supplies, conduit, wires, cables, connections, and equipment are ready for installation and interfacing before attempting installation.

E. Test all power and communications cabling before making connections.

1. Category 6 cables shall be tested in accordance with the testing requirements specified Division 27 – Communications.

F. Visually inspect each piece of equipment, determine defects, and correct.

G. Make arrangements through Owner and inspect locations where installation work will be performed. Verify that conditions found are in accordance with drawings and are acceptable for Contractor's installation work. Report any discrepancies in writing to Owner, stating suggested means of correction. As may be required, inspect existing inside and outside cable plant to determine system runs and interface conditions. Coordinate with Owner to establish interfaces.

3.02 INSTALLATION

A. See Section 280100, Paragraph 3.02.

B. Compliance:

1. Install the equipment in accordance with the contract documents, all applicable codes and standards and the Manufacturer's written instructions. The installed system shall meet all applicable equipment and performance requirements.

C. Standardization:

1. Standardize the installation practices and material to provide uniform materials and procedures to the maximum extent possible.

D. Locations:

1. Locate pull boxes, wire-ways or other items requiring inspection, removal, or replacement conveniently and accessibly with reference to the finished facilities.

E. Electrical Service:

1. Installation of electrical service to equipment shall conform to specific UBC Codes and Standards, NFPA 70, and other applicable requirements.

F. Electrical Equipment Inspection:

1. Provide electrical equipment inspection in accordance with NEMA PB 2.1 Part VII.

G. Installation Requirements:

1. Install all system components, including furnished equipment, and appurtenances in accordance with the manufacturer's instructions, and as shown, and shall furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified and shown. Control signal, communications, and data transmission line grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.

2. Install the security system equipment in accordance with the standards for safety, NFPA 70, UL 681, UL 1037 and UL 1076, and the appropriate installation manual for each equipment type. Components within the system shall be configured with appropriate service points to pinpoint system trouble in less than 20 minutes.

3. All wiring, including low voltage wiring outside the control console, cabinets, boxes, and similar enclosures, shall be installed in rigid galvanized steel conduit conforming to UL 6 (when outdoors), or electric metallic tubing (EMT) when indoors, unless otherwise noted. Minimum conduit size shall be 1-inch, except ¾" allowable between last pull box and end device, unless otherwise noted. All other electrical work shall be as specified with electrical specifications and drawings that are part of the contract documents and as shown. Grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.

   a. Detailed shop drawings shall be provided as part of the submittal process. The shop drawings shall include, but not be limited to wiring, conduit and devices, including hangars, brackets, back boxes and related equipment.

4. All equipment connected to alternating current circuits shall be protected from power line surges. Equipment protection shall meet the requirements of ANSI C62.41. Fuses shall not be used for surge protection.

5. Calibrate all equipment in accordance with manufacturer standards, and as required by Owner.
6. Inspect each component, determine obvious defects, and correct.
7. Perform tests as recommended by manufacturer or as required to ensure the security equipment is operating properly and meets specified requirements.
8. Correct all deficiencies detected and retest affected components.
9. Record test data, tabulate, and write narrative describing tests, results, deficiencies found, corrective measures, and results of retesting. Certify that the security equipment has been tested and is ready for performance verification testing, and submit to Owner.
10. The Security Contractor shall be responsible to verify with the Owner the exact final location of each camera prior to installation. The Security Contractor shall be responsible to coordinate with lighting, signage and other sub-contractors to avoid conflicts with intended fields of view as indicated in the drawings. The Contractor shall provide a means of utilizing a portable, functional camera and monitor to demonstrate the views and confirm the final mounting locations with the Owner. The portable camera shall have verifocal lens capabilities with a focal range that will allow for demonstrating views as would be available from the actual installed camera. PTZ camera preset positions shall be approved and accepted by the Owner prior to project acceptance.

3.03 DOCUMENTATION

A. See Section 280100, Paragraph 3.03.

3.04 INSTALLATION OF SECURITY SYSTEMS

A. See Section 280100, Paragraph 3.04.

3.05 INSTALLATION OF CONDUCTORS

A. See Section 280100, Paragraph 3.05.

B. General: Installation of conductors shall comply with Division 27 Specification Section 27 1500 "Horizontal Cabling", and meet all applicable manufacturer recommendations, local, state and national codes.

3.06 GROUNDING

A. See Section 280100, Paragraph 3.06.

B. Cable Shields: All shields and pair shields shall be grounded at one (1) point only. Cables that originate from processing equipment and serve field devices shall be grounded to the signal ground terminal in the processing equipment.

C. Comply with Section 270526.

3.07 GENERAL TESTING REQUIREMENTS

A. See Section 280100, Paragraph 3.07.

3.08 PHASED SYSTEM TESTING

A. See Section 280100, Paragraph 3.08

B. Final Test and Acceptance: Upon completion of Local Tests, the system will be operating at normal traffic capacity with the cameras transmitting video to the video servers and recorders for this test. This test shall prove "under load" communications,

video integrity, I/O functionality and system logic. All VSS functions, including ACS integration, shall be demonstrated to ensure the entire system is operational as required by these specifications and drawings. The Contractor shall provide a test schedule including the time and dates at least 10 days prior to the proposed test date. The Owner's representative will observe the testing. This test shall be conducted by the final test and acceptance plan as outlined below.

3.09 FINAL TESTING AND ACCEPTANCE PLAN

A. See Section 280100, Paragraph 3.09.

B. The Contractor shall develop a Final Test and Acceptance (FTAA) plan. The plan shall identify each component of the system, intent of test, method or methods of test and expected results. Each component listed in the plan shall include space for test party signatures, brief comments, time of test and pass/fail check boxes. The plan shall be submitted to the Owner for approval or comment. When Owner Test and Acceptance Plan comments are satisfied and the system is operational, the testing may begin. The component tests shall be compared to the transaction log for accuracy, queries shall be made to narrow the test report to the test cards, card holders, operator responses and portals involved in the test. All components must be checked "pass," signed by all parties and agree with the transaction log to be complete.

C. FTAA testing of the VSS shall, at minimum, include requirements listed in the phased testing procedure outlined above.

D. Contractor shall submit database information entered into test server to Owner 30 days in advance of Final Testing for Owner to prepare active VSS server.

3.10 SYSTEM AVAILABILITY TEST

A. See Section 280100, Paragraph 3.10, for additional requirements.

B. Following successful completion of the FTAA, the VSS shall undergo a fourteen (14) day System Availability Test (SAT). The operational demonstration period shall start when all of the cameras are operating and on line with the host CPU, the cameras are being monitored on the existing VSS system monitors and are recording on the digital video recording system, and shall continue for no less than fourteen (14) consecutive days of successful system operation. Final system acceptance of the entire Project shall be withheld until after successful completion and approval of the fourteen (14) day operational demonstration report. This report shall be submitted to the Owner within five (5) days from completion of the conclusion of the operational demonstration period.

C. The purpose of the SAT is to demonstrate that the system is capable of maintaining a 99.9% availability prior to final acceptance. Percent of system availability will be measured in terms of camera point hours. Example: If there are 50 cameras in the Project which provides (50 * 24) =1200 camera hours per day. The 14 day test covers (14 * 1200) = 16,800 camera hours; so the system must be available for (.999 * 16,800) = 16783 hours, leaving 17 camera hours allowed out of service for the test. Only cameras shall be used to calculate the available camera point hours. For this test, one video server shall be counted as equal to 100 camera hour points for failure calculations.

D. Examples: Any controlled camera or recording that is not in full automatic operation for a seventeen (17) hour period will cause the system to fail the test. The loss of the entire system for more than thirty (30) minutes will result in an automatic failure of the test and be cause for the re- starting of the SAT test duration. Loss or failure of a processing server will result in an automatic failure of the test and be cause for the re-starting of the SAT test duration even if the failure did not cause a loss of function.

E. All system failures or issues shall be logged and shall include issue or outage, all equipment involved, the issue start time and date, and the issue resolution time and date, and the name and initials of the person recording the event in the log. This log shall be maintained by the personnel monitoring and utilizing the system and shall be included as part of the SAT documentation. Failure to include this log will be grounds for SAT failure.

F. The SAT will be conducted while the system is in full operation.

G. The SAT shall utilize the Contractor's provided complement of spare parts to minimize downtime due to lack of spare parts. The Contractor at his expense shall replace all such spare parts used by the Contractor during the SAT.

H. Successful completion of the SAT is a prerequisite to final acceptance of the VSS.

3.11 MAINTENANCE AND SUPPORT

A. See Section 280100. Paragraph 3.11.

3.12 CLEANING

A. See Section 280100. Paragraph 3.12.

3.13 ACCEPTANCE

A. See Section 280100. Paragraph 3.13.

END OF SECTION 282313

SECTION 28 31 11

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Sections:

1. Division 01 General Requirements
2. Division 23 Heating Ventilating and Air Conditioning Monitoring & Control (HVAC).
3. Division 26 Electrical, All sections.

1.02 SUMMARY

A. Section Includes:

1. This specification of the specification shall provide for adding new fire alarm devices to the existing fire alarm system in the building and for reprogramming the existing fire alarm system so that the modified fire alarm system will operate in the same way the existing fire alarm operated.
2. The system shall be in full compliance with National and Local Codes.
3. The system shall include all required hardware, raceways, interconnecting wiring and software to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein.
4. All equipment furnished shall be new and the latest state of the art products of the manufacturer, of the existing fire alarm system in the building.
5. The system as specified shall be supplied, installed, tested and approved by the local Authority Having Jurisdiction, and turned over to the owner in an operational condition.
6. In the interest of job coordination and responsibilities the installing contractor shall contract with a single supplier for fire alarm equipment, engineering, programming, inspection and tests, and shall be capable of providing a "UL Listing Certificate" for the complete system.

1.03 FIRE ALARM SYSTEM SUB-SUBCONTRACTOR

A. All work that involves the fire alarm system shall be done by the company that does the maintenance on the existing fire alarm system in the building. The electrical subcontractor shall employ this company as a sub-subcontractor to do all work on the fire alarm system.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Complete manufacturer's catalog data including supervisory power usage, alarm power usage, physical dimensions, and finish and mounting requirements.

B. Power calculations. Battery capacity calculations. Battery size shall be a minimum of 125% of the calculated requirement. Provide the following supporting information:

1. Supervisory power requirements for all equipment.
2. Alarm power requirements for all equipment.
3. Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25% spare capacity.
4. Voltage drop calculations for wiring runs demonstrating worst-case condition.
5. NAC circuit design shall incorporate a 15% spare capacity for future expansion.

C. Submit manufacturer's requirements for testing Device Loop Card circuits and device addresses prior to connecting to control panel. At a minimum the following tests shall be required; device address, the usage (Alarm, Supervisory etc), environmental compensation, temperature ratings for thermal detectors and smoke detector sensitivities. This requirement shall need approval before any wiring is connected to the control panel.

D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Complete drawings covering the following shall be submitted by the contractor for the proposed system:
   a. Floor plans in a CAD compatible format at a scale of 1/8"=1'-0" showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
   b. Provide a fire alarm system function matrix as referenced by NFPA 72, Figure A-7-5.2.2 (9). Matrix shall illustrate alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions. Include any and all departures, exceptions, variances or substitutions from these specifications and/or drawings at time of bid.
4. Installation drawings shop drawings, and as-built drawings shall be prepared by an individual experienced with the work specified herein.
5. Incomplete submittals shall be returned without review, unless with prior approval of the Engineer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: The publications listed below form a part of this publication to the extent referenced. The publications are referenced in the text by the basic designation only. The latest version of each listed publication shall be used as a guide unless the authority having jurisdiction has adopted an earlier version.

1. FM Global (Factory Mutual (FM)):FM Approval Guide
2. National Fire Protection Association (NFPA)
   a. NFPA 70 National Electrical Code
   b. NFPA 72 National Fire Alarm Code
   c. NFPA 90A Standard For The Installation of Air Conditioning and Ventilating Systems
   d. NFPA 101 Life Safety Code

3. Underwriters' Laboratories, Inc. (UL) equipment standards, Latest Edition
   a. UL Fire Protection Equipment Directory
   b. UL Electrical Construction Materials Directory
   c. UL 38 – Manually Actuated Signaling Boxes for Use With Fire Protection Signaling Systems
   d. UL 228 – Door Holding Devices
   e. UL 268 - Smoke Detectors for Fire Protective Signaling Systems
   f. UL 268A - Smoke Detectors for Duct Application
   g. UL 464 - Audible Signal Appliances
   h. UL 497A – Secondary Protectors for Communications Circuits
   i. UL 521 - Heat Detectors for Fire Protective Signaling Systems
   j. UL 864 - Control Units for Fire Protective Signaling Systems
   k. UL 1076 – Security
   l. UL 1283 – Electromagnetic Interference Filters
   m. UL 1449 - Transient Voltage Surge Suppressors
   n. UL 1480 - Speakers for Fire Protective Signaling Systems
   o. UL 1971 - Signaling Devices for the Hearing Impaired
4. Underwriters Laboratories Canada (ULC)
5. International Code Council
   a. International Building Code
   b. International Fire Code.
6. State and Local Building Codes as adopted and/or amended by The Authority Having Jurisdiction, ADA, and/or State and local equivalency standards as adopted by The Authority Having Jurisdiction.
7. ISO 9002

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.

B. Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.

1.07 PROJECT CONDITIONS

A. Installed products or materials shall be free from any damage including, but not limited to, physical insult, dirt and debris, moisture, and mold damage.

B. Environmental Limitations: Do not deliver or install products or materials until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.01 DEVICES

A. All new fire alarm system devices shall be equal to existing devices in appearance and function.

B. Contractor shall provide any needed power supplies and batteries required by the addition of the fire alarm devices in this project. Connect any new power supply to a nearby 20A/1P spare circuit breaker in a nearby emergency panel with 2 #12 AWG & 1 #12 AWG ground in ½" conduit. Paint the circuit breaker red.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Perform work in accordance with the requirements of NFPA 70, NFPA 72 and NECA 1-2006, Standard of Good Workmanship in Electrical Contracting.

B. Fasten equipment to structural members of building or metal supports attached to structure, or to concrete surfaces.

C. NOT USED

D. Wiring Method: Install all cables in raceways except within consoles, cabinets, desks, and counters. Conceal all raceways.

E. NOT USED

F. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

G. Provide primary power for each panel from normal/ emergency panels as indicated on the Electrical Power Plans. Power shall be 120 VAC service and internally, transformed through a two-winding, isolation type transformer and rectified to low voltage DC for operation of all circuits and devices.

3.03 BOXES, ENCLOSURES AND WIRING DEVICES

A. Boxes shall be installed plumb and firmly in position.

B. Extension rings with blank covers shall be installed on junction boxes where required.

C. Junction boxes served by concealed conduit shall be flush mounted. All junction boxes and fire alarm devices shall be accessible.

D. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers installed. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed.

E. "Fire alarm system" decal or silk-screened label shall be applied to all junction box covers.

3.04 CONDUCTORS

A. Each conductor shall be identified as shown on the shop drawings at each with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible. Shop drawing shall show these cable numbers.

B. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer.

C. Wiring for strobe and audible circuits shall be a minimum 14 AWG, signal line circuits; 18 AWG twisted shielded, speaker circuits; 18 AWG twisted, telephone circuit; 18 AWG twisted shielded.

D. All splices shall be made using solderless connectors. All connectors shall be installed in conformance with the manufacturer recommendations.

E. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.

F. The installation contractor shall submit for approval prior to installation of wire, a proposed color code for system conductors to allow rapid identification of circuit types.

G. Wiring within sub panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

3.05 DEVICES

A. Relays and other devices to be mounted in auxiliary panels are to be securely fastened to avoid false indications and failures due to shock or vibration.

B. Wiring within panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

C. All devices and appliances shall be mounted to or in an approved electrical box.

3.06 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Permanently label or mark each conductor at both ends with permanent alphanumeric wire markers.

C. A consistent color code for fire alarm system conductors throughout the installation.

3.07 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Testing General:

1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.

2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.

3. The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.

4. Test reports shall be delivered to the acceptance inspector as completed.
5. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installing contractor. The following equipment shall be a minimum for conducting the tests:
   a. Ladders and scaffolds as required to access all installed equipment.
   b. Multi-meter for reading voltage, current and resistance.
   c. Two way radios, and flashlights.
   d. A manufacturer recommended device for measuring air flow through air duct smoke detector sampling assemblies.
   e. Decibel meter.
   f. In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the acceptance inspector.

3.08 ACCEPTANCE TESTING

A. A written acceptance test procedure (ATP) for testing the fire alarm system components and installation will be prepared by the manufacturer in accordance with NFPA 72 and this specification. The contractor shall be responsible for the performance of the ATP, demonstrating the function of the system and verifying the correct operation of all system components, circuits, and programming.

B. A program matrix shall be prepared by the installing contractor referencing each alarm input to every output function affected as a result of an alarm condition on that input.

C. The installing contractor prior to the ATP shall prepare a complete listing of all device labels for alphanumeric annunciator displays.

D. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the owner and test results recorded for use at the final acceptance test.

E. Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that all panel functions were tested and operated properly. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.

F. Final Acceptance Test: Notify the owner in writing when the system is ready for final acceptance testing. Submit request for test at least 14 calendar days prior to the test date. A final acceptance test will not be scheduled until meggar test results, the loop resistance test results, and the submittals required in Part 1 are provided to the owner. Test the system in accordance with the procedures outlined in NFPA 72.

   1. Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
   2. Test each initiating and indicating device and circuit for proper operation and response. Disconnect the confirmation feature for smoke detectors during tests to minimize the amount of smoke or test gas needed to activate the detector.
   3. Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.

4. Visually inspect all wiring.
5. Verify that all software control and data files have been entered or programmed into the FACP.
6. Verify that Shop Drawings reflecting as-built conditions are accurate.
7. Measure the current in circuits to assure that there is the calculated spare capacity for the circuits.
8. Measure voltage readings for circuits to assure that voltage drop is not excessive.
9. Measure the voltage drop at the most remote appliance on each notification appliance circuit.

G. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:

1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
   a. Open, shorted and grounded signal line circuits.
   b. Open, shorted and grounded notification, releasing circuits.
   c. Primary power or battery disconnected.
2. System notification appliances shall be demonstrated as follows:
   a. All alarm notification appliances actuate as programmed
   b. Audibility and visibility at required levels.
3. System indications shall be demonstrated as follows:
   a. Correct message display for each alarm input at the control display.
   b. Correct annunciator light for each alarm input at each annunciator and graphic display as shown on the drawings.
   c. Correct history logging for all system activity.
4. System off-site reporting functions shall be demonstrated as follows:
   a. Correct zone transmitted for each alarm input
   b. Trouble signals received for disconnect
5. Secondary power capabilities shall be demonstrated as follows:
   a. System primary power shall be disconnected for a period of time as specified in NFPA 101 and NFPA 72. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
   b. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
   c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

3.09 DOCUMENTATION

A. System documentation shall be furnished to the owner and shall include but not be limited to the following:

1. System record drawings and wiring details including one set of reproducible drawings, and a CD ROM with copies of the record drawings in DXF format for use in a CAD drafting program.
2. System operation, installation and maintenance manuals.
3. System matrix showing interaction of all input signals with output commands.
4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.
5. System program showing system functions, controls and labeling of equipment and devices.

3.10 PROTECTION

A. Remove and replace devices and panel components that are wet, moisture damaged, or mold damaged or that get wet.

3.11 DEMONSTRATION

A. Instructor: Include in the project the services of an instructor, who shall have received specific training from the manufacturer for the training of other persons regarding the inspection, testing and maintenance of the system provided. The instructor shall train the employees designated by the owner, in the care, adjustment, maintenance, and operation of the fire alarm system.

B. Training sessions shall cover all aspects of system performance, including system architecture, signaling line circuit configurations, sensor and other initiating device types, locations, and addresses, fire alarm control panel function key operation, and other functions as designated by the owner.

C. Required Instruction Time: Provide 2 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as are selected by the owner. The instruction may be divided into two or more periods at the discretion of the owner. One training session shall be videotaped by the contractor. Videotapes shall be delivered to the owner.

3.12 DUCT DETECTOR INSTALLATION

A. All duct detectors shall be furnished by the electrical contractor, handed to the mechanical contractor for installation in an HVAC duct and then wired to the fire alarm system by the electrical contractor.

B. The remote duct detector test switch/LED indicator light shall be installed in a close by electrical or housekeeping closet within reach from floor level or above an accessible ceiling and shall be clearly labeled with an engraved plastic nameplate that tells the correct name of the piece of HVAC equipment that the duct detector is associated with. Obtain this name from the HVAC contractor. Also, assign a different consecutive number to every duct detector and label every duct detector and test switch with that number. All duct detector labels shall be made from red stamped metal plenum rated material.

3.13 SPARE CAPACITY

A. The fire alarm system shall have the space and connection points to add a minimum of 50% more initiating and alarm devices than what is in this contract. There must be space for future plug in circuit boards, ect., in the fire alarm control panel to accommodate the future devices.

3.14 PROGRAMMING

A. The contractor shall reprogram the existing fire alarm system to accept all new devices that are part of this project.

3.15 PROGRAMMING

A. Contractor shall maintain the proper functioning of the existing fire alarm at all times during the construction period.

B. Contractor shall reroute and/or relocate any existing fire alarm system circuits or devices out of any area that is being demolished.

END OF SECTION 28 31 11

SECTION 313000

EXCAVATING, BACKFILLING, AND COMPACTING FOR STRUCTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Section includes the excavation, backfilling and compacting required for the structures shown in the Contract Drawings.

1.02 RELATED SECTIONS

B. Structural Testing/Inspection Agency Services.

1.03 REFERENCES

A. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.

B. ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).

C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

D. ASTM D1586 - Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.

E. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

F. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.04 DEFINITIONS

A. Granular sub-base: Granular fill directly beneath slabs-on-grade.

B. Backfill: Fill immediately behind foundation elements or retaining walls.

C. Structural fill: Fill under the structure other than the granular sub-base.

1.05 SUBMITTALS

A. Upon request, submit soil test reports performed by the Structural Testing/Inspection Agency.

B. Submit sufficient data for verification of the vibratory roller.

1.06 QUALITY ASSURANCE

A. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Verify structural fill complies with specifications.

2. Determine particle size, liquid limit, plastic limit, plasticity index and maximum density of each type of soil.

3. Observe proofrolling.

4. Perform a sufficient number of field density tests to verify compaction of structural fill. As a minimum, perform one test per lift for every 2500 square feet of fill placed.

5. Verify foundation bearing capacity.

6. Verify quantities of material removed and quantities of material placed where Unit Prices are involved.

1.07 SURVEY

A. Prior to construction, have structure location staked and certified by a licensed surveyor. If discrepancies between actual lines and elevations exist, notify Architect/Structural Engineer before proceeding with layout of structure.

1.08 SUBSURFACE CONDITIONS

A. Copies of a subsurface investigation of the site will be made available upon request. The data is not intended as a representation or warranty of the continuity of such conditions. Owner will not be responsible for interpretation or conclusions drawn therefrom by the Contractor. The data is made available for the convenience of the Contractor and is not guaranteed to represent all conditions that may be encountered.

B. Contractor may examine the site and make his own subsurface explorations at no additional cost to the Owner. Notify Owner prior to making any subsurface explorations.

1.09 EXISTING UTILITIES

A. Locate existing underground utilities by careful hand excavation. If utilities are to remain in place, provide protection from damage during construction operations.

B. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Do not interrupt existing utility service facilities occupied and used by Owner or others, unless written permission is given by the Architect and then only after temporary utility services have been provided.

C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Architect immediately for directions.

D. Repair damaged utilities to satisfaction of utility owner.

1.10 NOTICE

A. Notify the Architect/Structural Engineer 72 hours prior to the beginning of any excavation work.

PART 2 - PRODUCTS

2.01 GRANULAR SUBBASE

A. Granular sub-base shall be sound and free-draining, such as sand, gravel or crushed stone with less than 10% passing the 200 sieve. Maximum diameter shall be 1-1/2 inches.

2.02 BACKFILL

A. Backfill shall meet the requirements of the granular sub-base.

2.03 STRUCTURAL FILL

A. Structural fill shall meet the requirements of backfill specified above.

B. Structural fill shall be free of organics, debris and deleterious materials

PART 3 - EXECUTION

3.01 STRIPPING

A. Strip vegetation, topsoil, roots, and other unsuitable material to a depth determined by the Structural Testing/Inspection Agency but not less than one foot, nor less than 10 feet outside the perimeter of the structure.

B. Stockpile sufficient amounts of topsoil as required to cover areas to be landscaped with a minimum of six inches of material.

3.02 EXCAVATION

A. Excavation shall be considered unclassified.

B. Perform excavation to the depths and limits on the Drawings and as specified herein.

C. Do not excavate to full depth when there is probability of frost forming or ground freezing in excavation before concrete is placed.

D. Ground water may be encountered during the foundation excavation. Provide a system for controlling the ground water to a level at least three feet below the lowest point of the excavation.

E. Keep excavations dry by sloping ground away from holes and trenches.

3.03 PROOFROLLING

A. After stripping or excavation and before any fill placement, fill areas shall be proofrolled with a minimum of two coverages of a loaded dump truck or scraper in each of two perpendicular directions.

B. Areas found to be soft or pumping shall have the soft soil removed and replaced with structural fill and compacted as outlined herein.

3.04 PLACEMENT OF STRUCTURAL FILL

A. Do not place structural fill on subgrade that contains frost, mud or is frozen.

B. Structural fill shall be placed and compacted in 8 -inch thick loose layers.

C. Compact structural fill to 98 percent of the maximum dry density as measured by Standard Proctor, ASTM D698, with water content within +3/-3 percent of the optimum moisture content.

3.05 PLACEMENT OF GRANULAR SUBBASE

A. Do not place granular sub-base on subgrade that contains frost, mud or is frozen.

B. Compact granular sub-base to 95 percent of the maximum dry density as measured by Standard Proctor, ASTM D698, with the water content within +3/-3 percent of the optimum moisture content.

3.06 PLACEMENT OF BACKFILL

A. Backfill behind wall shall be placed in layers of six inches.

B. Compact backfill behind walls to 95 percent of the maximum dry density as measured by Standard Proctor, ASTM D698, with water content within +2/-2 percent of the optimum moisture content.

3.07 CLEAN UP

A. Remove excess excavated materials from job site and upon completion leave site in clean condition.

END OF SECTION 313000

SECTION 316000

PERMANENT EXCAVATION SHORING SYSTEM

PART 1GENERAL

1.01 SECTION INCLUDES

A. Permanent shoring that will be a part of the building construction and temporary shoring to retain excavation slopes and prevent damage to adjacent buildings, roads and utilities shall be designed and installed by the Contractor. The location, clearances, and other requirements for permanent shoring shall be as shown on the Contract Drawings.

B. Contractor shall be solely responsible for the design, installation, and performance of all shoring which shall meet, as a minimum, the requirements set forth in the Contract Documents.

1.02 RELATED SECTIONS

A. Structural Submittals

B. Structural Testing/Inspection Agency Services

1.03 BASIS OF PAYMENT

A. Bid price shall include the design of the system; furnishing and installing the system; complete performance of the tie-back testing program; redesign as a result of prototype tests or Architect/Structural Engineers' review; installation and monitoring of instrumentation; completion and submission of required reports; and any other incidentals necessary to the successful performance of the system.

B. Provide temporary excavation shoring as required. The cost of temporary shoring shall be included in the price for excavation.

C. Any element of the excavation shoring failing to meet the stated criteria shall be replaced by the Contractor at no additional cost.

1.04 DESIGN REQUIREMENTS

A. Design loading diagrams to be used as the basis for design of the permanent shoring system are shown on the Contract Drawings.

B. Contractor shall determine the appropriate lateral design loads for the conditions at the project site for use in designing the temporary shoring.

C. The maximum movement of any part of the excavation shoring system, except anchors, shall not exceed the following:

	General	Adjacent to Existing Structures
Lateral Movement	3/4 inch	1/2 inches

D. Overall Slope Stability for Permanent Shoring:

1. Overall slope stability of the retained earth mass shall have a factor of safety of at least 1.5 on any failure surface passing through the soil mass outside the tie-back system and exiting in the excavation.

2. Surcharge loads due to adjacent existing structures shall be included. Additionally, a surcharge of 250 psf shall be included due to traffic on adjacent roads.

3. Stability shall be considered for both the short-term undrained condition and long-term drained condition.

4. A computer program such as PCSTABL5M should be used to evaluate the overall slope stability.

5. Slope stability analysis will not be required where sound, unweathered bedrock is present at or above the excavation level for the structure.

E. Tieback Anchors for Permanent Shoring:

1. Tieback anchors shall be designed and tested to resist the total lateral design loads using the loading diagrams shown on the Contract Drawings. The loading diagram shall be proportioned for multilevel anchor systems.

2. Tieback anchors shall be designed for a factor of safety of 2 applied to the design load against pullout.

3. Anchorage length of tieback anchors shall not begin closer to the wall than a plane located 45° behind the wall through the intersection point of the wall and the final subgrade level inside the excavation area.

4. Anchorage length for anchors in rock shall be a minimum of 10 feet in sound unweathered bedrock.

5. For anchors developed in rock, the pullout resistance shall be assumed as 50 psi along the surface of the interface between the anchor grout and rock.

6. Tieback anchors in permanent excavation shoring shall be provided with long term corrosion protection for their full length including all bearing plates, nuts, etc., used to transfer the anchor load to the shoring wall.

7. Tieback anchors shall be installed, tested and locked off before any excavation proceeds below any tieback level.

F. Projections shall not extend out from the face of the completed wall more than 7 inches.

1.05 TEST REQUIREMENTS FOR PERMANENT TIEBACK ANCHORS

A. Tie-back anchors may be designed and installed by any method and procedure that will result in a system that performs satisfactorily and is not detrimental to existing ground conditions. Final anchor acceptance will be based on the performance or proof testing of each anchor.

B. Instrumentation shall be provided to measure wall movements in 3 directions for the full height of the wall and anchor bar elongations to an accuracy of 0.001 inches.

C. The first five tieback anchors and five percent of the remaining tieback anchors shall be performance tested.

1. Performance testing shall follow the loading cycles shown in the following schedule: (D.L. = Design Load for the anchor)

Each load in the schedule is applied to the tieback in the order listed. At each approximate load, elongation of the tieback is measured and recorded. In addition, the maximum load shall be held for 50 minutes.
While the load is maintained constant, the anchor movement in regards to a fixed reference point shall be recorded at 0 minutes, 30 seconds, 1, 2, 3, 5, 10, 30 and 50 minutes. Contractor shall then submit a record of basis of load, load wanted, load read, and gauge reading for each load step for each performance test, including elongation versus load plots, to the Architect/Structural Engineer for evaluation before locking off the anchor.

Cycle	Load	Cycle	Load
1	0 Tons	6	0.25 D.L.
	2 Tons		0.50 D.L.
			0.75 D.L.
2	0.25 D.L.		1.00 D.L.
	2 Tons		1.20 D.L.
			2 Tons
3	0.25 D.L.		
	0.50 D.L.	7	0.25 D.L.
	2 Tons		0.50 D.L.
			0.75 D.L.
			1.00 D.L.
4	0.25 D.L.		1.20 D.L.
	0.50 D.L.		1.50 D.L. (Hold for creep test)
	0.75 D.L.		1.00 D.L.
	2 Tons		0.85 D.L. (Lock-off Load)
5	0.25 D.L.		

0.50 D.L.
0.75 D.L.
1.00 D.L.
2 Tons

2. Test is acceptable if:

   a. Total elastic movement obtained exceeds 80 percent of the theoretical elastic elongation of the stressing length.

   b. Total elongation is less than the structural elastic elongation of the stressing length plus 50 percent of the bond length.

3. Test is acceptable for anchors in bedrock if a creep movement does not exceed 0.080 inch under maximum test loading held for a period of 24 hours.

4. Test is acceptable for anchors in soil if the creep movement does not exceed 0.08 inches during the final time increment of the performance test regardless of tendon length and load.

5. A time increment is one log cycle of time: i.e. 1 to 10 minutes, 5 to 50 minutes.

D. Tieback anchors which are not performance tested shall be proof tested.

1. Proof test shall be performed by incrementally loading the anchor in accordance with the following schedule. At each increment, the movement of the anchor shall be recorded to the nearest 0.001 inches with respect to an independent fixed reference point if possible. The jack load shall be monitored with a pressure gauge or load cell. The increments of load shall be: (D.L. = Design Load for the anchor)

   2.00 Tons
   0.25 D.L.
   0.50 D.L.
   0.75 D.L.
   1.00 D.L.
   1.25 D.L. (hold for creep test)
   0.85 D.L. (Lock-off Load)

2. Proof test results should be compared to the performance test results. Any significant variation from the performance test results warrants making a performance test on the next anchor. If any anchor fails the performance test, it will be judged unacceptable and replaced by a new anchor located not less than 6 inches from the failed anchor.

E. Projections shall not extend out from the face of the completed wall more than 7 inches.

1.06 CONSTRUCTION TOLERANCES FOR PERMANENT SHORING

A. Vertical Structural Elements shall not vary from true vertical alignment more than 1/8 inch per foot.

1.07 SUBMITTALS

A. Submit qualifications of Contractor required by this section at the time of bids.

B. Submit the following design calculations for permanent shoring for review by the Architect/Structural Engineer. Review will not relieve the Contractor of responsibility for satisfactory performance of the excavation shoring system.

1. Overall slope stability calculations. Show all assumptions, methods used, and calculations.

2. Design calculations for the vertical structural wall elements, connections, walers, lagging, etc. Also calculations of embedment factor of safety of vertical elements below the excavation level.

3. Design calculations for tied-back anchors.

C. Calculations and drawings of the excavation shoring system shall be stamped and signed by a professional engineer licensed in the project state.

D. Submit overall excavation plan with emphasis on phasing of excavation to coordinate shoring with other project excavation. Show sequence of excavation required for installation of all tied-back wall elements (i.e. vertical members, tiebacks, facing elements, etc.).

E. Submit plan for installation procedure for permanent tieback wall. Include location, sizes, methods of installation, testing, etc. for entire tieback wall system.

F. Submit plan, including test set-up to measure elongation of anchor bar and anchor movements, for conducting performance and proof tests on permanent tie-back anchors for approval a minimum of 10 days prior to starting tests.

G. Submit plans for long term corrosion protection of permanent anchors.

H. Submit instrumentation plan to include instruments, installation, reading, and reporting requirements for permanent shoring systems.

1.08 REPORTS AND RECORDS FOR PERMANENT SHORING SYSTEMS

A. Records and reports generated by the Contractor during the installation of the excavation shoring shall be furnished to the Architect/Structural Engineer in a timely manner. Records and reports shall include, but will not be limited to the following:

1. Records on all drilling, driving, concreting, and installing of various elements of the system.

2. Records of all performance and proof tests on tieback anchors.

1.09 QUALITY ASSURANCE FOR PERMANENT SHORING SYSTEMS

A. Structural Testing/Inspection Agency will observe shoring and installation, the tieback testing, (both performance and proof tests) and movement surveys; and report results to the Architect/Structural Engineer.

1.10 QUALIFICATIONS

A. Contractor shall be experienced in the successful design and installation of shoring systems of similar size and scope, as evidenced by at least 5 years of applicable experience and the completion of at least 10 similar projects.

B. Contractor shall be capable of installing shoring systems with low headroom clearance.

1.11 SUBSURFACE CONDITIONS

A. Copies of a subsurface investigation of the site will be made available upon request. The data is not intended as a representation or warranty of the continuity of such conditions. Owner will not be responsible for interpretation or conclusions drawn therefrom by the Contractor. The data is made available for the convenience of the Contractor and is not guaranteed to represent all conditions that may be encountered.

B. Contractor may examine the site and make his own subsurface explorations at no additional cost to the Owner. Notify Owner prior to making subsurface exploration.

1.12 EXISTING UTILITIES

A. Locate existing underground utilities by careful hand excavation. If utilities are to remain in place, provide protection from damage during construction operations.

B. Cooperate with Owner and utility companies in keeping their respective services and facilities in operation. Do not interrupt existing utility service to facilities occupied and used by Owner or others, unless written permission is given by the Architect and then only after temporary utility services have been provided.

C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Architect immediately for directions.

D. Repair damaged utilities to satisfaction of utility owner.

1.13 EXISTING STRUCTURES AND ROADS

A. Make complete examination and survey of adjacent existing buildings and roads to determine all facts necessary to design, construct and monitor excavation shoring system.

B. Regardless of review by Architect/Structural Engineer, Contractor shall be responsible for and repair any damage to the existing buildings and roads that is related to excavation and construction.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION 316000

SECTION 316333

MICROPILES

PART 1 - GENERAL

1.1 SCOPE

This work shall consist of Micropiles; designed, furnished, installed and tested in accordance with these specifications and as shown on the contract drawings.

1.2 LOAD-CARRYING CAPACITY

Unless otherwise directed, the contractor shall select the Micropile type and the installation method, and determine the length and diameter. The contractor shall be responsible for installing in accordance with the testing subsection of this specification. Contractor's proposal for said work shall explain in detail the materials, methods, and design assumptions he will employ.

1.3 QUALIFICATION

The contractor performing the work described in the specification shall have installed Micropiles for a minimum of five years. At the time of bid, the contractor shall submit a list containing at least five projects on which the contractor has installed Micropiles. A brief description of each project and a reference shall be included for each project listed. As a minimum, the reference shall include an individual's name and current phone number.

Prior to the start of work, the contractor shall submit a list identifying the engineer, drill operators and on-site supervisors who will be assigned to the project. The list shall contain a summary of each individual's experience and it shall be complete enough for the Engineer to determine whether or not each individual has satisfied the following qualification.

The contractor shall assign an engineer to supervise the work with at least three years of experience in the design and construction of Micropiles. The use of consultants or manufacturer's representatives does not satisfy the requirements of this section. Drill operators and on-site supervisors shall have a minimum of one year experience installing Micropiles with the contractor's organization.

Contractor shall be capable of installing shoring systems with very low headroom clearance.

The engineer shall approve or reject the contractor's qualifications and staff within 15 working days after receipt of the submission. Work shall not be started on any piling nor any materials ordered until approval of the contractor's qualifications is given. The engineer may suspend the Micropile work if the contractor substitutes unqualified personnel for approved personnel; the contractor shall be fully liable for additional costs resulting from the suspension of work and no adjustment in contract time resulting from the suspension of work will be allowed.

Also, the contractor shall submit a detailed narrative within his proposal describing the construction method he intends to employ and encompassing all aspects, peripheral or otherwise, of his site operation.

Please note the owner (and his contracts manager as appropriated) reserves the right to reject any or all bids on the basis of price or in the belief that the narrative content does not reveal that the contractor has given due

thought to the construction process.

1.4 SUBMITTALS

The contractor shall prepare and submit to the engineer for review and approval, working drawings and design submission describing the Micropile system or systems intended for use. The working drawings and design submission shall be submitted 30 calendar days prior to the commencement of the Micropile work. The working drawing and design submission shall include the following:

A drawing showing the location and orientation of each Micropile and a Micropile schedule giving:

- Micropile number
- Micropile design load
- Type and size of Micropile.

The engineer shall approve or reject the contractor's working drawings and design submission within 20 working days after receipt of the submission.

The contractor shall submit to the engineer for review and approval or rejection mill test reports for the steel piling components.

The contractor shall submit to the engineer for review and approval or rejection calibration data for each test jack, pressure gauge and master pressure gauge to be used. The calibration tests shall have been performed by an independent testing laboratory and test shall have been performed within 60 calendar days of the date submitted. The engineer shall approve or reject the calibration data within five working days after receipt of the data. Testing cannot commence until the engineer has approved the jack, pressure gauge and master pressure gauge calibration.

The contractor shall submit to the engineer within 30 calendar days after completion of the Micropile work a report containing:

- As-built drawings showing the locations of the Micropiles and the piles length.
- Steel manufacturer's mill test reports for the steel pile components incorporated in the installation.
- Detailed drilling records including depth to rock quality.
- Grouting records indicating the cement type, and quantity injected.
- Micropile test results and graphs.

PART 2 - PRODUCTS

2.1 Cement

Type I, II or III conforming to AASHTO M85 shall be used for grout. In some applications where voids exist, sand may be added to the grout.

2.2 Admixtures

Admixtures which control bleed, improve flowability, reduce water content and retard set may be used in the grout subject to the approval of the engineer. Admixtures, if used, shall be compatible manufacturer's recommendation.

2.3 Water

Water for mixing grout shall be potable.

2.4 Steel Pile Components

Mill test reports for the all thread bar: pipe wall thickness, pipe diameter, and steel type.

PART 3 - EXECUTION

3.1 INSTALLATION

Drilling

Unless otherwise directed, core drilling, rotary drilling, percussion drilling, auger drilling, driven casing or other acceptable means can be used. The Micropile can be installed in the drill hole after drilling or it can be advanced by the drill.

Grouting

The contractor shall use a neat cement grout or a sand-cement grout with a minimum 28 day unconfined compressive strength of 4,000 psi. The cement shall not contain lumps or other indications of hydration. Admixtures, if used, shall be mixed in accordance with the manufacturer's recommendation.

The grouting equipment shall produce a grout free of lumps and undispersed cement. The pump shall be equipped with a pressure gauge to monitor grout pressures. The pressure gauge shall be capable of measuring pressure of at least 150 psi or twice the actual grout pressures used by the contractor, whichever is greater. The grouting equipment shall be sized to enable the grout to be pumped in one continuous operation. The mixer should be capable of continuously agitating the grout.

The grout shall be injected from the lowest point of the drill hole. The grout may be pumped through grout tubes, casing, hollow-stem-augers or drill rods. The quantity of the grout and the grout pressures shall be recorded. The grout pressures and grout takes shall be controlled to prevent excessive heave in cohesive soils or fracturing of rock formations. The entire Micropile shall be filled with grout.

Upon completion of grouting, the grout tube may remain in the hole but it shall be filled with grout.

After grouting, the Micropile shall not be loaded for a minimum of three days.

3.2 TESTING

A minimum of one test pile shall be loaded to twice the design load. The load test shall be evaluated by the contractor and engineer to assume compliance with job performance requirements.

In lieu of reaction piles, two rock anchors can be installed to provide the reaction load. A structural beam shall be set and attached to the anchors to complete the reaction assembly.

The load shall be applied with a calibrated hydraulic jack. A leveling plate shall be attached to the surface of the test pile and the jack shall be set in position with the load centered on the pile.

The tests shall be performed in accordance with ASTM D 1143-81, Testing of Piles under Axial Compressive Load.

The test load shall be applied in compliance with ASTM D 1143-81, Paragraph 5.6 Quick Pile Test. In essence the load shall be applied in intervals in increments of 20 percent of the anticipated working load to maximum of a least 200 percent of the working load. The maximum load shall be maintained for 1 hour or until the settlement is less than or equal to 0.001 foot per hour. Load increments shall be maintained as applied as described in ASTM D 1143.81, Paragraph 5.4. Load increments shall be maintained as applied as described in ASTM D1143-81, Paragraph 5.4. Readings of settlements and rebounds shall be referred to a constant elevation benchmark and shall be recorded to 1/1000 of a foot for each increment or decrement of load.

Following the 1-hour hold on the maximum load, the test piles shall be rebound as described in ASTM D 1143.81, Paragraph 6.2. Six settlement and rebounded readings shall be made in addition to the initial and final readings (total of 8) during each load or rebound cycle.

The rebound curve shall be established by unloading in decrements of 75, 50, 25 and 10 percent of the total applied load.

The test pile may or may not be a production pile, as specified by the engineer.

Contractor guarantees that should the test pile fail to give acceptable results, he will modify his design and install and test another pile at his expense. He also guarantees that he will repair or replace at his own expenses all structural damage caused by inability of his piles to support the working loads satisfactorily for a period of two years.

END OF SECTION 316333

SECTION 2N1

UTILITY MAIN SLEEVES

01) DESCRIPTION

(a) This item shall consist of furnishing and installing split steel sleeves around active water and sewer mains as shown on the Plans, in accordance with these Specifications. Contractor shall provide a submittal for the entire assembly and structure prior to ordering and installation.

02) MATERIALS

(a) Steel Sleeves. Steel sleeves shall be minimum 0.375 inch wall, 36 inch O.D. or as indicated on the plans, mill type steel pipe conforming to current AWWA (American Water Works Association) Standard C200:2012. Pipe shall be coal-tar enamel coated and lined in accordance with current AAWA Standard C-203. The pipe exterior shall be wrapped with asbestos free coating, finished with kraft paper. For split sleeves, the pipe section shall be furnished in two halves, beveled for welding or with gasketed bolting flanges attached. Pipe joints shall be similarly beveled.

(b) End Caps. The annular space between the water and sewer mains and the sleeve at the ends of the sleeve shall be capped as indicated on the plans. If Contractor obtains prior approval from the Owner and Owner's representative, the annular space between the water and sewer mains and the sleeve at the ends of the sleeve may be packed with sand, which will extend a minimum of two feet -inside the sleeve ends. The packed sand shall be faced with loosely driven creosoted wood wedges at the ends of the sleeve.

(c) Carrier Pipe Insulators. Carrier pipe insulators shall be similar to two-piece steel band type pipeline crossing insulators, Maloney Company, Model 60, with six 1-1/2 inch high molded PF (polyester fiberglass) runners, or approved equal. Four runners shall be attached at equal spacing to the bottom half of the insulator band. Two runners shall be similarly attached to the top half of the band. If required to obtain bell clearance, an eight (8) inch wide and ½ inch minimum thick composite of an approved rubber belting material shall be placed between the lower one-third of the circumference of the carrier pipe and each insulator.

03) CONSTRUCTION

(a) Water and sewer main sleeves shall be constructed in accordance with the applicable requirements of Section D-701-Pipe for Storm Drains of Advisory Circular 150/5370-10G Standards for Specifying Construction of Airports, and the following additional specifications.

(b) All field welds shall conform to current, AWWA Specification C-206. All coatings and wrappings removed in the beveling and welding process shall be replaced in kind in the field. All field joints in the water main sleeve shall be absolutely watertight. Any evidence of infiltrating water shall be traced to its source and appropriate repairs shall be made. Contractor shall notify the Owner and Owner's representative prior to repairs.

(c) Existing water and sewer mains to be enclosed within split steel sleeves will be required to be maintained under pressure during sleeve construction. Any joint leaks in the existing water and sewer main, resulting from the Contractor's work, shall be repaired by the Contractor at the Contractor's expense.

(d) Carrier pipe insulators shall be installed on all existing water and sewer mains to be enclosed within

proposed split steel sleeves as indicated on the plans. If required to obtain clearance between the water or sewer main bell and the sleeve, an eight (8) inch wide composite of an approved rubber belting shall be placed between the lower one-third of the circumference of the carrier pipe and each insulator. A minimum one (1) inch bell clearance will be required. One insulator shall be attached at each existing pipe bell, clear of the bell rounding.

TESTING AND MATERIAL REQUIREMENTS

Test and Short Title	Material and Short Title
AWWA C200:2012	Steel Water Pipe, 6 In. (150 Mm) and Larger
AWWA C203	Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines
AWWA C206	Standard for Field Welding of Steel Water Pipe

Note: Others as required by referenced specifications.

END OF SECTION

SECTION P-301

SOIL CEMENT BASE COURSE

01) DESCRIPTION

(a) This item shall consist of constructing a subgrade of a minimum of 6" by uniformly mixing together soil, Portland cement, and water. Also, it shall consist of spreading, shaping, and compacting the mixture in accordance with the requirements of this specification and it shall conform to the dimensions and typical cross sections shown on the plans and to the lines and grades established by the Design Consultant.

(b) The Contractor is cautioned that underground facilities will be installed under other sections of this contract. These facilities shall be protected at all times during construction. The Contractor shall use construction methods that will minimize potential damage. After the curing is completed, the Contractor will be required to demonstrate, by a method acceptable to the Owner's Representative, that the underground facilities are undamaged.

02) MATERIALS

(a) Portland Cement: Portland cement shall be a standard brand and shall conform to the latest standard requirements of AASHTO M-85 for the type specified. Air-entrained Portland cement shall conform to the latest standard requirements of AASHTO M-134 for the type specified.

Contractor may use bulk cement, subject to the Design Consultant's approval of the apparatus for handling, weighing, applying the cement, and performance.

(b) Water: The water for the subgrade shall be clean and free from sewage, oil, acid, strong alkalis, or vegetable matter, and it shall be in sufficient supply for mixing and curing. Water of questionable quality shall be tested in accordance with the requirements of AASHTO T-26. The amount of water used in the mix will vary with the moisture content of the soil.

(c) Soil: The soil used in the subgrade stabilization shall be material remaining after Selective Grading and Preparation of Subgrade operations have been completed.

(d) Bituminous Material: The bituminous material used for curing the soil cement shall meet the following conditions:

1) Cutback asphalt – RC-70

2) Specification – AASHTO M-81

3) Application Temperature

(e) Unsuitable Material: Unsuitable material shall be as defined in Section P-152, 01) (d) 2.

03) DEFINITIONS

(a) Laboratory Soil Test: Prior to subgrade construction, the Contractor shall perform laboratory tests on the various types of soils for use as subgrade to determine the quantity of cement required to provide satisfactory results. Satisfactory materials for the soil cement mix designs shall be obtained from an approved source.

1) The specimens containing various amounts of cement are to be compacted in accordance with AASHTO T-134, and the optimum moisture for each amount of cement is to be determined. Samples of the optimum moisture shall be subjected to the wet-dry and the freeze-thaw test in accordance with AASHTO T-135 and T-136, respectively. Test specimens of the approved mix shall be capable of consistent field compressive strength of 600 psi when tested at seven days, with gain in strength thereafter.

2) The specified cement content for construction shall be that at which the weight loss of the specimens subjected to 12 cycles of either the wet-dry or the freeze-thaw is not more than 14% for granular soils, 10% for the more plastic granular and silty soils, and 7% for clay soils.

3) The compressive strength of soaked specimens should increase both with age and with increase in cement content.

4) The soil cement mix designs shall be submitted to the Design Consultant for his review well in advance of the required use in the field.

04) CONSTRUCTION METHODS

(a) Weather Limitations. The soil cement subgrade shall be not be mixed or placed while the atmospheric temperature is below 35°F or when conditions indicate that the temperature may fall below 35°F within 24 hours, or when the weather is foggy or rainy, or when the soil or subgrade is frozen. The temperature requirement may be waived, but only when so directed by the Design Consultant.

(b) Equipment. The soil cement may be constructed with any equipment that will meet the requirements for soil pulverizations, cement application, mixing, water application, incorporation of materials, compaction, finishing and curing specified herein.

1) The methods to be employed in performing the work, and equipment and tools to be used for handling the materials and executing the work, shall be subject to the approval of the Owner's Representative before the work is started. Whenever corrections are necessary, changes shall be made. All equipments, tools, machinery, and plant must be maintained in satisfactory working conditions.

2) The Contractor shall be required to install a hood device over the cement spreader bar to contain the cement dust and prevent discharge into the air, or at his option, mix the soil, cement and water by the central mix method.

(c) Preparation. The area designated for stabilization shall be graded, compacted, and shaped under the excavation and embankment operations described herein before.

(d) Pulverization. The soil for the subgrade shall be so pulverized that at the completion of moist mixing, 100% by dry weight passes a two inch sieve and a minimum of 80% passes a No. 2 sieve, exclusive of gravel or stone retained on the No. 2 sieve.

(e) Mixing and Spreading. Mixing of the soil, cement, and water shall be accomplished by the mixed-in-place method.

1) MIXED-IN-PLACE Method. Prior to the addition of cement, approximately four (4) passes shall be made with the mixer, or as many additional passes as required to pulverize the soils to eliminate soil clods and assure thorough mixing of cement. The specified quantity of cement shall be spread uniformly on the soil.

2) The percentage of moisture in the soil, at the time of cement application, shall not exceed the quantity that will permit a uniform and intimate mixture of soil and cement during mixing operations, and it shall not exceed the specified optimum moisture content for the soil cement mixture.

i. Cement that has been displaced shall be replaced before mixing is started. After the cement has been applied, it shall be mixed with the soil. Mixing shall continue until the cement has been sufficiently blended with the soil to prevent the formation of cement balls when water is applied.

ii. Immediately after the soil and cement have been mixed, water shall be incorporated into the mixture. Excessive concentrations of water on or near the surface shall be avoided. Water supply and pressure distributing equipment shall be provided that will assure the application of water within three hours of all mixing on the section being processed. After all mixing water has been applied, mixing shall continue until a uniform and intimate mixture of soil, cement, and water has been applied.

(f) Compaction. At the start of compaction, the percentage of moisture in the mixture and in unpulverized soil lumps, based on oven-dry weights, shall not be below or more than two percentage points above the specified optimum moisture content and shall be less than that quantity which will cause the soil cement mixture to become unstable during compaction and finishing.

1) The specified optimum moisture content and density shall be determined in the field by the moisture-density test, specified in AASHTO T-134, performed on representative samples of soil cement mixture obtained from the area being processed at the time compaction begins.

2) The density shall be 100% of the density determined in the field by the moisture-density test, specified in AASHTO T-134. During construction, one test shall be made for each 1,000 square yard of each area of soil cement placed and compacted. In order to monitor quality control, the Owner's Representative shall have the Contractor's testing laboratory prepare molded samples in accordance with AASHTO T-134 and cure the samples and have them tested at seven days to determine the compressive strength.

3) Compaction equipment used on all soil cement shall include pad type compactors such as Vibro Plue Model C.A. 25 PD, Caterpillar Tractor Company, Model 815, or approved equal.

4) Prior to the beginning of compaction, the mixture shall be in a loose condition for its full depth. The loose mixture shall then be uniformly compacted to the specified density within two hours. During compaction operations, shaping may be required to obtain uniform compaction and required grade and cross section.

(g) Finishing. After compaction, the surface of the soil cement shall be shaped to the required lines, grades and cross section. If necessary, during shaping operations, the surface of the base shall be lightly scarified to remove any tire imprints or smooth surfaces left by equipment. The resulting surface shall then be compacted to the specified density. Rolling shall be supplemented by broom-dragging, if required.

1) The moisture content of the surface material must be maintained at its specified optimum content during finishing operations. Surface compaction and finishing shall produce a smooth dense surface, free of compaction planes, cracks, ridges, or loose material.

2) Any portion of the soil cement that has a density of five pounds or more below that specified shall be corrected or replaced prior to final set to meet these specifications.

The contractor shall submit his methods for correcting the in-place mix for review and approval by the Owner's Representative prior to commencing any corrective action. The application of any additional cement, re-mixing, or other action required shall be at no additional cost to the Owner.

(h) Construction Joints. At the end of each day's run, a transverse construction joint shall be formed by a header or by cutting back into the compacted material to form a true transverse vertical face.

1) The protection provided for construction joints shall permit the placing, spreading, and compacting of base material without injury to the work previously laid.

Where it is necessary to operate or turn any equipment on the completed subgrade, sufficient protection and cover shall be provided to prevent damage to the finished surface. A supply of mats or wooden planks shall be maintained and used as approved and directed by the Owner's Representative.

2) Care shall be exercised to insure thorough compaction of the subgrade material immediately adjacent to all construction joints. When spreading or compacting subgrade material adjacent to a previously construction lane, care shall be taken to prevent injury to the work already constructed.

(i) Protection and Curing. After the subgrade has been finished as specified herein, it shall be protected against drying for a period of seven days by the application of bituminous material or other acceptable methods. The curing method shall begin immediately after final finishing and trimming. The finished subgrade shall be kept moist continuously until the curing material is placed.

1) The bituminous material specified shall be uniformly applied to the surface of the completed subgrade at the rate of approximately 0.4 gallon per square yard with approved heating and distributing equipment. The Contractor shall prepare a test section using a rate and temperature of application mutually agreed upon. Upon acceptance of the rate and temperature of application on the test section by the Design Consultant, the Contractor shall use those rates on the subgrade material.

2) At the time the bituminous material is applied, the surface shall be dense, free of any loose and extraneous material, and shall contain sufficient applied in sufficient quantity to fill the surface voids immediately before the bituminous curing material is applied.

3) No construction equipment or other traffic shall ride on the completed subgrade until the subgrade has cured for a minimum of three days, when temperatures are continuously above 40 °F., and five days when the temperature drops below 40 °F. at any time during the curing period. Additional cement may be added to decrease the above cure times.

4) The curing material shall be maintained and applied as needed by the Contractor during the seven day protection period so that all of the soil cement will be covered effectively during this period.

5) Finished portions of soil cement that are used by equipment in constructing an adjoining section shall be protected to prevent equipment from marring or damage the completed work.

6) When the air temperature may be expected to reach the freezing point, sufficient protection from freezing shall be given the soil cement for seven days after its construction and until it has hardened.

7) No additional payment will be made for curing materials; all costs thereof will be included in the contract lump sum.

j) Construction Limitations. When any of the operations after the application of cement are interrupted for more than 30 minutes or when the uncompacted soil cement mixture is wetted by rain so that the moisture content is exceeded by a small amount, the decision to reconstruct the portion affected shall rest with specified moisture content tolerance, the Contractor shall reconstruct, at his expense, the portion affected. All material along the longitudinal or transverse construction joints not properly compacted shall be removed and replaced, at the Contractor's expense, with properly moistened and mixed soil cement compacted to specified density.

k) Surface Test. The finished surface shall not vary more than 3/8" when tested with a 16-foot straightedge applied parallel with, or at right angles to, the longitudinal axis of the pavement. Any variations in excess of this tolerance shall be corrected by the Contractor, at his own expense, and in a manner satisfactory to the Owner's Representative.

1) The elevations, as determined by the Design Consultant, of the top of the subgrade shall not vary more than ½", plus or minus, from the proposed elevations.

(l) Thickness. The thickness of the soil cement subgrade shall be verified from measurements, taken by the Owner's Representative, in the trenches excavated through this layer for the placement of underdrains. The thickness of the soil cement subgrade shall be within ½" of the thickness shown on the plans. Where the thickness shown by the measurements is not within the tolerance given, the Owner's Representative shall evaluate the area and determine if, in his opinion, it shall be reconstructed at the Contractor's expense of the deficiency or deducted from the total material in-place.

(m) Maintenance. The Contractor shall be required to maintain, at his own expense, the entire subgrade within the limits of his contract in a condition satisfactory to the Owner's Representative from the time he starts work until all the work has been completed.

Maintenance shall include immediate repairs of any defects that may occur either before or after the cement is applied. The work shall be done by the Contractor at his own expense and repeated as often as necessary to keep the area intact at all times. Repairs shall be made in a manner that will insure restoration of a uniform surface and the durability of the part repaired. Faulty work must be replaced for the full depth of treatment. Any low areas shall be remedied by replacing the material for the full depth of treatment rather than by adding a thin layer of soil cement to the completed work.

(n) Repair. The contractor shall repair all soil cement that may be damaged by construction operations. The damaged area of soil cement shall be removed full depth and replaced with structural concrete meeting the requirements of specification Section P-501. Repairs to the soil-cement base course shall be incidental to the construction of the base course.

TEST AND MATERIAL REQUIREMENTS

Test and Short Title

AASHTO T-26 – Quality of Water

AASHTO T-27 – Sieve Analysis for Fine and Coarse Aggregate

AASHTO T-134 – Moisture-Density Relations of Soil-Cement Mixtures

AASHTO T-135 – Wetting-and-Drying Test of Compacted Soil-Cement Mixtures

AASHTO T-136 – Freezing-and-Thawing Test of Compacted Soil-Cement Mixtures

Material and Short Title

AASHTO M-81 – Asphalt RC

AASHTO M-85 – Portland Cement

AASHTO M-134 – Air Entrained Portland Cement

1/SS-A-674 – Asphalt Emulsion

END OF SECTION P-301

ITEM P-501

PORTLAND CEMENT CONCRETE PAVEMENT

01) DESCRIPTION

(a) This work shall consist of pavements composed of Portland Cement Concrete, with or without reinforcements as specified, constructed on a prepared subgrade or subbase course in accordance with these specifications and shall conform to the thickness and typical cross sections shown on the plans and with lines and grades established by the Contractor.

(b) The Contractor will be required to construct a test section of approximately 300 linear feet in length at the proposed plan width or as required by the Owner. This test section is to be paved prior to proceeding with the production paving utilizing the equipment, methods, and materials the Contractor has submitted for the work to be constructed under this contract.

The test section shall be checked by the Contractor in the presence of the Engineer to verify acceptability and compliance with the tolerances and other contract requirements. Work not meeting the requirements will be removed and/or corrected by methods approved by the Engineer.

(c) This section shall also include the replacement of damaged and/or deficient soil cement stabilized base course, capping of underdrain trenches, concrete fill in the trench above the longitudinal underdrain with low slump, low strength concrete. Mix design and placement methods shall be in general accordance with the requirements of this section.

02) MATERIALS

All aggregates shall be sourced from producers on the most recent Georgia Department of Transportation Office of Materials and Research Qualified Products List. Gradation will be performed at the frequency of one per day for each material for each day of the stockpiling or production.

All aggregates, including sand and stone, for use in concrete shall be tested for alkali-aggregate reaction in accordance with either ASTM C1260 or ASTM C1293. Expansions less than 0.08% at 14 days in the caustic soak solution in ASTM C1260 or less than 0.04% at one year in ASTM C1293 shall indicate that the aggregate is considered non-deleteriously reactive. Aggregates at or above these limits shall be considered potentially deleteriously reactive. Use of aggregates at or above these limits (i.e., aggregates that are potentially deleteriously reactive) shall require testing of the proposed concrete mix design to demonstrate control of deleterious expansion from ASR. The tests to demonstrate control of the mix shall be either a modified version of ASTM C1260 or ASTM C1293. The modification is that any mineral or lithium admixtures in the mix design shall be included in the cementitious portion of the batch of materials to be tested, and at the same weight percentages as designed for use in the concrete mixture being evaluated. Furthermore, in the case of ASTM C1260, the caustic soak storage solution shall be modified to incorporate the lithium admixture as described in the FHWA Publication No. FHWA-RD-03-047, pages 61 – 62, if lithium admixture is incorporated in the concrete mix design. Expansions less than 0.08% at 28 days in the caustic soak solution in the modified ASTM C1260 or less than 0.04% at two years in the modified ASTM C1293 shall be indicative of control of deleterious expansions from ASR. Aggregates shall also be tested for alkali-carbonate reaction in accordance with the criteria stated in ASTM C33. Aggregates shown to be alkali-carbonate reactive shall not be used.

(a) Fine Aggregate. Fine aggregate for concrete shall be natural sand and shall conform to the requirements of ASTM C33 and AASHTO M-6 and shall meet the gradation requirements of Table I.

TABLE I

Gradation For Fine Aggregate

Sieve Designation (Square Openings)	Percentage by Weight Passing Sieve
3/8 Inch	100
No. 4	95-100
No. 16	45-80
No. 30	25-55
No. 50	10-30
No. 100	2-10

(b) Coarse Aggregate. Coarse aggregate for concrete shall conform to the requirements of ASTM C33 and AASHTO M80. Coarse aggregate shall be furnished in the two separate sizes as shown in Table II. The coarse aggregate shall show no more than 47% wear when tested in accordance with ASTM C131 and/or ASTM C535.

TABLE II

Gradations from 1-1/2 Inch to No. 4

Sieve Designation (Square Openings)	Percentage By Weight Passing Sieves (AASHTO T-27)							
	2"	1-l/2"		1"	3/4"	3/8"	No. 4	No. 8
1-1/2" to 3/4"	100	90-100	20-55	0-15	0-5	-	-	
3/4" to No. 4	-	-		100	90-100	10-55	0-10	0-5

(c) Cement. The cement used shall be Portland cement conforming to one of the following specifications:

Portland Cement ..... ASTM C150, Type I or Type II

Cement supplied for use in concrete shall be of the low alkali type, the total alkali content to be less than 0.40%.

If for any reason cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

(d) Premolded Joint Filler. Premolded joint filler for expansion joints shall conform to the requirements of AASHTO M 213 and shall be punched to admit the dowels where called for on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the Engineer. When the use of more than one piece is authorized for a joint, the abutting ends shall be fastened securely and held

accurately to shape by stapling or other positive fastening means satisfactory to the Engineer.

(e) Joint Sealer. The joint sealer for the joints in the concrete pavement shall be as specified in Section P-605 Joint Sealing Filler.

(f) Dowel and Tie Bars. Dowel and tie bars shall conform to the requirements of AASHTO M 31 or AASHTO M 42, except that rail steel shall not be used for tie bars that are to be bent or re-straightened during construction. Tie bars shall be deformed bars. Dowel bars shall be plain round bars of the size specified and shall be free from burring or other deformation restricting slippage in the concrete. Before delivery to the construction site, one-half of the length of each dowel bar shall be painted with one coat of paint.

(g) Water. Water used in mixing or curing shall be as clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product as possible. Water will be tested in accordance with and shall meet the suggested requirements of AASHTO T-26. Water known to be of potable quality may be used without testing. Where the source of water is relatively shallow, the intake shall be so enclosed as to exclude silt, mud, grass, or other foreign materials.

(h) Cover Materials For Curing. Curing materials shall be liquid membrane-forming compounds for curing concrete and shall conform to ASTM C 309, Type 2, Class B. Apply at the rate of no more than 125 square feet per 1 gallon.

(i) Admixtures. The use of any material added to the concrete mix shall be approved by the Engineer. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below for the admixtures for which approvals are desired. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests will be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

Pozzolanic admixtures shall be fly ash meeting the requirements of ASTM C-350 or raw or calcined natural pozzolans meeting the requirements of ASTM C-402.

Air-entraining admixtures shall meet the requirements of AASHTO M 154 or ASTM C-260. Concrete to be tested for approval shall be made with the cement and aggregate to be used in the work and shall contain an air content of 4% to 6% by volume of the concrete mixture, as determined by ASTM C-231.

Water-reducing, set-controlling mixture shall meet the requirements of ASTM C-494, Type A, water-reducing or Type D, water-reducing and retarding and shall be added to all mixes. Type A shall be added when temperatures are below 65°F., and Type D when temperatures are above 65°F. Water-reducing admixtures shall be added at the mixer separately from air-entraining admixtures in accordance with the manufacturer's printed instructions. The water-reducing, set-controlling and retarding admixtures shall not contain calcium chloride or chloride containing compounds as a functional ingredient."

Lithium admixtures used for control of deleterious expansion from ASR shall meet the specifications described in the AASHTO Guide Specification for Highway Construction, Section 56X, Portland Cement Concrete Resistant to Excessive Expansion from Alkali Silica Reaction, section 713.04 (lithium nitrate aqueous admixture).

The quantity of lithium admixture required will be 0.6 gallons per cubic yard of concrete using low alkali cement (0.4% or less alkali), aggregates that have expansions less than 0.04% at 14 days in the caustic soak solution in ASTM C1260 and a low CaO Class F fly ash. There are aggregates in the Atlanta region that met the requirements. It is the contractor's responsibility to perform ASTM C1260 on the aggregates prior to stockpiling on site to determine that they meet the requirements if these locally available aggregates are not used. If the aggregates do not meet the requirements then it is the contractor's responsibility (at the contractor's cost) to put the proper amount of lithium admixture in the mix to account for the variation.

(j) Fly Ash. Fly ash shall be used as an additive in concrete to promote workability and plasticity. Fly ash shall be used as a partial replacement for portland cement in concrete in accordance with the following:

1) The quantity of fly ash in the mix shall be 25% of the weight of total cementitious material (i.e., Portland cement plus fly ash).

2) The fly ash shall conform to ASTM C-618, Type F, except that the loss on ignition shall not exceed 3%. The fly ash should have a maximum of 1.5% available alkali and a maximum 6% CaO.

3) Separate facilities must be provided for the fly ash such that it will be stored in the same fashion as cement and batched and weighed to the same degree of accuracy as required for cement. The same scales may be used for weighing both cement and fly ash provided they are handled as a separate operation.

4) The Contractor shall assume full responsibility for obtaining concrete having the minimum strength requirements set forth in the specifications.

5) A minimum of five and one-half (5½) bags of Portland cement, at 94#/bag, per cubic yard of concrete shall be used in the mix.

(k) Steel Reinforcement. Deformed welded wire fabric conforming to the requirements of AASHTO M-55 or M-221 shall be used where specified on the plans.

03) CONSTRUCTION METHODS

(a) Equipment. Equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer as to design, capacity, and mechanical condition. The equipment shall be at the job site sufficiently before the start of construction operation for examination and approval.

1) Batching Plant and Equipment.

i) General. The batching plant shall include bins, weighing hoppers, and scales for the fine aggregate and for each size of coarse aggregate. If bulk cement is used, a bin, hopper, and separate scale for cement shall be included. The weighing hoppers shall be properly sealed and vented to preclude dusting during operation.

ii) Bins and Hoppers. Bins with adequate separate compartments for fine aggregate and for each required size of coarse aggregate shall be provided

in the batching plant. Each compartment shall discharge efficiently and freely into the weighting hopper. Means of control shall be provided so that, as the quantity desired in the weighing hopper is approached, the material may be added slowly and shut off with precision. A port or other opening for removing an overload of any one of the several materials from the hopper shall be provided. Weighing hoppers shall be constructed to eliminate accumulations of tare materials and to discharge fully.

iii) An automatic recording device capable of recording all of the individual ingredients of the mix shall be installed at the point of manufacture of the concrete.

iv) Scales. The scales for weighing aggregates and cement shall be of either the beam or the spring less dial type. They shall be accurate within 0.5% throughout their range of use. When beam-type scales are used, provision, such as "tell-tale" dial, shall be made for indicating to the operator that the required load in the weighing hopper is being approached.

A device on the weighing beams shall clearly indicate critical position. Poises shall be designed to be locked in any position and to prevent unauthorized change. The weight beam and "tell-tale" device shall be in full view of the operator while charging the hopper, and he shall have convenient access to all controls.

Scales shall be inspected and sealed as often as the Engineer may deem necessary to assure their continued accuracy. The Contractor shall have on hand not less than ten 50-pound weights for frequent testing of all scales.

2) Mixers

i) General. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's plate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

A device, accurate within 3% and satisfactory to the Engineer, shall be provided at the mixer for determining the amount of air-entraining agent that is added to each batch requiring such admixture.

Mixers shall be examined daily for the accumulation of hard concrete or mortar and the wear of blades.

ii) Mixers at construction sites. Mixing shall be in an approved mixer capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified mixing period, and of discharging and distributing the mixture without segregation on the prepared grade. The mixer shall be equipped with an approved timing device which will automatically lock the discharge lever when the drum has been charged and release it at the end of the mixing period. The device shall be equipped with a bell or other suitable warning device adjusted to give a clearly audible signal each time the lock is released. In case of failure of the timing device, the mixer may be used for the balance of the day while it is being repaired,

providing that each batch is mixed 90 seconds. The mixers shall be cleaned at suitable intervals. The pickup and throwover blades in the drum(s) shall be repaired or replaced when they are worn down 3/4 inch or more. The Contractor shall have available at the job site a copy of the manufacturer's design, showing dimensions and arrangements of blades in reference to original height and depth, or provide permanent marks on blades to show points of 3/4 inch wear from new conditions. Drilled holes of 1/4 inch diameter near each end and at the midpoint of each blade are recommended.

iii) Central plant mixers. Mixers for central plant mixing (plant mixer, revolving drum type mixer, single opening revolving truncated drum mixer, and a revolving drum charging at one end and discharging at the other end) shall have attached thereto, in a prominent place by the manufacturer, a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the normal capacity (in cubic feet) of the drum or container in terms of the volume of mixed concrete, and the speed of rotation of the mixing drum or blades. Central plant mixers shall be equipped with an acceptable timing device that will not permit the batch to be discharged until the specified mixing time has elapsed. The water system for a central mixer shall be either a calibrated measuring tank or a meter and shall not necessarily be an integral part of the mixer.

The mixers shall be cleaned at suitable intervals. They shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or to wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch or more. The Contractor shall provide the Engineer with a copy of the manufacturer's design showing dimensions and arrangement of blades in reference to original height and depth.

iv) Truck Mixers and Truck Agitators. Truck mixers used for mixing and hauling concrete, and truck agitators used for hauling central mixed concrete, shall conform to the requirements of AASHTO M 157.

v) Non-agitator Trucks. Non-agitating hauling equipment shall conform to the requirements of AASHTO M 157.

3) Finishing Equipment.

i) Finishing machine. The finishing machine shall be self propelled and equipped with at least two oscillating type transverse screeds.

ii) Vibrators. Vibrators, for full width vibration of concrete paving slabs, may be either the surface pan type or the internal type with either immersed tube or multiple spuds. They may be attached to the spreader or the finishing machine, or they may be mounted on a separate carriage. They shall not come in contact with the joint, load transfer devices, subgrade, or side forms. The frequency of the surface vibrators shall be not less than 3,500 impulses per minute and the frequency of the internal type shall be not less than 5,000 impulses per minute for tube vibrators and not less than 7,000 impulses per minute for spud vibrators.

When spud internal vibrators are used adjacent to forms, they shall have a frequency of not less than 3,500 impulses per minute.

4) Concrete Saw. When sawing of joints is elected or specified, the Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions and at the required rate. The Contractor shall provide at least one standby saw in good working order. An ample supply of saw blades shall be maintained at the site of the work at all times during sawing operations.

The Contractor shall provide adequate artificial lighting facilities for night sawing. All of this equipment shall be on the job both before and at all times during concrete placement. Immediately after the initial sawing, the Contractor shall flush out the slurry in the joint with water and install a backer rod slightly larger in diameter than the width of the saw cut, at the bottom of the saw cut. The length of the backer rod shall be extended approximately 6" beyond the slab edge for future overlap of the adjacent slab.

5) Forms. Straight side forms shall be made of metal having a thickness of not less than 7/32" and shall be furnished in sections of not less than 10 feet in length. Forms shall have a depth equal to the prescribed edge thickness of the concrete, without horizontal joint, and a base width equal to the depth of the forms. Flexible or curved forms of proper radius shall be used for curves of 100 foot radius or less. Flexible or curved forms shall be of a design acceptable to the Engineer. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Flange braces shall extend outward on the base not less than two-thirds the height of the form. Forms with battered top surfaces, and bent, twisted, or broken forms shall be removed from the work. Repaired forms shall not be used until inspected and approved. Built-up forms shall not be used, except as approved by the Engineer. The top face of the form shall not vary from a true plane more than 1/8 inch in 10 feet, and the upstanding leg shall not vary more than ¼ inch. The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting.

(b) Form Setting. Forms shall be set sufficiently in advance of the concrete placement. After the forms have been set to correct grade, the grade shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place with not less than 3 pins for each 10 foot section. A pin shall be placed at each side of every joint. Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/4 inch at any point. Excessive settlement or springing of forms under the finishing machine will not be tolerated. Forms shall be cleaned and oiled prior to the placing of concrete.

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

(c) Conditioning of Underlying Course. Ruts or depressions caused by hauling or usage of other equipment shall be filled, as they develop, with suitable material to the satisfaction of the Engineer. A multiple-pin template weighing not less than 1,000 pounds (per 20 foot machine) or other approved template shall be provided and operated on the forms immediately in advance of the placing of the concrete. If the mixer is operated upon the grade, the template shall be operated between the mixer and the spreader; in any case, it shall be propelled only

by hand and plates shall be adjustable so that they may be set and maintained at the correct contour of the underlying course. The adjustment and operation of the template shall be such as will provide an accurate retest of the grade before placing the concrete thereon. All excess material shall be removed. If the grade is found to be below the true elevation, the depressions shall be filled with approved material and thoroughly compacted to the proper cross section by rolling or tamping with a hand tamp.

1) The template shall be maintained in accurate adjustment, at all times by the Contractor, and should be checked daily.

2) The work described under the foregoing paragraphs does not contemplate a regular subgrading operation, but rather a final accurate check of the underlying course.

(d) Handling, Measuring and Batching Materials. The batch plant site, layout, equipment, and provisions for transporting material shall assure a continuous supply of material to the work. Stockpiles shall be built up in layers of not more than 3 feet in thickness. Each layer shall be completely in place before beginning the next, which shall not be allowed to "cone" down over the next lower layer. Aggregates from different sources and of different gradings shall not be stockpiled together.

1). Aggregates shall be handled from stockpiles or other sources to the batching plant in such manner to secure the specified grading of the material. Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Rail shipments requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit free drainage. In case the aggregates contain high or non-uniform moisture content, storage or stockpile periods in excess of 12 hours may be required by the Engineer.

2). The fine aggregate and each size of coarse aggregate shall be separately weighed into hoppers in the respective amounts set by the job mix. Cement shall be measured by the sack or by weight. Separate scales and hoppers, with a device to indicate positively the complete discharge of the batch of cement into the batch box or container, shall be used for weighing the cement. Ninety-four pounds of bulk cement shall be considered one sack. Batches involving fractional sacks shall not be allowed, except when bulk cement is used.

3). When mixing is at the site of the work, aggregates shall be transported from the batching plant to the mixer in batch boxes, vehicle bodies, or other containers of adequate capacity and construction to properly carry the volume required. Partitions separating batches shall be adequate and effective to prevent spilling from one compartment to another while in transit or while being dumped. When bulk cement is used, the Contractor shall use a suitable method of handling the cement from weighing hopper or transporting container or into the batch itself for transportation to the mixer, such as a chute, boot, or other approved device, to prevent loss of cement. The device shall be arranged to provide positive assurance of the actual presence in each batch of the entire cement content specified.

4). Bulk cement shall be transported to the mixer in tight compartments capable of carrying the full amount of cement required for the batch, or if permitted, between the fine and coarse aggregate. When cement is placed in contact with the aggregates, batches may be rejected unless mixed 1-1/2 hours of such contact. Cement in

original shipping packages may be transported on top of the aggregates, each batch containing the number of sacks required by the job mix.

5). Batches shall be delivered to the mixer separately and intact. Each batch shall be dumped into the mixer without loss of cement, and when more than one batch is carried on the truck, it shall be dumped without spilling of material from one batch compartment into another. Batching shall be conducted so that the results in the weights of each material required will be within a tolerance of 1% for cement and 2% for aggregates.

6). Water may be measured either by volume or by weight. The accuracy of measuring the water shall be within ±1% of required amounts. Unless the water is to be weighed, the water-measuring equipment shall include an auxiliary tank from which the measuring tank shall be filled. The measuring tank shall be equipped with an outside tap and valve to provide checking of the setting, unless other means are provided for readily and accurately determining the amount of water in the tank. The volume of the auxiliary tank shall be at least equal to that of the measuring tank.

Methods and equipment for adding air-entraining agent or other admixtures to the batch, when required, shall be approved by the Engineer. All admixtures shall be measured into the mixer with an accuracy of ±3%.

(e) Proportions.

1). At least thirty (30) days prior to the start of concrete paving operations and after approval of all material to be used in the concrete, the Contractor shall submit the proportions of the material to produce the specified flexural strength of 650 psi at 28 days and 735 psi at 90 days. During the mix design process, additional beams shall be made to determine the strength at 24 hours, 36 hours and 48 hours. The Contractor shall submit for approval the job mix formula, at his expense, to the Engineer at least thirty (30) days prior to construction. The proportioning shall be approved in writing by the Engineer to the Contractor. Should a change in sources of materials be made, or if different sources of materials are to be used, proportions for these materials shall also be approved in writing by the Engineer before said materials are incorporated into the mix. The approved mix shall be a workable concrete designed for a one (1) inch slump, with one-half (½) inch as the minimum and one and one-half (1-1/2) inches as the maximum allowable in any specimen and an air content of 4% to 6%. If the Contractor proposes to place concrete by methods other than slip forming that requires a higher slump, the slump may be increased to a maximum of 2-1/2" provided the Contractor has had a mix designed and approved to the criteria specified herein.

The mix design for the low slump, low strength base course replacement shall follow the general requirements of this section. The concrete shall be designed for a 1" to 2" slump, 5% to 7% air content and a 7 day compressive strength of 2000 psi. The low slump concrete shall also be used for capping the underdrain trenches, duct banks, and conduit trenches in the base materials.

The mix design procedure shall include testing for gradation, specific gravity, fineness modulus, dry rodded unit weight, abrasion, compressive and tensile strengths of cement, slump, air, yield, strength, time of set, shrinkage, and statistical analysis. Sufficient beams shall be cast during the mix design process to adequately determine the strengths at 3 days, 7 days, 14 days, 28 days, and 90 days to insure

compliance with the requirements of the contract documents. The use of maturity meters shall be used to monitor and determine the concrete strength. The meters shall be IntelliRock Maturity Meters supplied by Engius of Stillwater, Oklahoma. Curves shall be developed during the mix design process and further proved during the concrete placement.

During construction, the Contractor shall make at least seven (7) beams for each 200 cubic yards, or fraction thereof, placed. Each individual three (3), seven (7) twenty-eight (28) day flexural strength test, consisting of the average of two (2) beam breaks, shall represent that amount of concrete each side of the test location midway to the adjacent test locations or to end of lane, whichever is applicable. The quantity of concrete represented by each test shall be as near as practical to the specified frequency. Beams shall be tested at three (3) and seven (7) twenty-eight (28) and ninety (90) days. The flexural strength average of any four (4) consecutive strength tests, tested at the end of twenty-eight (28) days, shall have an average flexural strength equal to or greater than the specified flexural strength. When the maturity meter curves have been developed to an acceptable level, the frequency of casting test beams will be modified to one set per 500 cubic yards. This shall apply to each approved mix design specifically. When the test specimens fail to conform to the requirements for strength, the Engineer shall have the right to order changes in the concrete sufficient to increase the strength to meet these requirements.

In order to monitor quality control the Contractor shall make test beams and the Contractor shall provide the concrete and adequate facilities for sampling, making, (including the beam molds), storing, curing, and breaking the beams in accordance with the ASTM specifications, at facilities set up by the Contractor at the worksite. Complete records shall be maintained on a daily basis, showing the location, age, test results, standard deviation, consecutive four (4) average, remarks and other data necessary to monitor quality control.

Should any portion of the concrete pavement fail to meet the requirement of the average four (4) consecutive twenty-eight (28) day flexural strength tests, the following shall apply:

i) Twenty-eight (28) day strengths shall be adjusted for any variation from design strengths in proportion to the square of the thickness as follows:

$$fs_{adjusted} = \frac{t^2_{actual}}{t^2_{design}} \times fs_{actual}$$

Where: t_{actual} = actual pavement thickness

t_{design} = design thickness

fs_{actual} = actual 28 day flexural strength

$fs_{adjusted}$ = adjusted 28 day flexural strength

ii) If the concrete pavements fail to meet the strength tests after adjustment for thickness, the unit price shall be adjusted for that quantity of concrete as defined by the 200 cubic yards, or 500 cubic yards represented by the beam

specimens.

TABLE III

Adjusted Deficiency in Flexure Strength-PSI	Proportional Part of Contract Price Allowed
650 psi and above	100%
649 psi to 645 psi	90%
644 psi to 640 psi	80%
639 psi to 635 psi	70%
634 psi to 630 psi	60%
629 psi to 625 psi	50%

Any adjusted deficiency below 625 psi shall be removed or, if approved by the Engineer, may be left in place without payment.

(f) Mixing Concrete. The concrete may be mixed at the work site in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials, except water, are emptied into the drum. Ready-mixed concrete shall be mixed and delivered in accordance with the requirements of AASHTO M-157.

1). When mixed at work site or in a central mixing plant, the mixing time shall be not less than 50 seconds nor more than 90 seconds. Four seconds shall be added to the specified mixing time if timing starts the instant the skip reaches its maximum raised position. Mixing time ends when the discharge chute opens. Transfer time in multiple drum mixers is included in mixing time. The contents of an individual mixer drum shall be removed before a succeeding batch is emptied therein.

2). The mixer shall be operated at the drum speed as shown on the manufacturer's nameplate on the approved mixer. Any concrete mixed less than the specified time shall be discarded by the Contractor at his expense. The volume of concrete mixed per batch shall not exceed the standard rating plate on the mixer, except that an overload up to 10% above the mixer's nominal capacity may be permitted, provided concrete test data for strength, segregation, and uniform consistency are satisfactory, and provided no spillage of concrete takes place.

3). The batch shall be charged into the drum so that a portion of the mixing water shall enter in advance of the cement and aggregates. The flow of water shall be uniform and all water shall be in the drum by the end of he first 15 seconds of the mixing period. The throat of the drum shall be kept free of such accumulations as may restrict the free flow of materials into the drum.

4). Mixed concrete from the central-mixing plant shall be transported in truck mixers, truck agitators, or nonagitating trucks having special bodies. The time elapsing from the time water is added to the mix until the concrete is deposited in place at the work site shall not exceed 30 minutes when the concrete is hauled in nonagitating trucks, nor 60 minutes when the concrete is hauled in truck mixers or truck agitators.

5). Retempering concrete by adding water will not be permitted. Concrete that is not within the specified slump limits at the time of placement shall not be used. Admixtures for increasing the workability or for accelerating the set will be permitted

only when specifically specified for in the contract.

(g) Limitations of Mixing. No concrete shall be mixed, placed or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

1). Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F., and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

2). When concreting is authorized during cold weather, the aggregates may be heated by either steam or dry heat prior to being placed in the mixer. The apparatus used shall heat the mass uniformly and shall be so arranged as to preclude the possible occurrence of overheated areas which might injure the materials. Unless otherwise authorized, the temperature of the mixed concrete shall be not less than 50°F., and not more than 80°F., at the time of placement in the forms.

3). If the air temperature is 35°F., or less at the time of placing concrete, the Engineer may require the water and/or the aggregates to be heated to not less than 70°F., nor more than 150°F. Concrete shall not be placed on frozen subgrade nor shall frozen aggregates be used in the concrete.

4). Sufficient cold weather protection shall be provided to cover and protect the freshly placed concrete for a period of a minimum of five (5) days.

6) Placement of concrete during hot weather shall be controlled by various means to maintain the concrete temperature at the time of placement in the forms to 85°F.

The temperature of the various materials and the final concrete may require the use of several simultaneous cooling methods including covering the aggregate stockpiles, sprinkling the aggregates, chilled water, substituting crushed ice for a portion of the mixing water, and/or any other method to maintain the temperature of the concrete at the time of placement to a maximum of 85° F.

(h) Placing Concrete. The concrete shall be deposited on the thoroughly moistened grade in such a manner as to require as little rehandling as possible. Unless truck mixers, truck agitators, or non-agitating hauling equipment are equipped with means for discharge of concrete without segregation of the materials, the concrete shall be unloaded into an approved spreading device and mechanically spread on the grade in such a manner as to prevent segregation of the materials. Placing shall be continuous between transverse joints without the use of intermediate bulkheads. Necessary hand spreading shall be done with shovels, not rakes. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or foreign substances.

1). Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. In no case shall the vibrator be operated longer than 15 seconds in any one location.

2). Concrete shall be deposited as near to expansion and contraction joints as possible, without disturbing them but shall not be dumped from the discharge bucket or hopper

onto a joint assembly unless the hopper is well centered on the joint assembly.

3). Should any concrete materials fall on or be worked into the surface of a completed slab, they shall be removed immediately by approved methods.

(i) Strike-Off of Concrete and Placement of Reinforcement. Following the placing of the concrete, it shall be struck-off to conform to the cross section shown on the plans and to an elevation such that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck-off to such length and depth that the sheet of fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck-off and screeded. Any portion of the bottom layer of concrete which has been placed more than 30 minutes without being covered with the top layer shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

1) Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond.

2) Reinforcing steel with rust, mill scale, or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire-brushed test specimen are not less than the applicable AASHTO specification requirement.

3) The Contractor shall, at his option, either place pavement reinforcing manually in the plane shown on the plans and then place the final lift or he may set the reinforcing into place using mechanical equipment to be approved by the Engineer prior to its use, after the placement of the concrete.

4) Mechanical equipment to place the pavement reinforcing after the placement of concrete shall be capable of positioning the pavement reinforcing at the required depth in the wet concrete without damaging the edges and finished surface of the concrete pavement. The Contractor shall use a finishing machine, equipped with side forms, to correct and refinish the surface of the concrete pavement to provide a smooth riding surface in accordance with the requirements of the specifications.

(j) Joints.

1) General. Longitudinal and transverse joints shall be constructed as indicated on the plans and in accordance with these requirements. All joints shall be constructed true to line with their faces perpendicular to the surface of the pavement. Joints shall not vary more than 1/4 inch from true line or from their designated position. The vertical surface of the pavements adjacent to all expansion joints shall be finished to a true plane and edged to a radius of 1/4 inch, or as shown on the plans. The surface across the joints shall be tested with a 10 foot straightedge as the joints are finished and any irregularities in excess of 1/8 inch shall be corrected before the concrete has hardened. Transverse joints shall be at right angles to the centerline of the pavement and shall extend the full width of the slab. The transverse joints in succeeding lanes shall be placed in the line with similar joints in the first lane. In the case of widening existing pavements, transverse joints shall be placed in line with similar joints in the

existing pavement. All transverse contraction joints shall be saw cut to the depths and widths shown in the plans.

i) Deformed Dowel Bars. Deformed dowel bars of the dimensions and spacings as shown on the plans shall be installed principally in longitudinal construction joints as shown on the plans. The dowel bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals of 12 inches, unless otherwise specified. They shall be held in position parallel to the pavement surface and midway between the surfaces of the slab.

When deformed dowel bars extend into an unpaved lane, they shall be drilled and epoxy grouted into the poured lane as hereinafter specified, unless threaded bolt or other assembled deformed dowel bars are specified. These bars shall not be painted, greased, or enclosed in sleeves.

ii) Smooth Dowel Bars. Smooth dowel bars or other load-transfer units of an approved type shall be placed across transverse, longitudinal, or other joints in the manner as specified on the plans. They shall be of the dimensions and spacings as shown and held rigidly in the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. When the dowels for longitudinal construction joints extend into an unpaved lane, they shall be drilled and epoxy grouted into the poured lane as hereinafter specified. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. The portion of each dowel painted with rust preventative paint, as required under Paragraph 02(f) hereinbefore, shall be thoroughly coated with Asphalt MC-70, or an approved lubricant, to prevent the concrete from binding to that portion of the dowel. In lieu of using dowel assemblies at contraction joints, dowel bars may be placed in the full thickness of pavement by a mechanical device approved by the Engineers.

2). Installation. If the paving mixer is operated from an adjacent lane, any joint materials required shall be set immediately after the final testing of the grade. If the paving mixer is operated from the lane being poured, the materials shall be set immediately after the mixer moves forward to permit as much time as possible for proper installation. All joint materials required shall be put in place on the completed and accepted grade. The materials and joint position shall be either at right angles or parallel to the centerline of the pavement, except for fillets or irregular sections. The top of an assembled joint device shall be set at the proper distance below the pavement surface and the elevation shall be checked. Such devices shall be set to the required position and line and shall be securely held in place by stakes or other means during the pouring and finishing of the concrete. The premolded joint material shall be placed and held in a vertical position; if constructed in sections there shall be no offsets between adjacent units. Dowel bars shall be checked for exact position and alignment as soon as the joint device is staked in place and the device shall be tested to determine whether it is firmly supported. Any joint installation not firmly and securely supported shall be reset.

i) When joints in concrete pavements are sawed, the joints shall be cut at the time and in the manner approved by the Engineer. The equipment used shall be as described in paragraph 03(a)4).

ii) The circular cutter shall be capable of cutting a groove in a straight line; the circular cutter shall produce a slot at least 1/8 inch wide. When shown on the plans or required by the specifications, the top portion of the slot or groove shall be widened by means of a second shallower cut or by suitable and approved beveling to provide adequate space joint sealers. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing. Sawing shall be carried on both during the day and night as required. The joints shall be sawed at the required spacing consecutively in sequence of the concrete placement, unless otherwise approved by the Engineer.

3). Longitudinal Joints.

i) Construction. Longitudinal construction joints necessary for lane construction shall be formed against suitable forms made of steel. Wooden forms may be used under special conditions, when approved by the Engineer. The construction joints shall be a butt-type joint with smooth dowel bars or deformed tie-bars, as indicated on the plans. The dowels for this type joint shall be painted and greased. The edges of the joint shall be finished with a grooving tool or edging tool and a space or slot shall be formed along the joint of the dimensions, as indicated, to receive the joint sealing material. Provisions shall be made for the installation of tie bars as noted on the plans.

ii) Contraction or Weakened-plane Type. The longitudinal groove formed or sawed in the top of the slab shall be installed where indicated on the drawings. The groove shall be formed in the plastic concrete with suitable tools or material to obtain the width and depth specified, or it shall be sawed with approved equipment in the hardened concrete to the dimensions required. When the groove is formed in plastic concrete, it shall be true to line with not more than 1/4 inch variation in 10 feet; it shall be uniform in width and depth; and the sides of the groove shall be finished evenly and smoothly with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The sawed groove shall be straight and of uniform width and depth. In either case, the groove shall be clean cut so that spalling will be avoided at intersections with transverse joints. Tie bars shall be installed across those joints, as shown on the plans.

iii) Expansion. Longitudinal expansion joints shall be installed where designated on the plans. These shall be of a butt type without load-transfer devices and shall include a premolded expansion material. The thickness of the concrete at these joints shall be increased by at least 25% of the normal pavement thickness to the nearest inch but not less than 2 inches. This increase shall slope to normal thickness in not less than 10 feet from the joint unless otherwise indicated on the plans or to the nearest joint such as a groove joint. The premolded filler, of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint, except for space for sealant at the top of the slab. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface.

A metal or wooden cap shall be provided to protect the top edge of the filler

and to permit the concrete to be placed and finished. After the concrete has been placed and struck-off, the cap shall be carefully withdrawn leaving the space over the premolded filler. The edges of the joint shall be finished and tooled while the concrete is still plastic. The width of the joint shall be corrected for temperature, nominal width shown on the plans to be at 68°F.

4). Transverse Joints.

i) Expansion. Transverse expansion joints shall be installed at the locations and spacing as shown on the plans. The joints shall be installed at right angles to the centerline and perpendicular to the surface of the pavement. The joints shall be so installed and finished to insure complete separation of the slabs.

Expansion joints shall be of a premolded type conforming to these specifications and with the plans and shall be the full width of the pavement strip.

All concrete shall be cleaned from the top of the joint material. Before the pavement is opened to traffic this space shall be swept clean and filled with approved joint sealing material.

The filler shall be placed on the side of the installing plate nearest the mixer. The top edge of the filler shall be protected by a metal channel cap of at least 10 gauge material. The installing device may be designed with this cap self-contained.

All devices used for the installation of expansion joints shall be approved by the Engineer. They shall be easily removable without disturbing the concrete and held in proper transverse and vertical alignment. Immediately after forms are removed, any concrete bridging the joint space at the ends shall be removed for the full width and depth of the joint.

When specified, expansion joints shall be equipped with dowels of the dimensions and at the spacing and location indicated on the plans. The dowels shall be firmly supported in place and accurately aligned parallel to the subgrade and the centerline of the pavement by means of a dowel assembly which will remain in the pavement and will insure that the dowels are not displaced during construction.

Other types of load-transfer devices may be used, when approved by the Engineer. The width of the joint shall be corrected for temperature, nominal width shown on the plans to be at 68°F.

ii) Contraction. Transverse contraction joints, weakened-plane joints, or both, shall be installed at the locations and spacing as shown on the plans. These joints will be installed by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened in the same manner as specified in paragraph 03)(j)3)ii).

Dowel bar assembly shall be installed when required, as shown on the plans.

iii) Construction. Transverse construction joints shall be installed in accordance with the details on the plans and ordinarily are only needed when it is necessary to suspend the work for more than 30 minutes. The construction joint shall be located at a planned contraction or expansion joint. The fresh concrete shall be removed back to the previously spaced regular joint.

iv) Construction of Connection Between New and Existing Pavement. The Contractor shall hand excavate, using extreme care, to the dimensions shown in the plans, adjacent to the edges of all existing pavements to prevent any damage to the existing pavement.

The connection between the new and existing pavements shall be constructed as shown on the plans.

Any damage to the existing pavement caused by the Contractor's operations shall be repaired by him, to the satisfaction of the Engineer at no cost to the Owner.

(k) Final Strike-Off, Consolidation and Finishing.

1). Sequence. The sequence of operations shall be the strike-off and consolidation, floating and removal of laitance, straightedging, and final surface finish. The addition of superficial water to the surface of the concrete to assist in finishing operations generally will not be permitted. If the application of water to the surface is permitted, it shall be applied as a fog spray by means of approved spray equipment.

2), Finishing at Joints.

i) The concrete adjacent to joints shall be compacted or firmly placed without voids or segregation against the joint material; it shall be firmly placed without voids or segregation under and around all load-transfer devices, joint assembly units, and other features designed to extend into the pavement. Concrete adjacent to joints shall be mechanically vibrated as required in paragraph 03(h).

ii) After the concrete has been placed and vibrated adjacent to the joints as required in paragraph 03(h), the finishing machine shall be operated in a manner to avoid damage or misalignment of joints. If uninterrupted operations of the finishing machine, to, over, and beyond the joints causes segregation of concrete, damage to, or misalignment of the joints, the finishing machine shall be stopped when the front screed is approximately 8 inches from the joint. Segregated concrete shall be removed from the front of and off the joint; the front screed shall be lifted and set directly on top of the joint and the forward motion of the finishing machine shall be resumed.

When the second screed is close enough to permit the excess mortar in front of it to flow over the joint, it shall be lifted and carried over the joint. Thereafter, the finishing machine may be run over the joint without lifting the screeds, provided there is no segregated concrete immediately between the joint and the screed or on top of the joint.

3). Machine Finishing.

i) A belt finish or burlap drag will be acceptable on the apron and roadway pavements. The final elevations of all pavements shall not vary more than one fourth (1/4) inch from the finished grade elevations.

ii) Vibratory Method. When vibration is specified, vibrators for full-width vibration of concrete paving slabs shall meet the requirement specified in paragraph 03)(a)3) ii). If uniform and satisfactory density of the concrete is not obtained by the vibratory method at joints, along forms, at structures, and throughout the pavement, the Contractor will be required to furnish equipment and methods which will produce pavement conforming to the specifications.

When in operation, the screed shall be moved forward on the forms with a combined longitudinal and transverse shearing motion, always moving in the direction in which the work is progressing, and so manipulated that neither end is raised from the side forms during the striking-off process. If necessary, this shall be repeated until the surface is of uniform texture, true to grade and cross section, and free from porous areas.

4). Hand Finishing. Unless otherwise specified, hand finishing methods will not be permitted, except under the following conditions:

i) In the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade.

ii) Narrow widths or areas or irregular dimensions where operation of the mechanical equipment is impractical may be finished by hand methods.

iii) Concrete, as soon as placed, shall be struck-off and screeded. An approved portable screed shall be used. A second screed shall be provided for striking-off the bottom layer of concrete when reinforcement is used.

iv) The screed for the surface shall be at least 2 feet longer than the maximum width of the slab to be struck-off. It shall be of approved design, sufficiently rigid to retain its shape, and shall be constructed either of metal or of other suitable material, shod with metal.

v) Consolidation shall be attained by the use of a suitable vibrator or other approved equipment.

5). Floating. After the concrete has been struck-off and consolidated, it shall be further smoothed, trued, and consolidated by means of a longitudinal float, using one of the following methods, as specified or permitted:

i) Hand Method. The hand-operated longitudinal float shall be not less than 12 feet in length and 6 inches in width, properly stiffened to prevent flexibility and warping. The longitudinal float, operated from foot bridges resting on the side forms and spanning but not touching the concrete, shall be worked with a sawing motion, while held in a floating position parallel to the road centerline and passing gradually from one side of the pavement to the other. Forward movement along the centerline of the pavement shall be in successive advances of not more than one-half the length of the float. Any excess water or soupy material shall be wasted over the side forms on each pass.

ii) Mechanical Method. The mechanical longitudinal float shall be approved by the Engineer, and it shall be in good working condition. The tracks from which the float operates shall be accurately adjusted to the required crown. The float shall be accurately adjusted and coordinated with the adjustments of the transverse finishing machine so that a small amount of mortar is carried ahead of the float at all times. The forward speed shall be adjusted so that the float will lap the distance specified by the Engineer on each transverse trip. The float shall pass over each pavement at least two times, but excessive operation over a given area will not be permitted. Any excess water or soupy material shall be wasted over the side forms on each pass.

iii) Alternative Mechanical Method. As an alternative to paragraph 03(k)5)ii., Contractor may use a machine composed of a cutting and smoothing float(s) suspended from and guided by a rigid frame. The frame shall be carried by four or more visible wheels riding on, and constantly in contact with, the side forms.

If necessary, following one of the preceding methods of floating, long-handled floats having blades not less than 5 feet in length and 6 inches in width may be used to smooth and fill in open-textured areas in the pavement. Long-handled floats shall not be used to float the entire surface of the pavement in lieu of, or supplementing, one of the preceding methods of floating. When strike-off and consolidation are done by hand, and the crown of the pavement will not permit the use of the longitudinal float, the surface shall be floated transversely by means of the long-handled float. Care shall be taken not to work the crown out of the pavement during the operation. After floating, any excess water and laitance shall be removed from the surface of the pavement by a straightedge 10 feet or more in length. Successive drags shall be lapped one-half the length of the blade.

6). Straight-edge Testing and Surface Correction. After the floating has been completed and the excess water removed, but while the concrete is still plastic, the surface of the concrete shall be tested for trueness with a 16 foot straightedge. For this purpose the Contractor shall furnish and use an accurate 16 foot straightedge swung from handles 3 feet longer than one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one half the length of the straightedge. Any depressions shall be immediately filled with freshly mixed concrete, struck-off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the requirements for smoothness. Straightedge testing and surface correction

shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross section.

7). Final Finish. Aprons and roadways and other pavements may be finished with either a belt finish, or a burlap drag finish.

i) Belt Finish. If the surface texture is to be a belt finish, when straightedging is completed and water sheen has practically disappeared and just before the concrete becomes non-plastic, the surface shall be belted with a 2-ply canvas belt not less than 8 inches wide and at least 3 feet longer than the pavement width. Hand belts shall have suitable handles to permit controlled, uniform manipulation. The belt shall be operated with short strokes transverse to the centerline and with a rapid advance parallel to the centerline.

ii) Drag Finish. If the surface texture is to be a drag finish, a drag shall be used; it shall consist of a seamless strip of damp burlap and it shall produce a uniform surface of gritty texture after dragging it longitudinally along the full width of pavement. For pavement 16 feet or more in width, the drag shall be mounted on a bridge which travels on the forms. The dimensions of the drag shall be such that a strip of burlap at least 3 feet wide is in contact with the full width of pavement surface while the drag is used. The drag shall consist of not less than two layers of burlap with the bottom layer approximately 6 inches wider than the upper layer. The drag shall be maintained in such a condition that the resultant surface is of uniform appearance and reasonably free from grooves over 1/16 inch in depth. Drags shall be maintained clean and free from encrusted mortar. Drags that cannot be cleaned shall be discarded and new drags substituted.

8). Edging at Forms and Joints. After the final finish, but before the concrete has taken its initial set, the edges of the pavement along each side of each slab, and on each side of transverse expansion joints, formed joints, transverse construction joints, and emergency construction joints shall be worked with an approved tool and rounded to the radius required by the plans. A well-defined and continuous radius shall be produced and a smooth, dense, mortar finish obtained. The surface of the slab shall not be unduly disturbed by tilting of the tool during use.

At all joints, any tool marks appearing on the slab adjacent to the joints shall be eliminated by brooming the surface. In doing this, the rounding of the edge shall not be disturbed. All concrete on top of the joint filler shall be completely removed.

All joints shall be tested with a straightedge before the concrete has set, and correction shall be made if one side of the joint is higher than the other or if they are higher or lower than the adjacent slabs.

(l) Surface Test. The Contractor shall also have a 16' rolling straightedge on the work to check the completed pavement. Surface deviations in excess of 1/4 inch in 16 feet in any direction will require correction by planing. Deviations exceeding ½" shall be cause for removal and replacement **.**

Any area or section so removed shall not be less than 10 feet in length nor less than the full width of the lane involved. When it is necessary to remove and replace a section of

pavement, any remaining portion of the slab adjacent to the joints that is less than 10 feet in length shall also be removed and replaced.

(m) Curing. Immediately after the finishing operations have been completed and marring of the concrete will not occur, the entire surface of the newly placed concrete shall be cured in accordance with one of the following methods. In all cases in which curing requires the use of water, the curing shall have prior right to all water supply or supplies. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than ½ hour between stages of curing or during the curing period.

1). Impervious Membrane Method. The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall.

Curing compound shall be applied by mechanical sprayers under pressure at the rate of 1 gallon to not more than 125 square feet. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application the compound shall be stirred continuously by effective mechanical means. Hand spraying of off widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. Curing compound shall not be applied to the inside faces of joints to be sealed.

The curing shall be of such character that the film will harden within 30 minutes after application. Should the film become damaged from any cause within the required curing period, the damaged portions shall be repaired immediately with additional compound.

Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface.

2). Curing in Cold Weather. When the average daily temperature is below 40°F., curing shall consist of covering the newly laid pavement with a protective curing authorized by the Engineer, which shall be retained in place as determined by the Engineer. Admixture for curing or temperature control may be used only when authorized by the Engineer.

When concrete is being placed and the air temperature may be expected to drop below 30°F., a sufficient supply of suitable blanketing material shall be provided along the work. Any time the temperature may be expected to reach the freezing point during the day or night, the material so provided shall be spread over the pavement to prevent freezing of the concrete. The period of time such protection shall be maintained shall be determined by the Engineer. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather, and any concrete injured by frost action shall be removed and replaced at the Contractor's expense.

(n) Removing Forms. Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has set for at least 12 hours, except where auxiliary forms are used temporarily in widened areas. Forms shall be removed carefully to avoid damage to the

pavement. After the forms have been removed, the sides of the slab shall be cured as outlined in one of the methods indicated in paragraph (m) above. Major honeycombed areas shall be considered as defective work and shall be removed and replaced. Any area or section so removed shall be not less than 10 feet in length nor less than the full width of the lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than 10 feet in length shall also be removed and replaced.

(o) Sealing Joints. The joints in the pavement shall be sealed in accordance with Section P-605 of these specifications.

(p) Protection of Pavement. The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by his own employees and agents. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, or crossovers, etc.

The plans or special provisions will indicate the location and type of device or facility required to protect the work and provide adequately for traffic. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

(q) Loading on new concrete The pavement shall attain a strength of 450 psi for dowel drilling equipment on the new concrete, 500 psi for paving equipment on the new pavement and 650 psi for opening to air traffic. The strength shall be determined based on the actual strength adjusted for the ratio of the design thickness compared to the actual thickness based on the pavement design.

(r) Opening to Traffic. The Engineer shall decide when the pavement shall be opened to traffic, based on maturity meter readings and/or flexural strength testing. The pavement shall not be opened to traffic for at least 3 days after the concrete has been placed. Prior to opening, the pavement shall be cleaned.

(s) Surface Tolerances. Extreme care must be exercised in all phases of the operation to assure that the pavement will pass the specified tolerances. The following tolerances are applicable:

1). Lateral deviation from established alignment of the pavement edge shall not exceed plus or minus 0.10 foot in any lane.

2). Vertical deviation from established grade shall not exceed plus or minus 0.04 foot at any point.

3). Surface smoothness deviations shall not exceed 1/4" from a 16-foot straightedge placed in any direction, including placement along and spanning any pavement joint or edge, and in addition shall not exceed the requirements as stated in 03(L).

4). In order to stay within the above tolerances, the Contractor must control the tolerances on all phases of construction preceding the placement of pavement and is cautioned that additive deviations may result in the removal and replacement of out of tolerance construction and/or price adjustments for deficient construction in accordance with the specifications as stated herein.

(t) Tolerance of Pavement Thickness. The thickness of the pavement shall be determined by average caliper measurement of cores taken and tested in accordance with AASHTO T-148

and by edge measurements taken prior to placement of adjacent lanes. Cores shall be taken by the Contractor at the frequency of one per 250 feet per lane per section to verify pavement thickness and concrete consolidation. The Contractor shall patch the core holes in a manner approved by the Engineer.

Should any portion of the concrete pavement fail to meet the requirements of the thickness, the following shall apply:

1). The twenty-eight (28) day strengths for the area of thickness deficiency shall be adjusted in proportion to the square of the thickness.

$$fs_{adjusted} = \frac{t^2_{actual}}{t^2_{design}} \times fs_{actual}$$

Where: t_{actual} = actual pavement thickness

t_{design} = pavement design thickness shown on plans

fs_{actual} = actual 28 day flexural strength

$fs_{adjusted}$ = adjusted 28 day flexural strength

2). If $fs_{adjusted}$ is less than 650 psi, the unit price shall be adjusted in accordance with Table III in Article 03(e), Item ii.

TESTING AND MATERIAL REQUIREMENTS

Test and short title	Material and short title
AASHTO T-26 -- Water	AASHTO M 6 -- Fine Aggregate
AASHTO T-23 -- Test Specimens	AASHTO M 80 -- Coarse Aggregate
AASHTO T-97 -- Flexural Strength	AASHTO M 85 -- Portland Cement Concrete
AASHTO T-119 -- Slump	AASHTO M 154 -- Air-entrained PC
AASHTO T-152 -- Air (Aggregate)	AASHTO M 151 -- Slag PC
	AASHTO M 90 -- Joint Filler
ASTM T-173 -- Air (Slag)	AASHTO M 153 -- Joint Filler
AASHTO T-121 -- Yield	AASHTO M 213 -- Joint Filler
AASHTO T-84 and T-85 -- Absorption and Specific Gravity	AASHTO M 55 -- Wire
	AASHTO M 137 -- Bars
	AASHTO M 54 -- Bars
AASHTO T-148 – Cores	AASHTO M 31 – Bars
ASTM C1260 – ASR	AASHTO M 42 – Bars
ASTM C1293 – ASR	AASHTO M 73 -- Mats
	AASHTO M 139 -- Paper
	AASHTO M 171 -- Polyethylene
	AASHTO M 182 -- Burlap
	AASHTO M 148 -- Membrane
	ASTM C 618 -- Fly Ash
	ASTM C 402 -- Pozzolans
	ASTM C 260 -- Air-entraining
	ASTM C 494 -- Water Reducing
	AASHTO M 157 -- Ready Mix
	Fed. Spec. TT-C-800 – Membrane

Note: Others as required by referenced specifications.

END OF SECTION P-501

ITEM P-605

JOINT SEALING FILLER

01) DESCRIPTION

(a) This section shall consist of providing and installing resilient and adhesive joint sealing filler capable of effectively sealing joints and cracks in pavements and structures and around the various electrical items embedded in the pavement.

(b) This section includes routing and sealing pavement cracks as directed by the Engineer.

(c) It is the intent of this specification to provide a superior sealed joint, considerably in excess of normal industry standards.

02) MATERIALS

(a) The joint sealing material for concrete pavement joints shall conform to the requirements of Table I.

1) Cold Applied Sealant for Joints.

TABLE 1 - SILICONE SEALANT REQUIREMENT

Test Method	Test	Material Requirement
As Supplied		
ASTM D 2202	Flow, maximum	0.2
ASTM D-1475	Specific Gravity	1.450 - 1.515
ASTM C 1183 (Type S)	Extrusion Rate, mL/minute, minimum	50
ASTM C 679	Tack-Free Time, minutes	35 - 75
Upon Complete Cure		
ASTM D 2240	Durometer[1], Shore A, points	15 - 25
ASTM D 412, Die C	Modulus, at 150% Elongation[1], psi (k Pa), maximum	45 (310)
ASTM D 412, Die C	Elongation[1], minimum	1200
ASTM D 5329[2] (Section 9, (Modified)	Adhesion to Concrete, minimum % elongation	500
Performance		
ASTM C 719	Movement, 10 cycles at 100/-50 %	No failure

ASTM C 793	Accelerated Weathering, @ 5,000 hours	No cracks, blisters or bond loss

[1] Sample cured 7 days at 77 ± 2 F (25 ± 1 C) and 50 ± 5% relative humidity. Proper joint design and proper joint preparation are necessary for maximum performance.

[2] Tested on random samples at least on a Quarterly basis. The Engineer shall have additional tests performed in accordance with ASTM C-719 on random samples taken form material supplied to the work. Material not passing the testing shall be removed and replaced at the contractor's cost.

(b) The joint sealing material for the concrete and asphalt joint interfaces shall conform to the requirements of Table II. This material may also be used to seal around light base cans in Portland cement concrete pavements.

TABLE 2 - SL SELF- LEVELING SILICONE SEALANT REQUIREMENT

Test Method	Test	Material Requirement
As Supplied		
ASTM D 1475	Specific Gravity	1.26 – 1.34
ASTM C 1183 (Type S)	Extrusion Rate, mL/minute, minimum	50
CTM 0098	Skin Over Time, minutes, maximum	60
CTM 0208	Non-Volatile Content, minimum	96
Upon Complete Cure		
ASTM D 412, Die C, Modified	Elongation[1], % minimum	1400
ASTM D 5329 (Section 9 Modified)	Joint Modulus at 50% elongation[1], psi (kPa), maximum	7 (49)
	Joint Modulus at 100% Elongation[1], psi (kPa), maximum	8 (56)
	Joint Modulus at 150% Elongation [1], psi (kPa), maximum	9 (62)
ASTM D-5329 (Section 9, modified)	Adhesion to Asphalt/Concrete [1], elongation	600 min
Performance		
ASTM C 719	Movement, 10 cycles at + 100/-50 %	No failure

ASTM C 793 Accelerated Weathering,
at 5,000 hours…….No cracks, blisters,
or bond loss

[1] Sample cured 7 days at 77 ± 2 F (25 ± 1 C) and 50 ± 5% relative humidity. Proper joint design and proper joint preparation are necessary for maximum performance.

[2] Tested on random samples at least on a Quarterly basis. The Engineer shall have additional tests performed in accordance with ASTM C-719 on random samples taken form material supplied to the work. Material not passing the testing shall be removed and replaced at the contractor's cost.

03) PREFORMED BACKUP RODS

Preformed backup rods, as shown on the plans and as recommended and approved by the sealant manufacturer, shall be used with cold applied sealants to control the depth of the sealant, to achieve the desired shape factor, to support the sealant against indentation and sag, and shall be a non-moisture absorbing resilient material. Backup materials shall be compatible with the sealant, shall not adhere to the sealant, shall be compressible without extruding the sealant, and shall recover to maintain contact with the joint faces when the joint is open.

Samples of all materials which the Contractor proposes for use and copies of the sealant manufacturer's recommendations for mixing and installation shall be submitted to the Engineer for approval at least thirty (30) days prior to use.

An appropriate primer, compatible with the seal and either manufactured by or approved by the sealant manufacturer shall be used with the sealant.

Each lot or batch of sealing material shall be delivered to the job-site in the manufacturer's original sealed container. Each container shall be labeled to include the following:
(a) Name of Material.
(b) Manufacturer's Name.
(c) Manufacturer's Lot Number.
(d) Shelf Life.
(e) Mixing Instructions.
(f) Storage Instructions.

04) CONSTRUCTION METHODS

(a) Time of Application. The joints shall be sealed immediately following the curing period or as soon thereafter as weather conditions permit, and before the pavement is opened to traffic, including construction traffic. At the time of application of the sealing compound, the atmospheric and pavement temperature shall be above 50°F and the weather shall not be rainy or foggy. The temperature requirements may be waived only when so directed by the Engineer.

At a temperature of 75°F. (24°C) and 50% relative humidity, the sealant will cure to a tack-free surface in about one hour. At a temperature of 40°F. (4°C) the tack-free time will be about 2-3 hours.

(b) Equipment. All equipment necessary for the proper construction of this work shall be on the project in first class working condition. The equipment shall be as recommended by the manufacturer of the filler and approved by the Engineer before construction is permitted to start. Air compressors shall be equipped with suitable traps capable of removing all free water and oil

from the compressed air and shall be capable of furnishing air with a pressure greater than 90 psi.

(c) Preparation of Joints. Immediately after final saw cutting and beveling is complete, the resulting cement slurry, laitance, curing compound and other foreign material shall be completely removed from the joint by water blasting. After cleaning is complete the joint shall be blown out with compressed air. When the surfaces are clean and dry, and just prior to placement of the backer rod and sealant, the joint shall be sand blasted with two passes, i.e., one pass on each bond face, then compressed air shall be used to blow out the joint and remove all residual dust.

Preparation for concrete pavement crack routing and sealing shall be by properly routing the crack to be slightly lower than the existing crack to ensure proper adhesion to the sidewalls. The cracks should be routed out to provide a minimum sealant reservoir 3/8" wide with a minimum depth of 3/8". The contractor shall use a specialized crack router that is designed to automatically follow the crack. Thickness and depth below the pavement surface shall be as specified for joint sealant. The cracks should be free of dirt, dust, and moisture and be frost-free.

(d) Installation of Sealants. Joints and cracks shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed. Sealants shall be installed in accordance with the manufacturer's recommendations and the following requirements:

1) Cold Applied Sealants. A backer rod shall be installed as shown on the plans and the primer shall be applied in the correct sequence in accordance with the sealant manufacturer's instructions, prior to placement of the joint sealer. The sealant shall be applied in a continuous operation, with an approved mechanical device that will force the sealant to the bottom of the joint and completely fill the joint without spilling the material on the surface of the pavement, and shall adhere to the concrete and be free of voids.

The sealant shall then be tooled, with an appropriate tool, to produce a slightly concave surface approximately 1/4" below the pavement surface for roadways, 3/8" below the surface for aprons and taxiways and 1/2" below the surface of runways. The sealant shall have a minimum thickness of 3/8". Tooling shall be accomplished before a skin forms on the surface, usually within 10 minutes of application.

The sealant shall be tooled in both directions to ensure a void-free installation. Sealant which does not bond to the concrete surface of the joint walls, contains voids, or fails to set to a tack-free condition will be rejected and replaced by the Contractor at no additional cost. Before sealing the joints, the Contractor shall demonstrate that the equipment and procedures for preparing, mixing, and placing the sealant will produce a satisfactory joint seal. This shall include the preparation of two small batches and the application of the resulting material.

2) A manufacturer's representative(s) is to conduct the demonstration(s), train the Contractor's personnel, and ensure the installation procedures are in accordance with the manufacturer's directions prior to the start of the sealing operations. The representative(s) shall visit the job-site at least four (4) times during the sealing operation for each type of sealant, and after the sealing is complete, is to conduct a general inspection of the work and perform more extensive inspections and/or testing on a random basis to reasonably assure that the construction is in accordance with the manufacturer's recommended construction methods and procedures. A report outlining the findings is to be submitted at the completion of the inspection.

3) In order to ensure that the superior workmanship is achieved throughout the contract, the Contractor shall be required to construct a test section per crew on a portion of the contract

site prior to commencing the contract work in order to evaluate workmanship of each of the Contractor's crews. If the test sites are completed to the satisfaction of the Engineer, the Contractor shall then receive notice to proceed with the approved crews with the remainder of the Contract work.

However, to maintain an acceptable level of productivity, the Contractor shall be required to maintain the same crew members per crew who performed work in the test area together throughout the duration of the contract. If any personnel changes are anticipated by the Contractor, either reducing the work force or changing specific individuals, the Engineer is to be notified. If, at any point during the construction period after a personnel change has been made, the Engineer believes the workmanship has diminished, the crew shall be ordered to halt all construction operations. The Contractor shall then be required to reinstate the original work crew or set-up with the Engineer to perform in another test area to re-qualify the new crew.

A new test area will then be developed by the Engineer. Upon a successful evaluation of the new test area, the evaluated crew may proceed with the contract construction.

4) The Contractor shall be required to perform test cores on portions of the newly installed joint seals at intervals outlined below. The cores shall be analyzed by the Engineer to evaluate the Contractor's workmanship. If the cores indicate unacceptable workmanship, the Contractor will be required to replace the sealant to the last acceptable core.

If deemed necessary by the Engineer, additional test cores will be required to determine the limits of defective work. Any additional cores shall be taken by the Contractor at no additional cost to the Owner.

i. At expansion joints, the Contractor will perform a test core every 100 feet per crew.

ii. At longitudinal and transverse joints, the Contractor will perform a test core every 100 feet per crew.

If the test results indicate satisfactory work is obtained by a crew on a continuous basis, the Engineer may reduce the number of cores required from the original amount of 100 feet for that crew. The specific intervals increasing or decreasing the amount of cores, is at the Engineer's discretion.

05) TEST CORE

As stated above, the resealed joints are to be tested at specific intervals. The size of the test cores shall be as follows:

(a) Transverse and longitudinal joints in general shall require a 1-1/2 inch diameter core. The actual core size will be based on the minimum core required to include the portion of the joint between the top edges of the beveled edge to a depth of 1/2 inch below the backer rod (see detail on Plans).

(b) The expansion joint in general shall require a 2-1/2 inch to a 5 inch core drilled to a depth of at least 2 inches below the backer rod. The actual core size will be based on a minimum core size required to include the portion of joint between the top of the beveled edges (see detail on Plans).

(c) The cores for the completed joint seal shall not be taken until after the seal has cured for 14 to 28 days as recommended by the seal manufacturer.

(d) The Contractor shall patch the core holes by preparing the core hole in the same manner as for seal placement. A short section of backer rod shall be coiled in the hole prior to sealant placement. After sealant placement the material shall be tooled to ensure bonding to the entire surface.

(e) Warranty. The sealant shall be warranted for repair and/or replacement for all defects in materials and workmanship by both the Contractor and the Sealant Manufacturer for a period of five (5) years.

TESTING AND MATERIAL REQUIREMENTS

Test and Short Title	
MIL-S-8802	Flow, Extrusion Rate, Tack-Free Time, Adhesion
ASTM D-1475	Specific Gravity
ASTM D-2240	Durometer
ASTM D-412,	Die C Modulus, Elongation
ASTM C-719	Movement
ASTM D-793	Accelerated Weathering
ASTM D-2202	Flow or Sag
AASHTO T-132	Bond to Concrete

END OF SECTION P-605

SECTION P-610

STRUCTURAL PORTLAND CEMENT CONCRETE

The requirements of Section 500 of the State of Georgia, Standard Specifications shall apply with the following modifications and additions:

01) DESCRIPTION OF WORK

This section consists of the manufacture and utilization of Portland Cement Concrete in the construction of drainage structures and underdrain outlet pipes, electrical manholes and handholes, sign bases and light bases, and electrical duct banks.

02) CLASSES AND USE OF CONCRETE

Cast-in-place foundations and related structures shall have a minimum compressive strength of 4000 psi and shall be designated as Class 4000 Concrete.

03) QUALITY CONTROL OF CONCRETE:

(a) Proportioning: The Contractor shall be responsible for designing the proportions of Portland Cement, fine aggregates, coarse aggregate, water and admixture, which will produce a workable concrete mix meeting all of the following limiting criteria for the concrete specified:

Class	Minimum Cement Content Per Cubic Yard	Slump	Minimum Compressive Strength 7 Days	28 Days
4000	6.5 bags*	3" ± 1"	2800 psi	4000 psi

*94 lbs. cement per bag

(b) Since the cement content necessary for a given mix to produce certain strength requirements is also dependent on the type and gradation of the aggregates actually used. The Contractor shall use whatever amount of cement is required to comply with all the provisions specified herein, and all costs or such compliance and materials required shall be understood to be included in the price bid for the various concrete items in the proposal.

(c) The slump shall be determined in accordance with ASTM Test Method C143. The consistency of the concrete shall be such as to be easily workable and to permit proper finishing. The plastic concrete, when deposited, shall not flow but shall remain in a conical pile. There shall be a minimum of segregation and surplus water during the process of handling and finishing.

(d) Admixtures: Air-entraining agents conforming to the requirements of the Standard Specifications shall be added to each concrete batch in such amount as to secure between 4% and 6% air entrained in the plastic concrete. Consideration shall be given to the amount of any air entrainment that may be incidentally afforded whenever a water reducing retarder agent is used.

1) The concrete producer shall insure compliance with the manufacturer's recommendations for the method of dispensing the admixtures, with particular attention to possible undesirable chemical reaction between products when mixed in concentrated form. The following listed admixtures shall be used in all concrete:

   i. A water reducing agent (ASTM C494 Type A) shall be added to the concrete when the ambient temperature is below 65^{0}F, and a water reducing retarder (ASTM C494 Type D) shall be added to the concrete at temperatures above 65^{0}F., as directed by the Owner's Representative. The manufacturer of the mixture shall submit in writing to the Prime Contractor for submission to the Owner's Representative, special recommendations for quantities of the mix to be used under various temperatures and job conditions to assure that the concrete can be maintained at a uniform consistency prior to and during placing. The mix is to have sufficient workability between lifts to prevent the occurrence of lift lines with the specified placement and consolidation techniques, and as approved by the Owner's Representative.

   ii. The addition of the superplasticizer, if deemed necessary, to the concrete mix shall be metered to assure proper dosage; the superplasticizer shall be added to the concrete only at the job site, and immediately prior to its placement in the forms.

   The Contractor will be required to run trial batches prior to concrete construction to determine the proper dosage of the superplasticizer and/or the water-reducing-retarding admixture. A slump-loss curve acceptable to the Contractor as well as other test results must be submitted to the Owner's Representative for approval. The Contractor shall advise the Owner's Representative not less than 48 hours prior to any trial batches so that the Owner's Representative may witness the trial batches. Changing the dosage of the superplasticizer at the job site will not be permitted without prior approval of the Owner's Representative. This approval or rejection will be made at the job site on a case-by-case basis.

   The maximum slump permitted for the superplasticizer concrete shall be eight (8) inches. Calcium chloride or other admixtures containing calcium chloride shall not be used.

   iii. The water reducing retarder agent proposed for use shall have a proven performance record in large construction projects for at least five years, as evidenced by letters from owners of structures attesting to satisfactory quality and durability of the concrete structures cited, submitted to the Owners Representative when approval of the agent is requested.

   The agent may be in liquid or powder form and may be either a) a calcium, sodium, potassium or ammonium salt of lignosulfonic acid, or b) a hydroxylated carboylic acid or its salt.

   Concrete containing this agent is hereinafter referred to as the "test concrete", and concrete with the same materials but without the agent is hereinafter referred to as the "referenced concrete". Both test and reference concretes shall be prepared at an ambient temperature of 70^{0}F. The cement and aggregates for the test and reference concretes shall be the same as those to be used in the project.

   Test concrete containing the agent in an amount sufficient to cause an increase of 50% and 60% in the initial setting time (ASTM Test Method C403) over the initial setting time of the reference concrete at an ambient temperature of 70^{0}F, and having

the same cement content and slump (AASHTO Test Method T119) as the reference concrete, shall exhibit the following properties when compared to such reference concrete:

(e) The water content in the test concrete shall be decreased by at least 5% from that of the reference concrete.

(f) The longitudinal linear measurement of the drying shrinkage (AASHTO Test Method T160) of the test concrete at the age of 28 days, after 14 days of initial moist curing, shall be decreased by at least 5% from that of the reference concrete.

(g) The compressive strength (AASHTO Test Method T22) of the test concrete shall be increased by at least 10% at the ages of 3, 7, and 28 days, from that of the reference concrete.

Concrete strengths shall be calculated on the average results of at least five 6 inch diameter by 12 inch high cylinders for compressive tests, at each age of test, prepared in accordance with AASHTO Test Method T126. Drying shrinkage shall be calculated on the average results of at least 3" x 3" x 16" specimens prepared in accordance with AASHTO Test Method T160.

The Contractor shall submit to the Owner's Representative actual test data from an approved laboratory evidencing that the above requirements have been met.

The Contractor shall submit to the Owner's Representative a certificate written by the manufacturer of the proposed water reducing retarder agent stating that the agent to be furnished for the project is identical in composition with the agent that was used for the acceptance tests. The samples of the agent necessary for the acceptance tests shall be selected at random from stockpiled supplies.

(h) Laboratory Mix Design:

Concrete mixes shall be designed by the Contractor on the basis of approved ingredients which the Contractor intends to use for this project and all trial batches shall be made using such materials. Trial mixes designed by the Contractor shall be tested for complete conformance to these Specifications by an approved laboratory engaged by the Contractor and at his own expense. All materials for the trail batches shall be furnished by the Contractor and the batches prepared either by him or by his laboratory, also at his own expense. After the Contractor has designed satisfactory mixes, and his laboratory has tested for compressive strength at least four concrete cylinders (for each mix) from each of three separate trial batches using that mix (2 cylinders for each age per batch), he shall furnish the Owner's Representative the mix data, the results of the cylinder tests, the yield as determined by ASTM Test Method C138, and all necessary ingredients for producing approximately 5 cubic feet of concrete. In establishing the amount of each ingredient to be used in the design mixes, the cement and aggregate proportions shall be given by weight for measuring and batching purposes; water and admixture shall be given by weight or volume, as appropriate or convenient. The Owner's Representative may then check the mixes for conformance to specifications and observe various other characteristics of the plastic concrete, such as workability, cohesiveness, finishing, setting time, etc. All such check testing will be done at the Owner`s expense. If any of the requirements are not met, the mixes design will be rejected and the Contractor shall furnish a new design and materials until satisfactory results are produced. The each design mix shall be checked as prescribed above for a new mix whenever the source of cement, coarse aggregate, fine aggregate or any other ingredient changes.

Upon acceptance of a design mix found satisfactory to the Owner's Representative, the mix proportions shall be used without change for all concrete structures under the class of concrete in this contract, unless necessary modifications are subsequently approved by the Owner's Representative. Corrections necessitated by variations in the moisture content of the aggregates shall be made by the Contractor as required.

04) CONCRETE MANUFACTURING

An automatic recording device capable of recording all of the individual ingredients of the mixes shall be installed at the point of manufacture of the concrete.

05) PRODUCTION AND PLACEMENT CAPACITY REQUIREMENTS

The requirements of Section 500.06 of the GDOT Standard Specifications shall apply.

06) FORMS

(a) The requirements of this Article in the Standard Specifications shall apply except that the formwork shall also conform to the following:

1) Prepare and submit shop drawings to the Owner's Representative for review.

2) Forms shall be designed with adequate strength to withstand pumping pressures and to permit ramming of concrete to fill all possible voids. All hinges shall be drilled for the hinge pins to insure better alignment of the forms.

3) Forms shall be provided with ample openings through which the concrete may be placed, worked and inspected as it moves into place.

4) Forms shall be metal type forms or plywood forms constructed to fit exactly the shapes required. The material used shall be of such thickness that the forms will remain true to shape. All bolts and rivet heads shall be countersunk. Clamps, pins and other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete. Forms which do not present a smooth surface or do not line up properly shall not be used.

5) Care shall be exercised to keep forms free from rust and grease and other foreign matter. Forms which, in the opinion of the Owner's Representative are unsatisfactory, shall not be used.

07) REMOVAL OF FALSEWORK AND FORMS

Forms shall not be removed without approval of the Owner's Representative, and all removal shall be accomplished In a manner which will prevent injury to the concrete. Forms shall be removed only after the concrete has attained sufficient strength to support itself without damage.

08) APPLICATION OF EXTERNAL LOADS TO CONCRETE

(a) Backfilling around underground structures shall not be performed until the compressive strength of the concrete has reached its design strength evidenced by concrete cylinders taken from the pour and tested in accordance with these specifications,unless authorized by the Owner's Representative.

(b) In order that the Owner's Representative can maintain a record of the strength gain of all concrete placed, and to enable the Contractor and the Owner's Representative to determine the times for the removal of the forms and the application of external loads, the Owner's Representative shall make 6" x 12" concrete test cylinders for determining strengths and other properties of the concrete, molds and equipment therefore, shall tag and identify the cylinders, shall cure the test specimens in the same manner as the concrete in the construction being sampled, and shall deliver them to his laboratory for testing. These cylinders shall be prepared in accordance with the requirements of ASTM Specification C31, and tested in accordance with AASHTO Test Method T22.

(c) In general, and unless otherwise required, six test cylinders shall be made from each continuous pour of concrete. Two cylinders of each set of six will be tested to determine when the concrete reaches the stresses for the removal of the forms, two at 7 days and two at 28 days. The cost of taking concrete samples, furnishing molds and equipment, preparing, curing and testing the cylinders shall be at the expense of the Contractor.

(d) In the event that, during the course of construction, a 7 day concrete cylinder breaks at a compressive strength lower than that specified hereinbefore for that age, the Owner's Representative reserves the right to order the Contractor to immediately core the portion of the concrete construction represented by that cylinder for testing purposes. The coring shall be made of the size and at the locations ordered by the Owner's Representative. Coring and filling core holes with concrete and core testing shall be done at the Contractor`s expense. If the results of the core tests indicate that, in the sole opinion of the Owner's Representative, the expected rate of strength gain is not sufficient to produce a satisfactory strength at 28 days, the portion of the concrete construction represented by the core, as delineated by the Owner's Representative, shall be removed and disposed of, at the Contractor`s expense, and that portion replaced with new construction. If the results of the core tests indicate that a satisfactory 28 day strength may yet be realized, possible rejection of the concrete in question will be deferred until the 28 day cylinders are tested. If a 28 day cylinder breaks at a strength below the required value, the Owner's Representative reserves the right to immediately reject the concrete represented by the cylinder, ordering such construction removed and replaced within designated limits, or he may permit the Contractor to perform additional coring. If additional coring is permitted, the Owner's Representative will either accept or reject the concrete represented on the basis of the 28 day core tests and all previous tests. The Owner's Representative`s decision in these cases shall be final and conclusive.

(e) In the event that, during the course of construction, and following satisfactory 7 day cylinder tests, a 28 day concrete cylinder breaks at a compressive strength lower than that specified hereinbefore for that age, the Owner's Representative reserves the right to immediately reject the concrete represented by the cylinder, ordering such construction removed and replaced within designated limits, or he may permit the Contractor to perform coring wherever ordered. If coring is permitted, the Owner's Representative will either accept or reject the concrete represented on the basis of the 28 day core tests and all previous tests. Coring and filling core holes with concrete and core testing shall be done at the Contractor`s expense. The Owner's Representative`s decision in these cases shall be final and conclusive.

09) CONCRETE HANDLING AND PLACING

(a) Before placing concrete, care shall be taken to ensure that all required embedded items are firmly and securely fastened in place, as shown on the plans or approved by the Owner's Representative. All embedded items shall be thoroughly cleaned and free from oil and other

foreign matter such as loose coating of rust, paint, scale and the like. Concrete shall be placed continuously in the forms in layers of such thickness as may be directed by the Owner's Representative. Each layer shall be placed and compacted before the preceding batch has taken initial set. Tapping or other external vibration of forms will not be permitted without specific permission of the Owner's Representative. Each layer shall be so compacted as to avoid the formation of a construction joint with a preceding layer which has not taken initial set. When the placing of concrete is temporarily discontinued, the concrete, after becoming firm enough to retain its form, shall be cleaned of laitance and other objectionable material to a sufficient depth to expose sound concrete. Where directed by the Owner's Representative, such surfaces shall be cut with an air and water jet at the proper stage of surface hardening, or shall be thoroughly cleaned with a stiff wire brush or other satisfactory tool and a stream of water or air, or both, under pressure, if necessary, in order to remove all laitance of undesirable surface accumulations. In the event that surfaces are not cleaned at the proper time or in the proper manner, sandblasting may be required in order to produce the required surface. Work shall not be halted except at construction joints shown on the plans or the approved shop drawings. Immediately after the work of placing concrete is halted, all accumulations of mortar splashed upon the reinforcement and surfaces of the forms shall be removed before the concrete takes its initial set. Care shall be taken when leaning reinforcing steel to prevent damage to or breakage of the concrete steel bond. Concrete that has attained its initial set or has contained its mix-water for more than 60 minutes shall not be placed in the work. Placing will not be permitted when, in the opinion of the Owner's Representative, limitations of facilities furnished by the Contractor prevent proper finishing and curing of the concrete. No concrete shall be placed by compressed air.

(b) Any concrete which is found to be defective, before the final completion and acceptance of the work, shall be removed, disposed of and the structure properly rebuilt, or if damaged during such time shall be properly repaired or replaced, as required to the satisfaction of the Owner's Representative, at no cost to the Owner.

(c) Chutes and Troughs: Where steep slopes are required, chutes either shall be equipped with baffle boards or shall be in short lengths that reverse the direction or movement. Concrete shall not be allowed to drop freely more than 5 feet in unexposed work nor more than 3 feet in exposed work; where greater drops are required, a tremie or other approved methods shall be employed. The discharge of the tremies shall be controlled so that the concrete may be effectively compacted into horizontal layers not more than 12 inches thick, and the spacing of the tremies shall be such that segregation does not occur. Care shall be taken to fill each part of the form by depositing the concrete in as near the final position as possible. The coarse aggregate shall be worked back from the forms and around the reinforcement without displacing the bars. After initial set of the concrete, the forms shall not be jarred and no strain shall be placed on the ends of projecting reinforcement.

(d) Pump Placement. Where the concrete is conveyed and placed by pumping, the plant and equipment used shall be subject to approval by the Owner's Representative. Operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. The position of the discharge end of the line shall be as near the final position of the concrete as possible. The discharge lines shall be horizontal, inclined upwards or vertical from the machine. When placing is completed, concrete to be used which is remaining in the pipelines shall be ejected without contamination of concrete or separation of ingredients. After each operation, debris and flushing water shall be washed away from the structures.

(e) Pumps used to convey concrete shall be of a suitable kind and size to adequately handle the

volumes of the concrete to be conveyed. The use of aluminum components that might come in contact, during pumping or conveying, with fresh concrete will not be permitted.

(f) Vibrating: Unless otherwise directed, concrete shall be compacted with suitable high speed mechanical vibrators. Vibrators shall not be used to push concrete into position.

The vibration at any point shall be of sufficient duration to accomplish compaction, but shall not be prolonged to the point where segregation occurs. Vibrators shall not penetrate previously placed layers more than 2 inches in order to consolidate the layers and to prevent over vibration of the previously vibrated layer.

(g) Waterstops shall be installed at the location shown on the plans.

10) CONCRETE SURFACE FINISHES

Finish shall be Type I, Type II, Type III, or Type IV as specified in the Standard Specifications.

11) COLD WEATHER CONCRETING

The requirements of Section 500.14 of the Standard Specifications shall apply.

12) HOT WEATHER CONCRETING

The requirements of Section 500.15 of the GDOT Standard Specifications shall apply.

13) TOLERANCES

Permissible construction tolerances shall conform to the requirements specified in the Standard Specification. The Contractor shall be responsible for setting and maintaining forms sufficiently within

the tolerances specified. Concrete work that exceeds the tolerance limits specified shall be remedied or removed and replaced, or corrected at the expense of the Contractor.

TESTING AND MATERIAL REQUIREMENTS

Testing and Short Title	Material and Short Title	
AASHTO T-27-Gradation	AASHTO M-80	- Aggregate
AASHTO T-96-Abrasion	AASHTO M-6	- Aggregate
AASHTO T-26-Water	AASHTO M-85	- Portland Cement
AASHTO T-121-Yield	AASHTO M-134	- Air-Entrained Portland Cement
AASHTO T-84-Absorption		
AASHTO T-85-Absorption	ASTM C-350	- Fly Ash
AASHTO T-152-Air Content	ASTM C-402	- Pozzolans
AASHTO T-23-Cylinders	AASHTO M-154- Air-Entrained	
AASHTO T-22-Compressive Test		- Additives
	ASTM C-494	- Retarder
AASHTO T-119-Slump		
AASHTO M-33-Joint Material		
	ASHTO M-90	- Joint Material
ASTM C-31-Test Specimens	AASHTO M-153- Joint Material	
	AASHTO M-213- Joint Material	
	AASHTO M-18	- Joint Material
	AASHTO M-73	- Cotton Mats
	AASHTO M-139- Paper	
	AASHTO M-171- Polyethylene	
	AASHTO M-182- Burlap	
	AASHTO M-148- Membrane	
	ASTM C-618	- Fly Ash

END OF SECTION P-610

ITEM P-621

PAVEMENT MARKINGS AND MARKING REMOVAL

01) DESCRIPTION

This section shall consist of the preparation and painting of markings and stripes, and the removal of existing markings, on the surface of Aprons and Roadways applied in accordance with these specifications and at the locations shown on the plans, or as directed by the Owner.

02) MATERIALS

(a) Materials Acceptance. The Contractor shall furnish manufacturer's certified test reports for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. The reports can be used for material acceptance or the Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the Engineer upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers for inspection by the Engineer. Material shall not be loaded into the equipment until inspected by the Engineer.

(b) Paint. Paint shall be Waterborne meeting the requirements of Federal Specification TT-P-1952D, Type II, furnished in White – 37925, Yellow – 33538 or 33655, Red – 31136, and Black – 37038, in accordance with Federal Standard No. 595. The color pink shall be made using one part Red – 31136 to two parts White – 37925.

(c) Reflective Media. This feature will be provided by the addition of glass spheres to the surface of the pigmented binder. Glass spheres shall meet the requirements of Federal Specification TT-B-1325D, Type III.

(d) Water. Water to be used by high-pressure water equipment for removing pavement markings shall be obtained by the Contractor from a potable source.

(e) Chemicals. The use of chemicals for removing pavement markings will not be permitted.

03) CONSTRUCTION METHODS

(a) Weather Limitations. The painting shall be performed only when the existing surface is dry and clean, when the atmospheric temperature is at least 45°F and rising, when the pavement surface temperature is at least 5°F above the dew point, and when the weather is not excessively windy, dusty, or foggy. The suitability of the weather will be determined by the Owner.

Do not perform work when the atmospheric temperature is below 40 degrees F or when the pavement is covered with snow or ice.

If markings are applied with wind speeds sustained in excess of 10 knots, windscreens shall be used to shroud the material guns.

(b) Equipment. All equipment for the work shall be approved by the Owner and shall include the

apparatus necessary to properly clean the existing surface, a mechanical marking machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

1) The mechanical marker shall be an approved atomizing spray-type marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall be designed so as to apply markings of uniform cross sections and clear-cut edges without running or spattering and within the limits for straightness set forth herein. When needed, a dispenser shall be furnished which is properly designed for attachment to the mechanical marker and suitable for dispensing the required quantity of reflective media.

2) Suitable adjustments shall be provided on the sprayer(s) of a single machine or by furnishing additional equipment for painting the width required.

(c) Preparation of Surfaces. Immediately before application of the paint, the existing surface shall be dry and entirely free from dirt, grease, oil, acids, laitance or other foreign matter which would reduce the bond between the coat of paint and the pavement. The surface shall be thoroughly cleaned by waterblasting as required to remove all dirt, laitance and loose materials. After the cleaning operations, vacuuming or other Owner-approved cleaning methods shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

1) During blasting, dust and debris will be controlled and contained by vacuums or other approved processes.

2) Obliterating pavement markings by masking with paint, bituminous material, surface treatments or other cover material will not be an acceptable removal method.

3) Paint shall not be applied to new Portland cement concrete pavement until the concrete in the areas to be painted is clean of curing material and/or removal of existing markings. Sandblasting or high pressure water shall be used to remove curing material and laitance from the concrete surfaces.

(d) Removal Methods. Pavement markings shall be removed from indicated areas by methods acceptable to the Engineer, such as waterblasting, that cause negligible damage to existing pavements, surface texture, joint sealants, or other airfield appurtenances as determined by the Owner. The Contractor shall repair at his expense any damage to the pavement, surface texture, sealant, or appurtenances caused by the removal work. Methods to repair damages shall be acceptable to the Owner.

1) Contractor shall be aware that existing paint to be removed may contain lead. Safety precautions shall be taken for environmental concerns. Contractor shall test the area prior to submitting a bid for this condition.

2) Any removal method that causes objectionable dust, contaminated water runoff, or other such hazard or nuisance shall be controlled by means approved by the Owner that eliminate such causes of objection or its use will not be allowed.

(e) Layouts and Alignment. On those sections of pavements where no previously applied figures, markings, or stripes are available to serve as a guide, suitable layouts and lines of

proposed stripes shall be spotted in advance of the paint application. Control points shall be spaced at such intervals as will insure accurate location of all markings. All stripes shall be accurately surveyed and layout accomplished well in advance of painting and shall be approved by the Owner prior to applying paint.

1) The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimensions and application of the paint.

2) Single stripes shall be applied wholly on one side of the longitudinal pavement joints. Double or multiple stripes shall be centered over similar joints.

(f) Application. Markings shall be applied at the locations and to the dimensions and spacing indicated on the plans or as specified. Paint shall not be applied until the layouts, indicated alignment and the condition of the existing surface have been approved by the Owner. Pavement shall be dry to the satisfaction of the Owner prior to application of paint.

1) The paint shall be mixed in accordance with the manufacturer's instructions before application. The paint shall be thoroughly mixed and applied to the surface of the pavement with the marking machine at its original consistency without the addition of thinner. The paint shall be applied uniformly by suitable equipment at the following rates:

Pavement Type	Paint Application Rate
Portland Cement Concrete	115 Square Feet per Gallon
Freshly Sealcoated Asphalt Concrete	75 Square Feet per Gallon
Other Asphalt Concrete	115 Square Feet per Gallon

If the paint is applied by brush, the surface shall receive two coats; the first coat shall be thoroughly dry before the second coat is applied.

2) The reflective media shall be distributed to the surface of the pigmented binder immediately after application and imbedded at the rate and depth as required to provide adhesion and reflection. Glass spheres shall be applied at the rate of 12 pounds per gallon of paint. High-intensity granules shall be applied at the rate of 1.7 pounds per gallon of paint.

3) In the application of markings, any deviation in the edges exceeding l/2" in 50 feet shall be obliterated and the marking corrected. The dimensions of the markings shall be as designated within a tolerance of plus or minus 5%. All painting shall be performed to the satisfaction of the Owner by competent and experienced equipment operators, laborers, and artisans in a neat and workmanlike manner.

4) No paint shall be applied to bituminous pavement until the pavement has been allowed to cure to the Owner's satisfaction. Upon application to properly prepared surfaces after curing, the paint shall not bleed excessively, blister, peel, curl, or discolor.

5) The Contractor shall furnish certified test reports for the materials shipped to the project. These reports shall not be interpreted as a basis for final acceptance. The Owner shall be notified upon arrival of a shipment of paint to the job site for inspecting and sampling of the materials. The Contractor shall make an accurate accounting of the paint materials used in the accepted work.

(g) Protection. After application of the paint, all markings shall be protected while the paint is drying. The fresh paint shall be protected from injury or damage of any kind. The Contractor shall be directly responsible and shall erect or place suitable warning signs, flags or barricades, and protective screens or coverings as required. All surfaces shall be protected from disfiguration by spatter, splashes, spillage, drippings of paint or other materials.

(h) Cleanup. The Contractor shall remove from the site all debris, waste, loose or unadhered reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the Engineer. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and Federal environmental statutes and regulations.

(i) Defective Workmanship or Material. When any material not conforming to the requirements of the specifications or plans has been delivered to the project or incorporated in the work, or any work performed is of inferior quality, such material or work shall be considered defective and shall be corrected as directed by the Owner, at the expense of the Contractor. Any areas of paint that chips or peels or wears excessively in respect to the overall shall be repainted within the warranty period.

TESTING AND MATERIAL REQUIREMENTS

Test and short title	Material and short title
TT-B-1325C[1]	Beads (Glass Spheres) Retro-reflective
TT-P-1952D[1]	Paint, Traffic and Airfield Marking, Waterborne
Federal STD 595	Colors used in Government Procurement

1 Federal Specification

END OF SECTION P-621

SECTION 335444

PRECONDITIONED AIR DIRECT-EXPANSION AIR HANDLING UNITS AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Provide 100-ton point-of-use preconditioned air unit and accessories as specified in this Section at new Gate F3A for the service of the A380-800 aircraft.

B. This Section includes the design criteria, product description, installation guidelines and commissioning of Preconditioned Air (PCA) Direct Expansion (DX) air handling units for installation on passenger boarding bridges (PBB). This includes all components and equipment necessary to provide a complete and operational PCA system including start-up services, and warranties as specified. The following types of equipment and accessories are included:

1. Preconditioned Air Units.
2. Aircraft adaptor nozzles.
3. Preconditioned air hose reels.
4. Flexible aircraft duct (hose).

C. Related Work Specified Elsewhere:

1. Commissioning: DIVISION 01.
2. Passenger Boarding Bridges and Fixed Walkways: SECTION 347713.
3. Gate Monitoring System: SECTION 275900.

1.02 REFERENCES

A. Applicable Standards:

1. American Bearing Manufacturers Association (ABMA).
2. Air-Conditioning and Refrigeration Institute (ARI):
   a. 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils.
   b. 850 - Commercial and Industrial Filter Equipment.
3. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
   a. 15 - Safety Code for Mechanical Refrigeration.
   b. 52 - Method of Testing Air-Cleaning Device Used in General Ventilation for Removing Particulate Matter.
4. American Society of Mechanical Engineers (ASME).
5. National Fire Protection Association (NFPA):
   a. 70 - National Electrical Code.
   b. 90A - Standard for Installation of Air Conditioning and Ventilation Systems.

6. National Electrical Manufacturer's Association (NEMA):
   a. MG1 - Motors and Generators.
7. Occupational Safety and Health Act (OSHA).
8. Society of Automotive Engineers (SAE):
   a. ARP 1801 - Measurement of Exterior Sound Level of Specialized Aircraft Ground Support Equipment.
   b. ARP 5374 - Method of Testing Preconditioned Air Equipment.
9. Sheet Metal and Air-Conditioning Contractors National Association (SMACNA).
10. Underwriters Laboratories (UL).

1.03 SYSTEM DESCRIPTION

A. Design Parameters:
   1. The A380-800 aircraft shall be served by two 100-ton (nominal) DX PCA units mounted on the Passenger Boarding Bridge (PBB) at gates F3 and F3A. Gate F3 PCA unit is an existing unit and will be re-used for this Project.
   2. A PCA unit controller shall be provided for the selection of PCA equipment operation to provide cooling, heating, or ventilation, as required, to all aircraft based on outdoor air ambient temperature.
   3. Precooling and preheating shall be provided for each passenger boarding bridge controlled at the PBB console.

B. Furnish all material, equipment, and labor to provide a complete and operational PCA System on the PBB at gate F3A. In general, the Work includes:
   1. Direct Expansion PCA Unit and all required accessories for a complete operating unit.
   2. Supply air distribution system, comprised of rigid ductwork (if required), flat flexible duct (hose) extension with aircraft mating nozzle, and hose storage reel.
   3. Condensate drain system.

C. The following conditions shall govern the design of the preconditioned air system unit:
   1. The PCA unit shall be designed such that the aircraft parked at the gates shall maintain an interior cabin temperature of 75°F in the cooling season and 72°F in the heating season (tolerance of +2°F). The relative humidity of the interior aircraft space shall be between 40 and 60%. A minimum ventilation rate of 10 cfm/seat for the cooling mode and 5 cfm/seat for the heating mode shall be required. Cooling shall be provided for outdoor air temperatures of 55°F and above during the cooling season. Ventilation shall be provided for outdoor air temperatures between 45°F and 55°F. The DX PCA unit's electric strip heaters shall provide heating for outdoor air temperature of 45°F and below during the heating season.
   2. Design Day Ambient Conditions Summer 94°F d.b. 77°F w.b.
      Winter 18°F d.b.

3. The PCA unit shall be sized for 1/2 of the A380-800's overall cooling load; 100% passenger and crew load, 50% aircraft electrical load, maximum solar load, design ambient temperatures, and 100% outside air for peak cooling capacity.

4. For peak heating load calculations, no internal heat gain shall be included for passenger heat gain to space, solar gain or internal electrical loads.

5. Each PCA unit shall be sized to attain and maintain the required aircraft temperature as specified with 100% outdoor air. Return air to the air handling unit shall not be used.

6. Each PCA unit design shall be based on the following criteria. The static pressure at the outlet of the air handling unit shall be sufficient to meet the requirements of all aircraft that may be parked at the gate, including the longer length of hose required for MD-80 aircraft. The aircraft mix is listed on the Drawings. The PCA unit shall be designed to provide the cooling capacity listed at the aircraft connection considering the hose heat gain and static pressure loss.

   a. Wide-body Mode: PCA unit shall be capable of 750,000 Btu/h nominal cooling capacity. Supply air shall be delivered at a minimum of 330 lb./min at 37°F and 25 inch w.c. air at the aircraft connection. Heating capacity shall be a minimum of 120,000 Btu/h at 130 lb./min., minimum. Unit shall be nominal 75 ton, minimum, with single hose outlet to aircraft connection.

   b. Jumbo Mode: PCA unit shall be capable of providing 890,000 Btu/h nominal cooling capacity. Supply air shall be delivered at a minimum of 460 lb./min at 37°F and 25 inch w.c. at the aircraft connection. Heating capacity shall be a minimum of 160,00 Btu/h at 165 lb./min., minimum. Unit shall be nominal 90 ton, minimum, with dual outlets to aircraft connections.

   c. Each PCA unit, while operating in A380 mode, shall provide one-half the cooling capacity required for an A380 aircraft at design day conditions. Supply air shall be delivered at a minimum of 440 lb./min at 40ºF and 35 inches w.c. at the aircraft connection with two supply air hoses. Heating capacity shall be a minimum of 260,000 Btu/h at 220 lb./min minimum.

   d. Each PCA unit shall be capable of providing preheat and precool supply air to the PBB when not servicing an aircraft. Motor actuated dampers shall be utilized to divert conditioned air to the PBB supply duct with zero leakage of air to the aircraft supply hose.

1.04 SUBMITTALS

A. General: Submit the following in accordance with DIVISION 01.

B. Contractor shall provide with the Bid all technical data and calculations to support unit capabilities to provide cooling performance at the specified system conditions.

C. PCA Unit Data: Include manufacturer's technical product data, including rated capacities clearly indicated, dimensions, required clearances, weights, furnished specialties and accessories; and installation and start-up instructions. Also include the following:

   1. Fan performance curves with system operating conditions indicated.

   2. Actual cfm at the minimum and maximum static pressure conditions and the input current (amps) at each condition.

3. Motor ratings and electrical characteristics plus motor and fan accessories.
4. Factory test reports (2 copies) showing units cooling and heating capacity at each mode of operation for design day conditions.
5. Materials gauges and finishes.
6. Method of capacity control refrigeration (i.e., cylinder unloading, hot-gas bypass) and heating systems, defrost cycle, air volume control, and overload protection. Include the number of tubes and fin spacing for coil selection.

D. Accessory Product Data: Submit manufacturer's technical data for each type of ductwork, fitting, flexible connection, aircraft adaptor nozzle, cabin temperature probe, and reel hose storage including dimensions, capacities, and materials of construction; and installation instructions.

E. Correspondence with bridge manufacturer indicating coordination efforts.

F. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loading, required clearances, methods of field assembly, components, and locations and size of each field connection. Detail mounting and securing to passenger boarding bridges.

G. Wiring diagrams detailing wiring for power, signal, and control systems and differentiate between portions of wiring that are factory-installed and portions to be field-installed.

H. Operation and Maintenance Manual: Submit maintenance data and parts list for each PCA unit, including "troubleshooting" maintenance guide, servicing guide, and preventive maintenance schedule and procedures. Include in the O&M manuals directions for scheduled, routine air filter cleaning and/or replacement. O&M manuals shall contain the minimum following information:

1. Description and operation of all systems and components.
2. Electrical drawings specific for each unit furnished. Provide two sets of bound, laminated electrical drawings for each unit, to be placed in a access door to the unit controls.
3. Maintenance instructions including troubleshooting diagnostics guidelines.
4. Overhaul instructions.
5. List of parts and part numbers.
6. Illustrated list of all components.
7. Recommended spare parts list and sources.
8. Complete and detailed Preventive Maintenance Program for each type of PCA furnished under this Contract.
9. The Operation and Maintenance Manual shall be provided in accordance with Closeout Procedures, SECTION 01770.

1.05 QUALITY ASSURANCE

A. All equipment and material shall be the latest design, new, undeteriorated, and the first quality standard product of manufacturers regularly engaged in the production of such equipment and material.

B. PCA Units shall be products of a single manufacturer.

C. PCA Manufacturer's Qualifications: Normally involved in the design and manufacture of specially constructed aircraft conditioned air equipment. Minimum of five years' experience in the manufacture of DX PCA units.

D. Manufacturer to perform factory testing of air volume, temperature, and pressure on one PCA unit of each size provided for Project at design day conditions prior to delivery to jobsite. Written factory test results shall be submitted prior to shipment of equipment.

E. Accessory Manufacturer's Qualifications: Firms regularly engaged in manufacture of ductwork and equipment, of types and sizes required, whose products have been in satisfactory use for not less than 2 years. Ductwork and accessories must have demonstrated successful operation with the submitted and approved preconditioned PCA unit.

F. ARI Compliance: Coils shall comply with ARI 410; Air filter equipment shall comply with ARI 850.

G. ASHRAE Compliance: Air filters shall comply with ASHRAE Standard 52 for method of testing, and for recording and calculating air flow rates; and Standard 15. Comply with ASHRAE recommendations pertaining to construction of ductwork.

H. NFPA Compliance: Comply with applicable portions of NFPA 70, for components and installation of air handling units.

I. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

J. SMACNA Compliance: Comply with applicable portions of SMACNA HVAC Standards.

K. UL Compliance: Components shall be UL listed and labeled.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Lift and support PCA units with the manufacturer's designated lifting or supporting points.

B. Follow manufacturer's written instructions for all handling of equipment.

C. Disassemble and reassemble PCA units as required for movement into the final location following manufacturer's written instructions.

D. Deliver PCA units as a factory-assembled unit to the extent allowable by shipping limitations, with protective crating and covering.

E. Deliver and store flexible aircraft ducts (hose), aircraft adapter nozzles, hose reels, and "across-the-bridge" devices to the jobsite in original unopened containers with labels informing about manufacturer, product name, and other pertinent information.

F. The shipment, unloading and checking of equipment shall be coordinated with the Owner's Representative. Under no circumstances will the equipment be released for shipment or delivered to jobsite without prior approval.

G. Examine all equipment and material delivered to the jobsite for concealed damage. The Contractor shall be responsible for loss or damage until substantial completion of project. Report any damage to the Owner's Representative.

H. Protect all equipment and material during storage and prior to start-up which shall include the coverings of all openings, protection against rust and other damage. Equipment stored outdoors shall be protected from weather.

I. Each PCA unit shall be easily mounted and removed from the aircraft bridge without permanent damage to the bridge or its operation.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate with the loading bridge installing contractor. Structural integrity and operational characteristics of the bridge shall not be compromised by installation of the PCA unit. Submit correspondence with the bridge manufacturer indicating coordination efforts.

1.08 WARRANTY

A. Contractor shall provide a one (1) year parts and labor warranty for the entire PCA system. A separate, five (5) year factory warranty on the PCA unit compressors is required. Warranty shall commence with Substantial Completion of installation.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of filters for each unit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. PCA Units:

a. JBT Aerotech - Jetaire Systems.

2. Smoke Detectors:

a. Air Products & Controls, Ltd.

b. Siemens Cerberus (Pyrotonics).

c. System Sensor.

d. Approved equal.

3. Flexible Ductwork (Flat, Roll-up Hose):

a. ABC Industries.

b. AirTech, Inc.

c. Flex Fab.

d. HK Porter.

e. Inet Airport Systems.

f. J&B Aviation Services, Inc.

g. Approved equal.

4. Aircraft Adapter Nozzle:

a. Hall Industries.

b. ITW GSE Group.

c. BFM Transport Dynamics Corporation.

d. Devtec Corporation.

e. J&B Aviation Services, Inc.

f. Inet Airport Systems.

g. Approved equal.

5. Preconditioned Air Hose Reels:

a. AirTech, Inc.

b. ITW GSE Group.

c. Aviation Systems, Inc.

d. BFM Transport Dynamics Corporation.

e. Inet Airport Systems.

f. J&B Aviation Services, Inc.

g. JBT Aerotech Jetaire Systems.

h. Approved equal.

B. Materials: Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard PCA unit as required for a functioning system.

2.02 PRECONDITIONED AIR DIRECT EXPANSION (DX) AIR HANDLING UNITS

A. General Description:

1. Provide a PCA unit that can be mounted on the passenger boarding bridge, such that the operational characteristics of the bridge are unrestricted, and the bridge's structural integrity is uncompromised.

2. The PCA unit at each gate shall contain evaporator coils, evaporator blower, compressors, condenser coils, condenser fans, electric heating coils, refrigeration and temperature controls, safety controls, air filters, smoke detector, complete motor starting equipment (including disconnect switch), condensate drain pan, and condensate discharge pump. Each unit shall provide the required cooling, heating, or ventilation air to maintain the aircraft cabin temperature specified, and to provide precooling to the passenger boarding bridge.

3. The PCA unit(s) shall have the capacity required to sufficiently cool the designated aircraft parked at a gate, considering quantity of air to be delivered and static pressures. Units shall serve all aircraft listed for that gate.

4. The blower shall be centrifugal type and sized for the specified variable volume airflow requirements. The unit size shall be selected so that the fan brake horsepower does not exceed the maximum required over the design operating range of the unit at the total static pressure.

5. Horsepower shall be selected based on manufacturer's choice of equipment that affects the internal resistance of the system. Contractor shall furnish the fan motor

and unit size adequate for final total static pressure and maximum brake horsepower requirements.

6. The construction of the unit shall be of a material to provide structural rigidity of frame and enclosure; and provided with thermal insulation for conditions encountered in normal usage. Equipment exterior shall be primed and painted to match bridge color. Equipment interior finish shall be manufacturer's standard.

7. The maximum sound level for the PCA units at maximum cooling shall not exceed 85 dBA at a distance of 15 feet from the unit as measured using SAE ARP 1801 guidelines. Precooling/preheating airflow shall not exceed 85 dBA inside the bridge.

B. Casing: Manufacturer's standard casing construction, having internal and exterior panel corrosion protection coating, and exterior painted finish. Casings shall have removable panels or access doors for inspection and access to internal parts, a minimum of 1-inch-thick manufacturer's standard thermal insulation, knockouts for electrical and exterior condensate drain connection, and lifting lugs. Insulation shall meet requirements of NFPA 90A. All sheet metal parts internal and external surfaces shall be prime coated prior to final assembly. Exterior casing surfaces shall have a baked enamel finish coat after assembly. Color shall match custom color selected for the exterior of the PBB and shall be approved by the Architect. The following items shall be fully removable and replaceable via access panels and without requiring removal of the PCA unit from the bridge:

1. Compressors.

2. Blower/damper.

3. Air filters.

4. Controls.

C. Fans:

1. General: Provide fans that are factory fabricated and assembled, factory tested, and factory finished, with required capacities and characteristics.

2. Fans and Shafts: Statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower.

   a. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70% of the first critical speed at the top of the speed range of the fan's class.

3. Shaft Bearings: Provide bearings having a median life "Rating Life" (AFBMA L_{50}) of 200,000, calculated in accordance with AFBMA 9 for ball bearings or AFBMA 11 for roller bearings.

4. Evaporator Fans: Centrifugal, direct-drive blower, no belt drive; and permanently lubricated motor bearings.

5. Condenser Fans: Propeller-type, direct-driven fans with permanently lubricated bearings.

6. Fans shall have a high pressure cutout switch (static pressure).

D. Refrigeration Coils:

1. Aluminum plate fins and seamless copper tube type. Fins have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall have a galvanized steel casing. Coils shall be mounted in the coil casing with same end connections accessible for service. Coils shall be removable from the unit. Coil section shall be completely insulated.

2. Coils shall be constructed and certified in accordance with ASHRAE 15 and ARI 410.

3. Coils shall be proof 400 psig and leak 250 psig tested with air pressure under water, then cleaned, dehydrated, and sealed with a holding charge of nitrogen. If refrigerant R410A is used, test pressures shall be adjusted for higher pressure system.

4. Provide expansion valve, solenoid valve, and distributor for each coil.

E. Electric Heaters:

1. General: Provide electric resistance open coil duct-type or finned tubular type heaters to provide heat to the supply air. A minimum of six steps of capacity control shall be required in the heating mode. SCR type control preferred to vary heating capacity for aircraft mix.

2. Heating Elements: Open-wire type, 80% nickel, 20% chromium elements, uniformly distributed and supported in aluminized- or galvanized-steel frame with vertical support brackets and insulate with ceramic bushings.

3. Controls: Provide thermal cutouts, primary and secondary controls, contactors, circuit fusing, airflow switch, and fused control transformer. Include integral primary automatic and secondary manual reset thermal-protection devices and airflow switches.

F. Compressors:

1. Scroll, hermetically sealed compressors with integral vibration isolators. A minimum of four compressors are required per air handling unit. A minimum of 8 steps of refrigeration capacity control are required. Compressors shall use non-ozone depleting refrigerant.

   a. Thermal expansion valves, filter dryers, sight glasses, compressor service valves, liquid line service valves; minimum of two refrigerant circuits for units having two or more compressors; and fan-cycling control for low ambient control to 35°F.

2. Safety Controls:

   a. Low refrigerant pressure cutout, auto reset;

   b. High refrigerant pressure cutout, auto reset;

   c. Compressor motor overload protection, internal and external, manual reset;

   d. Anti-recycling timing device;

   e. Adjustable low-ambient lockout;

G. Airflow Control: Supply airflow control shall be by variable frequency drive. In addition, provide damper assembly at each outlet to bleed off any air leakage past main valve and prevent hose from inflating when not in use.

H. Air Filters: Provide factory-fabricated, viscous coated flat panel type replaceable air filters with holding frames, with 2-inch-thick UL class 2 throwaway filter media. Construct media of interlaced glass fibers, sprayed with nonflammable adhesive and frame in throwaway fiberboard casings. Construct holding frames of galvanized steel or aluminum, gasketed as necessary to limit bypass air.

I. Motors:

1. General Requirements:

a. Motors 1/2 HP and Larger: Polyphase.

b. Motors Smaller than 1/2 HP: Single phase.

c. Frequency Rating: 60 Hz.

d. Voltage Rating: Determined by voltage of circuit to which motor is connected.

e. Service Factor: According to NEMA MG 1, unless otherwise indicated.

f. Capacity and Torque Characteristics: Rated for continuous duty and sufficient to start, accelerate, and operate connected loads at designated speeds, in indicated environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

g. Enclosure: Open dripproof, unless otherwise indicated.

2. Polyphase Motors:

a. Description: NEMA MG 1, medium induction motor.

(1) Design Characteristics: NEMA MG 1, Design B, unless otherwise indicated.

(2) Energy-Efficient Design.

(3) Stator: Copper windings. Multispeed motors have separate winding for each speed.

(4) Rotor: Squirrel cage.

(5) Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.

(6) Temperature Rise: Match insulation rating.

(7) Insulation: Class F.

b. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for indicated controller, with required motor leads brought to motor terminal box to suit control method.

c. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

(1) Critical vibration frequencies are not within operating range of controller output.

(2) Temperature Rise: Match rating for Class B insulation.

(3) Insulation: Class H.

(4) Thermal Protection: Where indicated, conform to NEMA MG 1 requirements for thermally protected motors.

d. Rugged-Duty Motors: Motors shall be totally enclosed with 1.25 minimum service factor, greased bearings, integral condensate drains, and capped relief vents. Windings shall be insulated with nonhygroscopic material. External finish shall be chemical-resistant paint over corrosion-resistant primer.

e. Source Quality Control: Perform the following routine tests according to NEMA MG 1:

(1) Measurement of winding resistance.

(2) No-load readings of current and speed at rated voltage and frequency.

(3) Locked rotor current at rated frequency.

(4) High-potential test.

(5) Alignment.

3. Single-Phase Motors:

a. Type: As selected by manufacturer from one of the following, to suit starting torque and other requirements of specific motor application.

(1) Permanent-split capacitor.

(2) Split-phase start, capacitor run.

(3) Capacitor start, capacitor run.

b. Shaded-Pole Motors: Do not use, unless motors are smaller than 1/20 hp.

c. Thermal Protection: Where indicated or required, internal protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range, unless otherwise indicated.

d. Bearings: Ball-bearing type for belt-connected motors and other motors with high radial forces on motor shaft. Sealed, prelubricated sleeve bearings for other single-phase motors.

J. Solid-State, Variable Frequency Drive: Provide solid-state speed adjustment with adjustable frequency and voltage output that shall provide a constant volts per hertz excitation of a three-phase, squirrel-cage induction motor up to 60 hertz. The variable frequency drive shall be selected by the manufacturer based on the maximum blower motor brake horsepower required. The controller shall have a 50% overload rating for one minute. The controller shall have a minimum efficiency of 95% at rated load. The controller shall operate in an ambient temperature of -40°C to 52°C for elevations up to 3,300 feet above sea level and within a humidity range of 0 to 95% noncondensing. The variable torque controller starting current shall be limited to 150% of the full load current.

1. The controller input shall be rated 460V (+10% to -10%), three-phase, and 60-hertz (=2% TO -2%0. The converter shall utilize a three-phase, full-wave, diode bridge. Provide 12 pulse unit.
2. The DC voltage shall be inverted with a pulse width modulated (PWM) transistor inverter to an adjustable frequency output. The output frequency stability to be +1.0% to -1.0% and the output voltage regulation to be +2% to -2%.
3. The controller shall maintain a minimum lagging power factor of 0.95 at any speed or load. The controller shall have input line filtering in compliance with IEEE 519 and shall not generate harmonics of a magnitude that create power line disturbances objectionable to the local utility.

K. Temperature Control:

1. Factory-installed, demand-oriented control system with minimum of 8 cooling steps and 6 heating steps. Controls include temperature sensor which can be placed by gate agents in the aircraft interior.

L. Electrical Service: Unit shall require only a single feed 480/3/60 electrical connection. Provide transformers as required to feed components and controls utilizing other voltages. Where the unit requires electrical power greater than that indicated in the Specifications and Drawings, Contractor shall include the upgrade of the complete power system as required to each unit as part of the Bid.

M. PCA Accessories:

1. PCA Units shall include the following accessories:

   a. Control Panel: Furnish panel for mounting on PCA unit which contains control of cooling and heating, evaporator fan, and volume control; and indicator lights for up to six unit functions.

   b. Gauge Ports: Gauge ports shall be required for refrigeration circuit. Pressure and temperature ports shall be required on the PCA unit outlet plenum. All gauge ports shall have caps secured by a chain.

   c. Outside air temperature sensor and manufacturer's standard intermediate and discharge temperature sensors as required for system operation.

   d. The on board temperature sensor assembly shall be adaptable to a thermal resistor type aircraft sensor with 1,000 ohm resistance of 70°F and a 3 ohm per degree change. Temperature sensor shall be provided with coiling cord of length to allow sensor to be placed inside aircraft cabin by airline personnel. Cord shall be equipped with plug at end for connection to jack located in the loading bridge cab.

   e. A condensate pump and drain pan shall be provided for each DX PCA unit. The condensate pump shall be lightweight, self-priming, and capable of running dry. Minimum pump rating shall be 3 gpm, 40-foot head, 1/3 hp. Position the drain pan under the coil section. Drain pan shall be stainless steel with capability of complete drainage leaving no standing water in pan.

   f. Smoke Detector: Furnish each PCA unit with a smoke detector downstream of the electric strip heat. Detector shall be ionization type and listed by UL per UL 268A. The detector shall operate at air velocities from 300 to 4,000 feet per minute. When smoke is sensed, the supply air blower shall shut down. Visual indication of alarm and pilot shall be provided on the detector

front and PCA unit exterior. A manual reset shall be located on the front of the device. Detector heads shall not require additional filters or screens which must be maintained. The hosing shall contain a detector base which will accept ionization detector heads. Terminal connections shall be the screw type. Terminals shall be provided for remote pilot and alarm indication.

N. Unit Controller: Unit controller shall be installed for each PCA unit. The controller shall contain the required circuitry, power supplies, and other components necessary to perform the functional operation described below. It shall be housed in a gasketed NEMA 3R cover. The unit controller shall have as a minimum the following functions and features:

1. Local operator interface with ground personnel shall consist of the following:
   a. ON/OFF pushbutton (or selector switch) station, lighted.
   b. STOP Switch.
   c. Wide-body (WB)/jumbo (JB) pushbutton (or selector switch).
   d. Single Output/Dual Output selection.
   e. Summary FAULT indicator (overloads, compressor circuits, filter alarm).
2. Local interface with passengers boarding bridge operator to start and stop bridge precooling from PBB console.
3. Monitor:
   a. Supply air dry bulb temperature.
   b. Cabin dry bulb temperature.
   c. PCA unit on/off.
   d. PCA summary faults.
4. Control:
   a. Refrigeration on/off/capacity level.
   b. Strip heat on/off/capacity level.
   c. Cabin temperature set point adjustment.
5. Gate Alarms:
   a. Smoke detector alarm/trouble.
6. Network Communication:
   a. The PCA unit shall have the ability to communicate via Ethernet and transmit data (including unit status and operational/metering information) to a building management system. The unit shall have the ability to communicate directly with the passenger boarding bridge control system. Coordinate communication requirements with the passenger boarding bridge manufacturer.

2.03 FLEXIBLE DUCTWORK (FLAT, ROLL-UP HOSE)

A. Provide one, 14-inch diameter, insulated, flexible duct for extension of the ductwork from the loading bridge to the aircraft PCA connection at each narrow body aircraft

gate. Provide two, 14-inch diameter flexible ducts for each WB and Jumbo aircraft gates. The hose shall be provided in segments with a connecting device to allow easy replacement in the field without special tools. Each hose shall be a minimum of 65 feet in length, but in no case requiring a "taut" over-extension to the connection point. A separate section of hose with end connections in an attachable separate reel for extension to MD-8 aircraft shall be provided at gates with MD80 aircraft in the design mix. Refer to Drawings for aircraft types at each gate.

B. Maximum heat gain/loss from leaving coil temperature to supply temperature at the aircraft shall be 7°F at design conditions.

C. When hose is supported by a hanger, hanger shall be tube or elbow style design, not a strap, to prevent kinking hose.

2.04 AIRCRAFT ADAPTOR NOZZLE

A. Provide one nylon, lightweight aircraft adapter nozzle with integral handles for each hose provided per gate. Provide a swivel joint at the hose to adaptor connection. The aircraft adapter nozzles shall be a Milo Adapter or a Slot Filling Design Adapter. Provide a swivel joint at the hose to adaptor connection.

2.05 HOSE REEL

A. Provide a wheeled type metal hose reel to store the flexible supply duct (hose) and aircraft adapter nozzle(s) at the end of the bridge at each gate. J&B Model JB680 or approved equal. The hose reel shall allow up to 80 feet of 14-inch diameter flat hose to be rolled to and from the aircraft. Provide attachable separate MD-80 extension hose reel at gates which have an MD-80 in its aircraft mix.

B. The hose reel shall be mounted to the bridge support mechanism accessible on the airside. Hose reel shall be side mounted or otherwise positioned so as to allow boarding bridge to fully lower without damaging any piece of equipment.

C. The hose reel shall be painted and free of sharp edges. Hose reel construction shall be steel frame with rounded top edges and corners, and an open framework design.

D. Hose reels connected to apron drive bridges shall be constructed such that they can be readily removed and reconnected.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of air handling units.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. PCA air handling units shall be mounted underneath the passenger boarding bridge behind the bogie wheels. Bridge-mounted DX air handling units shall not transmit vibration to the passenger bridges. Contractor shall provide vibration isolation.

B. Install units to provide access space around PCA units for service and maintenance.

C. Furnish all supports, brackets, guards, and safety hooks, for installing PCA units on passenger boarding bridge.

D. PCA units shall be aligned, adjusted and lubricated before final acceptance.

E. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

F. Coordinate with other work, as necessary to interface installation of ductwork accessories properly with other work.

G. Perform air system testing and balancing.

H. Perform factory testing of volume, temperature and pressure on each unit at each operating mode at design day conditions prior to shipment to site.

I. Perform volume, pressure and functional tests on each unit after installation on the PBB.

J. Prepare surface and spot paint all equipment where shop paint has been damaged or flaked off. Paint to match existing color in accordance with equipment manufacturer's recommendations.

K. Apply color coded physical hazard stripe on PCA unit in accordance with manufacturer's suggested practice.

3.03 CONNECTIONS

A. Air Handling Unit Connection: Connect equipment with flexible connectors.

B. Aircraft Connection: Aircraft connections shall be made with an aircraft adapter nozzle.

C. Electrical: Connect unit components to ground in accordance with the National Electrical Code.

D. Condensate: Connect condensate pump discharge to drain back to hub drain located near rotunda column. Condensate piping provided by this Contractor.

3.04 FIELD QUALITY CONTROL

A. Tests: Perform all Field Performance Tests as required by this Specification and to meet the requirements of SECTION 01810 - COMMISSIONING.

B. Manufacturer's Representative: Installing contractor shall arrange and pay for a factory-authorized on-site representative for the time required to assist and/or supervise the installation, start-up and testing of all PCA gate equipment in accordance with the manufacturer's written instructions. The on-site representative shall be the point of contact for interface with the manufacturer's home office engineering, manufacturing and other support staff as needed, and serve as liaison with the PBB manufacturer if applicable.

1. The service representative shall be called to the Site only after the installation is complete and the Owner's Representative has been notified at least five working days in advance.

2. Contractor shall submit a written notice containing the test schedule, test procedure and the personnel who will be present at the test.

3.05 PRELIMINARY PROCEDURES FOR PCA UNIT START-UP AND TESTING

A. Before operating the system, perform these steps:

1. Check filters for cleanliness.

2. Prepare report test sheets for each PCA unit. Obtain manufacturer's recommended procedures for testing.

3. Lubricate all motors and bearings.

4. Check fan rotation.

5. Connect air handling unit (via flexible ductwork) to Contractor-provided "test section."

3.06 START-UP AND TESTING

A. Each PCA unit shall be tested for a minimum of two hours in each mode of operation. All tests shall be witnessed by the Owner's Project Representative.

B. Contractor shall provide a field fabricated adjustable "test section" to simulate the pressure and flow restrictions of different aircraft.

1. The "test section" must be able to be attached to the 14-inch flexible PCA duct via an aircraft adapter nozzle.

2. The "test section" shall be mounted on feet for stability, and a volume damper shall be located at the far end of the "test section" to adjust static pressure and airflow.

3. Also provide a port at the midpoint of the "test section" large enough to insert a pitot tube.

4. All PCA units shall be tested during start-up with this test section for airflow volumes, gauge pressure and supply air temperature.

C. Conduct a functional performance test witnessed by the Owner's Project Representative prior to acceptance on each gate's PCA equipment to ensure proper operation and function of the equipment furnished in accordance with the specifications. Perform all tests recommended by the manufacturer and required by codes. As a minimum the following PCA unit operating functions are to be tested and recorded.

1. Aircraft Cooling Operation:

a. Measure and record the supply air temperature, flow rate, and gauge pressure at the outlet of the aircraft connector.

b. For gates servicing multiple sizes of aircraft, supply air recordings shall be made for all selector switch options.

2. Aircraft Heating Operation:

a. Measure and record the supply air temperature, flow rate, and gauge pressure at the outlet of the aircraft connector.

b. For gates servicing multiple sizes of aircraft, supply air recordings shall be made for all selector switch options.

c. Verify electric strip heat stage control.

3. Bridge Precool and Preheat Operation:

a. Measure supply airflow rate and temperature at the supply air grille.

b. Verify correct damper position.

c. Verify aircraft hose does not inflate when PCA unit in Bridge Precool/Preheat operation even if not properly stored in reel.

4. Safety Device:

a. Perform a "canned smoke" test of the PCA unit smoke detector to verify proper unit shutdown and visual alarm indication.

b. Verify unit restarts after manual reset energized.

5. Record and Report Data:

a. Record all data obtained during start-up and testing procedures as approved on the sample report forms.

b. Provide additional calculations as required to demonstrate unit is operating per design when tested at non-design day temperatures.

c. Provide recommendations for correcting unsatisfactory mechanical performances when system does not meet specified design criteria.

d. Correct all deficiencies resulting from tests.

6. In the event that equipment defects necessitate the rejection of the PCA equipment, the Owner's Representative shall have the right to operate the equipment without additional cost until such time as new equipment is provided to replace the rejected equipment. Replacement of the equipment shall be coordinated and scheduled with the Owner.

3.07 TRAINING

A. Training:

1. Review with Owner's personnel, the information contained in the Operating and Maintenance Data.

2. Schedule training with Owner with at least seven days prior notice.

3. The scheduled training shall include a minimum of forty (40) total hours of training administered as follows:

a. Training may include up to 12 personnel over two shifts.

b. Training shall include start-up, shutdown, servicing, preventive maintenance, and troubleshooting. Information shall also be provided concerning procedures for obtaining repair parts and technical assistance.

c. Review operating and maintenance manuals during training sessions.

4. Training shall be accomplished in accordance with Closeout Procedures, SECTION 017700.

3.08 ADJUSTING, CLEANING, AND PROTECTING

A. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel and cabinet.

B. Clean or replace air filters.

C. Clean and comb evaporator and condenser coil fins.

END OF SECTION 335444

SECTION 347713

PASSENGER BOARDING BRIDGES AND FIXED WALKWAYS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and DIVISION 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section Includes:

1. Passenger Boarding Bridges (PBBs): Provide new apron drive passenger boarding bridges at gate F3A as indicated on the Drawings and in this Section capable of serving the A380-800 jet aircraft U1 service door (26 feet above apron) and the L2 service door for other wide body aircraft.

2. Fixed Walkways: Provide new fixed walkway section as indicated on the Drawings and in this Section. The fixed walkway tunnel extension shall meet all structural, dimensional, and finish requirements specified for the passenger boarding bridges.

3. Modification to existing PBB located at gate F3 to provide an anti-collision avoidance system and controls on the existing bridge to match those provided on new F3A PBB.

B. Related Work Specified Elsewhere:

1. Commissioning: SECTION 01810.

2. Carpeting: SECTION 096800.

3. Preconditioned Air Direct-Expansion Air Handling Units and Accessories: SECTION 335444.

4. Gate Monitoring System: SECTION 275900.

5. Ground Power Units (400 Hz): SECTION 263543.

1.03 REFERENCES

A. Passenger Boarding Bridges and Fixed Walkways shall comply with the following applicable standards:

1. Air Transport Association (ATA):

a. Spec. 101 - Ground Equipment Technical Data.

2. Americans with Disabilities Act (ADA): Comply with ADA requirements where specified, and as much as possible where not specifically required by this Section or the Local Governing Code.

3. American Society for Testing and Materials (ASTM):

a. A36 - Carbon Structural Steel.

b. A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

c. A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

d. A311 - Cold-Drawn, Stress-Relieved Carbon Steel Bars Subject to Mechanical Property Requirements.

e. A325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

f. A449 - Quenched and Tempered Steel Bolts and Studs.

g. A490 - Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.

h. A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

i. A514 - High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.

j. A517 - Pressure Vessel Plates, Alloy Steel, High-Strength, Quenched and Tempered.

k. A569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality.

l. A570 - Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.

m. A572 - High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

n. A576 - Steel Bars, Carbon, Hot-Wrought, Special Quality.

o. A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

p. D2240 - Standard Test Method for Rubber Property - Durometer Hardness.

q. E2074 - Test Method for Fire Tests of Door Assemblies.

4. American Welding Society (AWS):

   a. D1.1 - Structural Welding Code - Steel.

5. Federal Specifications:

   a. TT-P-641 - Primer, Paint, Zinc Dust-Zinc Oxide (For Galvanized Surfaces).

6. National Electrical Manufacturer's Association (NEMA):

   a. 4 - Watertight and Dusttight.

7. National Fire Protection Association (NFPA):

   a. 1 - Uniform Fire Code.

   b. 70 - National Electrical Code (NEC).

   c. 101 - Life Safety Code.

   d. 415 - Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways.

8. Society of Automotive Engineers (SAE):

   a. J429 - Mechanical and Material Requirements for Externally Threaded Fasteners.

9. Society for Protective Coatings (SSPC):
   a. SP1 - Solvent Cleaning: Removes oil, grease, soil, drawing and cutting compounds, and other soluble contaminants.
   b. SP3 - Power Tool Cleaning: Removes loose material. Not intended to remove all scale or rust.
   c. SP6 - Commercial Blast Cleaning: Two-thirds of each square inch free of all visible residues; remainder only light discoloration.
10. International Building Code with all current Georgia Amendments.
11. International Energy Conservation Code.

1.04 DEFINITIONS

A. The terms "passenger boarding bridge" and "fixed walkway" and specified components of these, whether referred to in singular or plural form, apply to each unit provided in this Contract.

B. Tunnels "A," "B," and "C" are referred to in the order from closest to the terminal to closest to the aircraft.

C. The terms "right" and "left" refer to directions looking down the tunnels toward the aircraft.

1.05 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings for review in accordance with the requirements of DIVISION 01. Shop drawings shall show sufficient detail to indicate conformance to the requirements of this Contract. Manufacturer's assembly or fabrication details that do not provide additional information needed to determine compliance with requirements are not acceptable and shall not be submitted. No fabrication and/or assembly of any of the passenger boarding bridge or fixed walkway components shall begin until the shop drawings for such components have been reviewed and accepted by the Owner's Representative. Additional shop drawings shall be submitted as necessary to fully describe the bridge and walkways to be delivered and ensure proper interface with the external environment. All drawings, sketches, details, and material shall be submitted in English language and in Inch-Pound units, including dimensions, volumes, weights, and forces. All Shop Drawings shall be signed and sealed by a Georgia-Registered Professional Engineer. Shop drawings shall include, but not be limited to, the following:

1. An index prepared in chronological order listing all drawings, sketches, details, and material submitted.
2. Project-specific general arrangement drawing.
3. Product Data: Manufacturer's technical product data, including specifications. Include data substantiating that materials comply with requirements.
4. Interior Finishes:
   a. Interior finish schedule including interior wall and ceiling finishes. Include physical characteristics, such as durability, resistance to fading, flame resistance, and manufacturer's recommendations for maximum permissible moisture content of substrates.
   b. Transition details.

c. Wall finish attachment methods.

d. Light fixture details, ceiling materials, layout, and maintained illumination calculations at floor using the actual interior finishes (use 10% reflectance for the floor surface).

e. Passenger boarding bridge and fixed walkway section dimensions and general arrangement drawings.

f. Tunnel floor finish.

g. Cab floor finish.

h. Carpet edging details, including lines of demarcation between carpeted and hard surfaced floor, at wall areas, and treatment at doors and thresholds.

i. Carpet quantity.

j. Insulation.

k. Handrail details.

l. Bridge precooling/preheating grille.

5. Exterior Configuration:

a. General bridge and walkway layout.

b. Exterior elevations.

c. Graphics/signage details.

d. Paint finishes.

e. Flashing (building to passenger boarding bridge or fixed walkway). Coordinate terminal flashing attachment method with Design Consultant following award.

f. Flashing (fixed walkway section to passenger boarding bridge). Coordinate terminal flashing attachment method with Architect following award.

g. Flashing (between bridge segments).

h. Cab door seal.

i. Ramp service stairway.

j. Emergency egress stairway.

k. Service/maintenance ladder, cage and cab roof handrails.

l. Gate sign.

6. Cab:

a. Operator's cone of visibility, including mirrors for viewing drive wheels and apron.

b. Control panel location and functional layout.

c. View panels.

d. Safety devices.

e. Aircraft interface for each aircraft type to be serviced using the appropriate PBB slope.

f. Features necessary for proper connection with required aircraft types including auto-leveling devices.

g. Operating instructions placard.

h. Cab doors.

7. Aesthetics and Safety Markings:

a. Color and finish, exterior.

b. Reflective safety stripes on all equipment mounted below PBB.

c. Signage and plaques (interior).

8. Accessories:

a. Ventilator unit.

9. Electrical, Mechanical, Structural:

a. Certifications of Compliance with all referenced Design and Construction Standards.

b. Electrical power calculations that shall be signed and sealed by a Georgia-Registered Professional Engineer.

c. Electrical power and control schematic diagrams.

d. Hydraulic schematics.

e. Interface requirements for foundations and building supplied utilities.

f. Structural drawings including all foundation loading and other pertinent calculations which shall be signed and sealed by a Georgia-Registered Professional Engineer.

g. Welder qualifications and weld procedure qualifications.

h. The bridge and fixed walkway manufacturer shall provide the Owner's Representative with actual foundation loading data sheets for each type of bridge and each fixed walkway configuration provided based on load requirements specified in the "Structural Design and Support Elements" Article in PART 2 of this Section.

10. Anti-Collision System:

a. Proximity sensors product data.

b. Laser collision avoidance product data.

c. Anti-collision system installation schematics showing sensor and laser locations for new and existing PBB.

d. Collision avoidance system program description and program, including ladder logic for the new PBB and existing PBB.

e. All associated controls.

11. Certificates of compliance with NFPA 415 from a certified testing company located in the continental United States. The manufacturer shall also provide affidavits attesting to the passenger boarding bridge's and fixed walkway's compliance with NFPA 415.

12. Furnish notarized certifications that the bridges and fixed walkways, including all electrical, mechanical and hydraulic designs, components, and installations meet the requirements prescribed in this Specification.

B. Spare Parts: List of recommended spare parts for a duration of 2 years of operation, including prices and sources.

C. Operation and Maintenance Manuals:

1. Supply, upon delivery of PBB, five (5) copies of technical manuals for the passenger boarding bridge model furnished under this Contract. Manuals shall not be generic in nature and shall reflect the exact construction of each bridge furnished. Non-applicable items and drawings shall not be included in the manuals. Manuals may have descriptive type photographs. Pages shall have reinforced edges. Manuals shall be compact in size and bound. Manufacturer shall provide all listed manual information in PDF format on six (6) copies of CD-ROM disk.

2. The technical manuals shall comply with ATA Spec 101 and contain the following information:

a. Description and operation of all systems and components.

b. Electrical drawings specific for each bridge furnished. Provide one set of bound, laminated electrical drawings for each bridge, to be placed inside the control console. Provide one set in each technical manual.

c. Maintenance instructions including troubleshooting/diagnostics guidelines.

d. Overhaul instructions.

e. List of parts with both component manufacturer and PBB manufacturer part numbers.

f. Illustrated parts list of all components.

g. Recommended spare parts list and sources.

h. Complete and detailed Preventive Maintenance Program for each type of boarding bridge furnished under this Contract.

3. The Operation and Maintenance Manuals shall be provided in accordance with Closeout Procedures, SECTION 01770.

D. Submit detailed procedures for Functional Site Testing Methods for approval prior to start-up and testing of the bridges.

E. Training: Submit a detailed description including agenda and duration of training proposed.

F. Test Reports: Submit all factory and field test reports to the Owner's Representative prior to the final inspection.

1.06 QUALITY ASSURANCE

A. Qualifications: The manufacturer and installer shall provide evidence of at least five (5) years of satisfactory experience in the design, fabrication, and installation of apron drive passenger boarding bridges and fixed walkways. The installer shall be trained and certified by the manufacturer as having the necessary experience, staff, and training to install the manufacturer's products per the specified requirements. Materials used shall have been used successfully in similar installations and shall have withstood exposure for a period of at least five (5) years.

B. Regulatory Requirements: The bridges and fixed walkways shall be designed to conform to all applicable Federal, State and Municipal Codes and regulations as applicable to the Project Site which are in effect at the time of manufacture.

1. All passenger boarding bridges and walkways shall conform to the requirements of NFPA 415. Certified documentation shall be provided.

2. Structural Design and Construction Standards:

a. American Welding Society Standards. All welds shall be qualified weld procedures performed by qualified welders in accordance with AWS D1.1. Submit welder qualifications and weld procedure qualifications. All welds shall exhibit adequate penetration and shall be clean and free of slag. Welds shall not be ground to improve appearance except as required for flush surfaces or where nonstructural parts are involved.

b. All sheared or sharp metal edges shall be deburred or broken. All exposed metal corners shall have minimum radii in accordance with the appropriate material specification referenced in this Section.

3. Mechanical and Hydraulic Specifications and Standards:

a. All mechanical and hydraulic components and designs shall conform to the recommendations and standards established by the Society of Automotive Engineers, Joint Industrial Conference and the American Society of Mechanical Engineers.

b. All threaded fasteners shall incorporate suitable locking devices.

4. Electrical Specifications and Standards:

a. All electrical equipment and methods of installation shall conform to the requirements and recommendations of the American Insurance Association, the National Electrical Manufacturers Association, Joint Industrial Conference, the National Electrical Code, and any modifications to the NEC by the local authority having jurisdiction.

b. All electrical components utilized shall be recognized by Underwriters Laboratories/ETL in all cases where UL/ETL maintains a listing category for the devices installed.

C. Single Source Responsibility: Obtain each product, material, premanufactured assembly or component from one supplier/manufacturer for all passenger boarding bridges and fixed walkways in this Specification. Obtain color, texture, grade, finish, and type of material from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver passenger boarding bridges and fixed walkways with protective coverings to prevent exposure of interior to weather, dirt and water.

B. Factory and Field Storage: Protect passenger boarding bridge and fixed walkway interiors from weather, dirt, water and construction debris during storage at the factory and on Site. On-site storage shall be at the option of and coordinated with the Owner's Representative.

C. Handling: Handle passenger boarding bridges and fixed walkways according to manufacturer's written rigging and installation instructions for unloading, transporting and setting in final location.

1.08 SEQUENCING AND SCHEDULING

A. Working Area: Coordinate location of passenger boarding bridge and fixed walkway staging area, storage area and erection area with Owner's Representative, Airport Operations Authorities, and the Federal Aviation Administration.

B. Foundations: Coordinate the installation of passenger boarding bridges and fixed walkways with installation of passenger boarding bridge and fixed walkway foundations.

C. Bridge-Installed Equipment: Coordinate the installation of the 400-Hz ground power units, cable hoists, preconditioned air handling units, hose reels, building supplied electrical and communication services with installation of the passenger boarding bridges, fixed walkways, fixed walkway cooling unit and emergency egress stairs.

1.09 WARRANTY

A. Special Project Warranty: Provide special project warranty, signed by Contractor, installer, and manufacturer, agreeing to replace, repair, or restore defective materials and workmanship of passenger boarding bridge and fixed walkway work during warranty period of 1 year from final acceptance. This warranty shall be in addition to, and not a limitation of, other rights the Owner's Representative may have against the Contractor or Manufacturer under the Contract Documents. It may run concurrent with other project warranties.

1. "Defective" is defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected, and unsatisfactory conditions.

2. Warranty Claim Response time: The manufacturer shall ship repair parts and send a qualified service technician (if required), to the Owner's Representative within 24 hours of being notified of an equipment failure while under warranty and parts shall be delivered to the applicable Owner's Representative facility within 48 hours from the time the order was placed by the Owner's Representative. If the manufacturer is unable to obtain the parts to restore the equipment to service, the Owner's Representative reserves the right to obtain the replacement parts or service elsewhere and charge the total cost to the manufacturer, including labor and administrative fees. The manufacturer shall pay all Customs fees, taxes, and freight for warranty parts during the warranty period.

1.10 MAINTENANCE

A. Extra Materials: Provide the following materials for each bridge at installation:

1. Spare fuses, minimum one (1) each size.
2. Paint touch-up kit, full and unopened.
3. Aircraft closure repair kit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products by the following:

1. JBT AeroTech, Jetway Systems.

2.02 MATERIALS

A. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard pre-engineered passenger boarding bridge and fixed walkway systems and as required for a complete system. All equipment and parts provided shall be the manufacturer's latest listed and published stock models, except as permitted or required by the Owner's Representative. The equipment and parts shall meet all the applicable requirements of the Specifications.

B. Material Specifications:

Component	Applicable Standard
Structural Plate	ASTM A36
Structural Steel & Shapes	ASTM A36 or ASTM A572 Grade 50
Steel Hollow Structural Sections	ASTM A500 Grade B
Steel Pipe	ASTM A53 Grade B
Steel Sheet	ASTM A570, ASTM A569 or ASTM A653
T-1 Steel	ASTM A514 or ASTM A517
Hinge Pins	ASTM A311 Grade 1018 or Grade 1144 or ASTM A576 Grade 1045
Component	**Applicable Standard**
Bolts-Standard	ASTM A307
Bolts-High Strength	ASTM A325, SAE J429 Grade 5 or 8, or ASTM A490

C. Operational control limit switches shall be of the proximity type where practical. Ultimate limits switches shall be of the mechanical type.

2.03 APRON DRIVE PASSENGER BOARDING BRIDGE GENERAL REQUIREMENTS

A. Design: The passenger boarding bridge shall be of telescoping three-tunnel design. The passenger boarding bridge, including telescoping tunnels, cab and canopy shall serve the A380-800 jet aircraft U1 service door (26 feet above apron) and the L2 service door for various other wide body aircraft including those indicated on the

Drawings. Foundation location with respect to the terminal wall and current aircraft layout are indicated on the Drawings.

B. Operation Limits: The apron drive bridges shall continuously drive to any point on the terminal apron within the design operational range to accommodate the indicated aircraft. Minimum continuous operational range is indicated on the Passenger Boarding Bridge and Fixed Walkway Schedule and aircraft mix to be served is indicated on the Aircraft Gate Usage Schedule shown on the Drawings. The apron drive bridges shall have simultaneous directional movements including extension-retraction, lateral motion, vertical elevation, and cab rotation. Each passenger boarding bridge shall have a minimum continuous operation range as indicated on the Drawings measured from the center point of the rotunda to the center point of cab rotation. The passenger boarding bridges shall meet the full continuous range of horizontal and vertical movement specified throughout the full continuous range of cab rotation without requiring field modification to meet the full range of movement.

C. Operating Environment: The bridge shall operate satisfactorily in the Atlanta, Georgia operational and climatological environment, under ambient temperatures from -25ºF to 125ºF with winds up to 60 mph on wet, ice-covered or snow-laden apron surfaces. The entire bridge shall be weatherproof when extended while parked to the aircraft and in the stowed position with the cab door closed. Equipment and controls exposed to the weather shall be of weatherproof-type or housed in weatherproof enclosures. Electrical panels or cabinets mounted external to the bridge shall be equipped with heaters or electric components to control condensation where required by the installation environment.

D. Operating Instructions: A weatherproof and water resistant placard outlining the bridge operating instructions shall be displayed in a prominent location in the cab of each bridge in plain sight of the Operator. A qualified graphics expert shall prepare the placard and the displayed instructions.

E. Safety Requirements: The purpose of these Specifications and standards is to describe the requirements, quantities, performance and maintenance properties of the boarding bridge design and installation. Safety to passengers, employees, other personnel, aircraft and equipment is of prime importance. Nothing in these Specifications shall relieve the manufacturer or Contractor of the responsibility for providing and installing a safe product.

1. All equipment shall be designed to be fail-safe and all controls that regulate bridge motions (i.e., horizontal travel, vertical travel, and cab rotation) except for the cab auto-level feature shall be of the dead-man type. Dead-man type shall mean controls that require the operator to apply constant pressure to be engaged. Once the pressure is released the control is disengaged.

2. All operating mechanisms (i.e., horizontal and vertical drive, cab rotation) shall be designed so the drive mechanism is locked with a manual release override when power fails or is shut off.

3. Positive mechanical stops shall be provided to prevent over-travel where any component might become disengaged from its guiding or restraining component. The positive stop shall be in addition to all limit switches provided to restrict over-travel during normal operating conditions, including drive wheel steering motions and cab rotation. This does not apply to tunnel rotation which shall have dual limit switches. Mechanical stops shall be identified and detailed on the Shop Drawings.

4. The operator's position in the control cab shall be designed to provide the operator adequate visibility to position the boarding bridge with the cab weather door closed. Suitable enclosures, guard rails, and other restraint devices shall be provided to protect the operator from being pitched out the open end of the cab in case of sudden stops or inadvertent movements of the bridge when operated with the door open. An operator handhold shall be attached to the wall near the control station.
5. Fall protection shall be provided for technicians working on the roof consisting of a stainless-steel tie-off cable.
6. Highly reflective and daylight visible safety stripes shall be provided on any auxiliary equipment mounted below the boarding bridge.
7. Safety decals shall be provided on the cross tube of the drive column wheel bogie to warn against storing anything on the cross tube and to warn about the danger of getting a foot run over.

F. Maintenance Provisions:

1. Maintenance requirements shall present no special obstacle to personnel knowledgeable in their respective fields of hydraulics, electrical power and controls, or general mechanical assembly.
2. Install bridge and fixed walkway components with adequate access and appropriate fastener types to permit change-out by one person. If a component's weight requires mechanical assistance to lift, the component or assembly shall be provided with lift eyes, fork lift guides, or other means of providing a mechanical advantage. Components shall be simple, rugged and easily accessible for routine maintenance, lubrication, exchange and adjustment. Electrical cabinets, hydraulic cabinets and pumps shall be located so they are always accessible to maintenance personnel. All interior electrical cabinets shall have a door-operated light for illuminating all interior components.
3. Access panels, where required to gain access to equipment or maintenance areas, shall be sized to allow necessary tools and equipment to be inserted to complete the Work. The panel shall be permanently attached to the structure by stainless steel hinges, and any fasteners required shall be stainless steel permanently affixed to the panel.
4. Provide all product specific tools required for routine maintenance.
5. Modular components: Utilize standardized modular components that are readily available in the continental United States to provide rapid corrective measures of malfunctioning critical components. Critical bridge components shall be located to allow for ease of access and installation.
6. All hardware items required including, but not limited to, bolts, studs, nuts, washers and fasteners shall be provided in Inch-Pound unit sizes. Exterior hardware and fasteners shall be stainless steel where practical.
7. The manufacturer shall maintain an adequate inventory of all proprietary or vendor fabricated and modified parts for routine maintenance of the unit. All stock shall be maintained, whether or not the unit is in current production, for a minimum of ten (10) years from date of the last unit supplied.

8. All mechanical and electrical systems shall be protected from potential damage resulting from climatic conditions, falling objects or collision with aircraft service equipment and other moving vehicles.

9. All cable ties, fasteners, and other items subject to direct or indirect sunlight shall be ultraviolet light rated.

G. Power and Communication Characteristics:

1. The passenger boarding bridge and walkway shall operate on a 480V, 3-phase, 60-Hz, 60-Amp power circuit, with ground and neutral. Each passenger boarding bridge shall be provided with an electrical disconnect switch mounted to the rotunda column. See the drawings for disconnect switch requirements. Electrical, communication, and fire alarm service is shown on the Terminal Building Electrical Drawings.

2. Provide transformers and circuit breakers as required to transform the 480V, 3-phase power to 120/208V or 120/240V power or as otherwise required for boarding bridge and fixed walkway power distribution.

3. All exterior electrical components shall be housed in enclosures conforming to NEMA 4.

4. Provide sufficient cable lengths to reach the PBB disconnect switch at the rotunda column and junction boxes mounted on the terminal wall. Cable length shall be estimated from Drawings with sufficient spare length and exact length determined in the field.

5. Provide strain relief devices on all unsupported cables. Supporting cables by zip ties is not acceptable. Supports shall not have sharp edges.

6. Provide cabling for the following across each bridge: Bridge power, including, but not limited to, power, lighting, controls, and gate sign; Ethernet communication cable; 400-Hz frequency converter; pre-conditioned air unit; gate docking system; smoke detector alarm signal from PBB and PCA; collision avoidance system; telephone and DAS and Wi-Fi system. Cables shall be flexible copper.

7. Rotunda Column Grounding: Provide a grounding stud on the rotunda base plate. Rotunda base anchor bolts are not ground rods and shall not be considered as such.

8. Electrical Components:

a. General: All electrical equipment and components shall be manufactured in Inch-Pound units and conform to recommendations and standards listed in the Quality Assurance Article.

b. Electrical Junctions: All electrical junction points and connections within the boarding bridge shall be made directly to terminal strips, not by means of plug-type connections or splices. Electrical connections between major bridge components/accessories and the bridge, such as horizontal and vertical drives shall be heavy-duty quick-connect type.

(1) Power cables shall be hardwired from the passenger boarding bridge disconnect switches or J-boxes directly to disconnect switch at the rotunda column.

(2) Electrical or communication service conduit shall not be permitted on the exterior sides of the passenger boarding bridge.

(3) All cables and wiring shall be installed in cable carrying devices approved by the Owner's Representative.

(4) All electrical switch and receptacle device plate covers shall be stainless steel and shall match the device configurations, and on exposed wiring shall exactly fit the outlet box dimensions.

c. All electrical circuitry shall be successfully tested before the unit leaves the manufacturer's plant.

d. Primary Power: The main primary power "ON" indicator light shall be located on the operator's control panel adjacent to the power "ON/OFF" control switch.

e. Anti-Chafing Devices: Whenever electrical cables are required to slide or move, anti-chafing devices shall be provided. Acceptable anti-chafing devices include grommets, flexible sleeves and jackets, and other similar approved devices.

f. Identify all cables with wire/cable identification bands on both ends. Bands shall be pre-numbered plastic coated style or type-on style with clear plastic self-adhesive cover flap, numbered to show circuit identification numbers indicated on Shop Drawings.

g. All J-boxes shall be labeled with engraved placards to indicate usage (i.e., 400-Hz, PCA, PBB Power).

h. Breakers in the raceways or J-box shall be resettable from a locked box located on the side of the bridge, accessible from the service stairs and labeled appropriately.

H. Mechanical Characteristics:

1. Mechanical and Hydraulic Design and Components:

a. Only standard components readily available in the continental United States, manufactured in Inch-Pound standard units and conforming to recommendations and standards listed in the Quality Assurance Article shall be used.

b. All operating mechanical and hydraulic components shall be assembled and tested before the unit leaves the manufacturer's plant. The Owner's Representative shall be notified in advance of and may witness testing.

c. Hydraulic cylinders shall be designed for seal replacement by maintenance technicians.

2.04 PERFORMANCE REQUIREMENTS

A. Aircraft: The passenger boarding bridge shall be capable of servicing the A380-800 aircraft U1 service door and the L2 service door for various other wide body aircraft.

1. Passenger boarding bridges shall meet the full continuous range of vertical travel indicated, measured from the apron to the cab spacer leveled edge with the cab fully rotated counterclockwise and the tunnels fully extended perpendicular to the terminal wall, as installed, without requiring field modification.

2. Mounting locations of equipment and accessories shall be made such that the PBB shall meet the full cab height range. Low cab height range may be achieved by providing a side-mounted PCA hose reel. Mounting of PCA unit or GPU in a location other than under the PBB cab will be considered only if there is not enough room for it to be mounted under the PBB cab.

B. Telescoping Tunnel Slope: Maximum slope in any direction shall be 1:12 (8.33%) measured in the tunnels (except at the transition ramps), for each aircraft serviced.

C. Cab Rotation: The cab shall be designed to rotate a total of 125º (92.5º-95º counterclockwise and 32.5º-35º clockwise from center) at a maximum speed of 145º per minute in either direction.

D. Bridge Rotation: The rotunda shall permit the entire unit to rotate 175º (87.5º clockwise and 87.5º counterclockwise).

E. Drive Wheel Rotation: Steer angle shall be 180º in place and in motion. Steer speed shall be adjustable from 16º per second minimum to 42º per second minimum.

F. Vertical Lift Speed: 2.5 feet per minute (fpm) to 4 fpm as measured at the cab spacer.

G. Drive Speed: The drive system shall permit the unit to extend/retract and rotate to any point within its range of required movement at a variable speed between 0 and 90 fpm.

H. Deceleration: The horizontal drive system shall include a decelerator device to reduce or eliminate shocks when approaching maximum extension or retraction, or when horizontal travel is stopped or reversed suddenly, for protection of the equipment and passenger boarding bridge operator.

2.05 STRUCTURAL DESIGN AND SUPPORT ELEMENTS

A. Loads: In addition to the dead loads and dynamic effects caused by movement, the entire passenger boarding bridge and fixed walkway shall support the following minimum loads, and those of all attachments to the bridges, unless the governing building code prescribes more severe requirements. These loads may be applied in total or in part, singularly or simultaneously. The submitted sealed structural design calculations shall be based on the combination that imposes the most adverse loading.

1. Live Load PBB (Extended or Retracted) and Fixed Walkways: 40 lb./sq. ft.

2. Wind Load:

a. Retracted and Stowed: 25 lb./sq. ft., or an approximate wind velocity of 90 mph.

b. Operational: 12.5 lb./sq. ft., or an approximate wind velocity of 60 mph.

3. Roof (Snow) Load: 25 lb./sq. ft. and the ability to support a 300 lb. person at any location on the roof.

4. Equipment Minimum Loads (Approximate - Sole responsibility remains on PBB manufacturer for coordinating and supporting equipment loads mounted on the bridge):

a. Preconditioned Air Handling Unit 8,000 - 10,000 lbs. Mount under the "C" tunnel.

b. Hose Reel and Hose: 350 lbs. Below cab as required to provide space for the bridge to lower to the specified range. Mount where required.

c. 400-Hz Point-of Use-Ground Power Unit: 2,750 lbs. Under cab unless there is not enough clearance. Coordinate alternative mounting location with Owner.

d. 400-Hz Cable Hoist: 600 lbs. Top right of side of cab. Provide quantity as required.

e. Gate Sign: 200 lbs. Right side of cab.

5. The structural design shall provide sufficient torsional rigidity to minimize sway when the boarding bridge is brought to a gradual stop.

6. All mechanisms for actuating, guiding and restraining the boarding bridge and its components shall be designed to minimize the noise, deflection, and vibration apparent to passengers. No operating vibrations or loads shall be transmitted to the Terminal Building.

2.06 BRIDGE ASSEMBLY ELEMENTS

A. Rotunda Assembly:

1. Corridor:

a. The rotunda entry corridor shall be a fixed rectangular tunnel at a constant height that connects the Terminal Building or fixed walkway with the rotunda.

b. The rotunda entry corridor shall be cantilevered from the rotunda column to the Terminal Building face or the mating frame of the fixed walkway.

c. Provide corrosion resistant exterior flashing to create a weather-tight connection between the rotunda entry corridor and the Terminal Building or fixed walkway. Flashing shall be sloped so as not to trap or pond water. Provide interior metal flashing to allow bridge movement. Interior metal flashing shall be painted to match PBB interior and shall be connected only to corridor (not to Terminal Building) and shall have felt backing on Terminal Building interface side to prevent chafing of terminal. Coordinate terminal flashing attachment method with Owner's Representative following award.

d. Door Threshold: Install a threshold at the fixed walkway/boarding bridge interface that allows for bridge movement. The threshold shall be aluminum diamond plate.

2. Rotunda:

a. The rotunda shall be a cylindrical structure supported on a tubular column. The rotunda floor shall remain level at all positions and shall be installed at the same elevation as the terminal floor or fixed walkway corridor.

b. Flap-type seals (dual) shall be provided for complete weather tightness between the rotunda and the hinged telescoping tunnels.

c. Rotunda side curtain shall be aluminum and provided with adjustable tensioning devices or positive tracking system and interior weather seals. The exterior metal curtain covers shall be full length with stainless steel hinged access panel to allow access to curtain idler barrel grease fittings.

3. Support Column:

a. PBB shall not be anchored or secured to the Terminal Building, nor shall it transmit any live or dead loads or vibrations to the Terminal Building.

b. Rotunda support columns shall use an industry standard #7, 8-bolt, foundation anchor bolt pattern.

c. Coordinate and verify quantity, location, and details of foundation design prior to fabrication.

4. Bolts:

a. Provide (8) 2-1/4-inch, 4-foot long anchor bolts per support column to foundations contractor prior to pour of concrete footings and bases.

B. Telescoping Tunnels:

1. Telescoping tunnels shall be rectangular in cross-section, constructed of metal panels and hinged at the rotunda end for vertical motion. Minimum inside dimensions of the telescoping tunnels, not including handrails, shall be:

a. Minimum Interior Width; C Tunnel: 4 feet-10 inches

b. Minimum Interior Height: 6 feet-11 inches

c. Minimum Transition Ramp Width: 4 feet-8 inches

2. Where telescoping sections overlap, low angle transition ramps shall be provided to accommodate the difference in elevation. The inner tunnel transition ramp shall be hinged and slope shall be less than 3º relative to the tunnel centerline.

3. Provide flat roof tunnel with a slip resistant surface and with adequate provisions for water to freely run off.

4. Design the telescoping tunnels and all other elements of the structure to resist the accumulation of water at low points and pockets in the structure. Drain holes shall be provided where necessary to drain collection points in any operating attitude. Drains from internal gutters shall be carried clear of the structure and attached equipment, including 400-Hz ground power unit and PCA unit by aluminum gutters, and shall be sized to prevent blockage by accumulated debris.

5. Provide mechanical stops with elastomeric bumpers to prevent over-travel in the event of limit switch failure.

6. Maintain clearance between the telescoping tunnels such that no soiling or wear of the interior surfaces occurs as the result of movement.

7. Utilize flap-type seals (dual) between the individual tunnel assemblies to provide a weather tight seal and to prevent the entrance of fire and/or smoke in the event of an apron fire. Exterior seals shall utilize EPDM rubber and meet the fireproofing requirements of NFPA 415.

C. Fixed Walkways:

1. Fixed walkways shall be of similar construction to that of the telescoping "B" tunnels.

2. Minimum inside dimensions of the fixed walkway, not including handrails, shall be:

a. Minimum Height: 7 feet-7 inches

b. Minimum Width: 6 feet-10 inches; Handrail to Handrail: 6 feet-3 inches.

3. Provide exterior flashing to create a weather-tight connection between the fixed walkway and the Terminal Building. Flashing shall be sloped so as not to trap or pond water. Provide interior metal flashing. Interior metal flashing shall be painted to match PBB interior and shall be connected only to fixed walkway (not to Terminal Building) and shall have felt backing on Terminal Building interface side to prevent chafing of terminal. Coordinate terminal flashing attachment method with Owner's Representative following award.
4. Terminal Door Threshold: Install a threshold at the terminal door/fixed walkway interface that allows for fixed walkway movement and building settlement. The threshold shall be aluminum diamond plate.
5. Support Column:
   a. Fixed walkway shall be supported and cantilevered from the rotunda support column at the rotunda end.
   b. Fixed walkway support columns shall use an industry standard #127 foundation anchor bolt pattern.
   c. Coordinate and verify quantity, location, and details of foundation design prior to fabrication. Coordinate and verify structural details prior to fixed walkway fabrication.
6. Support fixed walkways at the terminal building end from structural steel attached to the terminal building.
7. Sloped Fixed Walkways: Provide walkways sloped where required.

D. Bridge and Fixed Walkway Insulation:
1. Insulation shall be provided in the walls and ceiling.
2. Insulation in ceilings shall be 1-inch thick, black, mat faced fire-resistant fiberglass.
3. Insulation in walls shall be 1/2-inch, and shall be provided with air space between the insulation and tunnel materials.
4. Insulation materials shall not be exposed to the weather or applied with glues or tape.
5. All insulation materials shall be covered with appropriate weather resistant finish material.
6. Insulation shall be installed full width of ceiling with all areas insulated. Insulation shall butt against light frame edges with separate piece over light fixture.
7. The design shall eliminate the possibility of condensation in the insulation that might cause unsightly water stains appearing on the interior finished surfaces and rust at the interface of the insulation and outer shell.
8. The use of asbestos or asbestos products as an insulation material or for any other use is not permitted.

E. Aircraft Cab:
1. The cab shall be equipped with a forward facing operator control station located behind a window to permit the operator full view of the aircraft contact area. Additional visibility shall be provided through windows to the left and right sides of the control station.

2. Cab roll-up side curtains shall be aluminum slats. The left and right curtains shall be equipped with interior weather seals and shall be interchangeable. The exterior metal curtain covers shall be full length with stainless steel hinged access panel.

3. Cab shall be equipped with double swing doors installed to seal the interior from outside weather conditions when the door is closed. The minimum door width shall be 43 inches and minimum height shall be 7 feet-8 inches. Provide swing doors with return closure, stainless steel kickplates on both sides, and deadbolt type latch.

4. The cab shall be rotated by a gear motor and chain drive operating on the circumference of the fixed circular floor section of the aircraft cab. Adjustable limit switches and fixed physical stops shall control the limits of rotation.

5. Articulating Cab Floor: The aircraft end of the cab shall be provided with an automatic level device when the cab is rotated at an angle up to 95º off the centerline of the bridge tunnels.

    a. The articulating cab floor shall level automatically and shall be equipped with a manual override control switch. The floor shall be capable of providing a level surface adjacent to the aircraft doorsill for passenger boarding bridge slopes from -10% to +10%.

    b. No portion of the cab floor shall exceed 1:12 (8.33%) slope in the direction of expected passenger traffic. Walking surface shall be smooth with no raised surfaces that may introduce a tripping hazard.

    c. The system shall include a double hinge floor. The maximum slope of this floor shall be limited to +/- 6.5º (11.4%).

6. Spacer: Provide a spacer (bumper) spanning the full outside width of the boarding bridge cab opening, along the front edge of the cab floor at the point of contact with the aircraft.

    a. Spacer installation and material shall not mark the aircraft skin, and shall prevent any damage or abrasion of the aircraft skin when the bridge is in contact with the aircraft.

    b. The spacer shall provide bodily support when stepped upon, and shall have a Shore A Durometer hardness of 70 +/- 5 when measured in accordance with ASTM D2240.

    c. The spacer material shall be an EPDM, or other suitable polymer, compounded to meet the fireproofing requirements of NFPA 415.

    d. Passenger boarding bridge motion control or limit devices mounted on the spacer shall be located one at each end and one along its centerline. Limit devices shall not be lever-type limit switches.

    e. Provide Safety Track or 3M anti-skid on C-channel between the cab floor and spacer.

    f. No metal trim or structural element shall be capable of contacting the aircraft fuselage outside the canopy padding and/or spacer.

F. Aircraft Closure (Canopy):

1. The aircraft end of the cab shall be equipped with an adjustable closure with folded accordion bellows to make a weather-tight seal against the aircraft. Provide inner liner curtain that covers the canopy frame members.
2. The closure shall be able to enclose both the open aircraft door and doorway of all aircraft served at each gate and specifically the A380 aircraft.
3. The entire Aircraft Closure shall be designed to be water-resistant, ultraviolet light rated, withstand weathering, remain elastic and flexible between -31ºF and 127ºF, be tear-resistant, and meet fire resistance requirements of NFPA 415. The aircraft closure color shall be gray.
4. Each side of the aircraft closure shall use electrically and independently controlled adjustable actuators, to permit the seal to conform to critical aircraft contours and provide a weather-tight seal. The actuating mechanism shall be designed to preclude excessive pressure on the aircraft fuselage.
5. All actuators for the canopy, automatic leveling device, and other controls shall be provided with rigid covers to protect them from passenger contact.
6. Cushion pad seals shall be provided at the point of contact between the canopy and aircraft fuselage to prevent denting or scratching of the aircraft skin or cabin and cockpit windows. This includes damage to rain diverters or troughs that may be located over the doors. The seals that contact the aircraft shall be segmented and attached to the main closure assembly by Velcro-type fastener strips.
7. Canopy supports or stiffening rods shall be thoroughly padded to prevent contact with the aircraft and protect canopy material when in its retracted position. The padding shall be firmly attached in such a manner that it will not slip, turn, twist, or distort from repeated usage. Allow replacement of the padding sides and top, and any inserts in sections, without replacing the entire canopy.
8. Changes in the position of the aircraft and/or passenger boarding bridge while the canopy is in contact with the fuselage shall not cause excessive loads to be exerted on the aircraft skin. Pressure exerted by closure against the aircraft fuselage shall not exceed 2 psig. Dependence upon the automatic leveling device alone to prevent such an occurrence is not acceptable.
9. Any chains, cables, or electrical wires that penetrate the floor or wall structure shall have adequate clearance, be protected, and securely fastened.
10. Cab seal shall be resilient bellows type. Tarpaulin types are not acceptable.
11. The canopy, when in its retracted position, shall be protected by a rigid metal hood to prevent water from flowing into the folds of the canopy material when the bridge is not in use. Exterior canopy liner shall be inherently designed to prevent water ponding in the folds.

G. Service Assembly:

1. No service door or landing is required for the A380 PBB at gate F3A due to the tight docking clearance with the A380 aircraft engine.

H. Drive Column: The drive systems shall be either hydraulic or electro-mechanical and meet the criteria listed below.

1. Vertical Drive - Electro-Mechanical:

   a. The bridge shall be moved vertically by means of two recirculating ball bearing screw assemblies. Each assembly shall be independent of the other, with individual motors. Each assembly shall be capable of supporting the passenger boarding bridge and attached equipment, including preconditioned air handling unit, and 400-Hz ground power unit, under full design load. The lifting mechanism shall hold its position at any elevation within the travel range with or without power supplied.

   b. The ball screw ball nut shall be equipped with wiper brushes to remove grit or dirt from screw threads and a self-locking acme-type thread which will prevent unit collapse in the event of ball nut failure.

   c. The vertical drive motors shall be AC induction motors with integral reducer and brake. The brakes shall be spring-applied and electrically released only when signal is received from the operator's console or the auto-level system.

   d. The brakes shall hold securely at all elevations, without creeping, whether the bridge is in operation or not.

   e. A fault detector shall sense differential motion of the ball screw assemblies. The fault detector circuit shall shut down the electrical power to the vertical drive motors and set the brakes independently of the operator if a fault is detected. Drive column fault shall not falsely occur at any height within the indicated range due to flexing of the lift columns.

   f. A tapered collar that prevents the screw from disengaging the ball nut shall be attached to the ball screw's lower end.

   g. Reference stripes shall be painted or mechanically fastened on the inner tubes to indicate column travel limits, both high and low.

   h. Backup emergency plunger-type limit switches shall be provided in the vertical circuit, for both high and low limits.

   i. Inspection holes in each column tube shall be provided to allow baroscope inspection of the ball screw surface. All holes shall be aligned in inner and outer column tubes. Cover plates shall be provided in outer tube.

   j. Ensure the vertical drive column provided is long enough and in the correct position to continuously travel the full range of cab movement indicated.

2. Vertical Drive - Hydraulic:

   a. The hydraulic pump and motor drive for vertical travel of the bridge shall be an integral part of the drive wheel assembly, accommodate the size and weight of the bridge and attached equipment including preconditioned area unit and 400-Hz ground power unit, and operate smoothly and quietly.

   b. The hydraulic power system shall permit simultaneous vertical travel and horizontal travel and steering.

   c. The hydraulic power system shall utilize a heavy-duty oil-based hydraulic fluid with corrosion inhibitors.

d. The operating temperature environment shall determine hydraulic oil viscosity. Special synthetic hydraulic oils having a low viscosity index shall be supplied for extremely low-temperature environments. Provide hydraulic oil based on the project location environment.

e. All hydraulic components shall be designed for maximum corrosion resistance and compatibility with the hydraulic fluid used.

f. Vertical travel shall occur by driving two hydraulic cylinders to the desired height by means of solenoid-operated hydraulic valves.

g. Hydraulic cylinder rods shall be chrome plated. The hydraulic cylinders shall be equipped with a vertical drive pump brake (pilot-operated check valves) which automatically releases when hydraulic pump(s) are in operation and vertical motion, up or down, is signaled from the operator's console or from the auto-level circuit.

h. Pilot-operated check valves located at hydraulic cylinders shall prevent bridge downward movement in the event of a total hydraulic system failure, including rupture of any hydraulic hose in the system.

i. Each drive column shall be designed to support the full weight of the bridge and attached equipment if the other should fail.

j. Provide manual vent valves at the high points of the vertical drive system to bleed air from the hydraulic system.

k. Ensure the vertical drive column provided is long enough and in the correct position to continuously travel the full range of cab movement indicated.

3. Horizontal Drive - Electro-Mechanical:

a. A variable speed electro-mechanical drive system shall provide horizontal travel of the passenger boarding bridge. The drive shall be two-wheeled with solid tires.

b. An AC gear motor shall independently drive each wheel. The gear motors shall be provided with integral brakes. Solid-state variable frequency motor controllers shall drive the AC motors. The controller shall provide built-in diagnostics to assist in trouble shooting.

c. A regenerative braking system shall allow the bridge to come to smooth, controlled stops. Integral electrically-released spring actuated brakes shall be provided with each drive motor and shall lock the bridge in place whenever electrical power is cut off, either by moving the control lever to the neutral position or if power fails.

d. Provide a manual override to release drive wheel brakes to permit towing the passenger boarding bridge into or out of position on the apron in case of power failure. The override system shall be mechanically interlocked to preclude normal operation with the brakes locked out.

e. Connection lugs shall be provided to allow the bridges to be towed in the event of power failures.

f. Provide positive identification for both the front and backsides of the wheel bogie.

4. Wheels and Tires:

   a. Passenger boarding bridge wheels and tires shall be of sufficient width and surface quality to preclude damage to apron pavement and shall be designed to operate on Portland cement or asphalt pavement.

   b. The tires shall be solid rubber with treads suitable for use by passenger boarding bridges. Tires shall be manufactured of a rubber compound that will not chip or fray at the edges, and not be affected or damaged due to contact with oil, lubricating and hydraulic fluids, and/or fuels from aircraft and servicing equipment, including Skydrol hydraulic fluid.

   c. Each tire shall be rated for wheel loading under full dead and live loading.

   d. Only the wheel to axle hub bolts/nuts shall be able to be removed while the wheel is mounted on the wheel bogie. This shall preclude accidentally loosening the tire from the rim while still mounted on the wheel bogie assembly.

   e. The wheel and tire changing procedures shall be specified in the Maintenance Manual.

   f. Solid rubber tires shall have a projected life of more than 10 years.

I. Brackets for Equipment Mounting:

1. Provide factory installed mounting brackets for GPU, PCA unit, and Automatic Docking System Controls. Coordinate bracket requirements with manufacturer of each unit.

J. Controls:

1. Control Station General Requirements:

   a. Passenger boarding bridge shall be controlled by an Allen-Bradley programmable logic controller (PLC).

   b. The PBB shall have the ability to communicate via Ethernet and transmit data (including systems status and operational information) to a building management system. The unit shall also have the ability to communicate directly with the 400-Hz GPU and the pre-conditioned air unit to obtain data from each. The PBB shall have the ability to transmit this data to a building management system. Coordinate communication requirements with the 400-Hz GPU and pre-conditioned air unit manufacturers.

   c. Locate all passenger boarding bridge operator controls on the bridge cab control console in a position that provides maximum operator visibility as the bridge is maneuvered near the aircraft with the cab weather door closed.

   d. Locate the operator control station to provide adequate space for the operator and maintenance access to the electrical control components as required by voltage classification in the National Electrical Code.

2. Control Console: The control console shall be located in the operator compartment and protected from the outside environment. The control console shall be tamper and theft proof. Provide two door locks, top and bottom, and hold open gas shock or other means to hold the door open. Provide hinged console face and support rod.

a. Provide lighted and labeled controls for all switches and indicators. Console shall have a lamp test button to test all console lamps and alarms. Lamp test shall be enabled in the operator switch "OFF" position only and shall supply power to console lamps.

b. Provide 5-inch LCD monitor mounted in console face and closed-circuit surveillance camera mounted under bridge near rotunda column to view under bridge area and passenger boarding bridge wheels from the operator control station.

c. Provide a diagnostic touchscreen with accessory controls and indicators, mounted in console face to provide the operator with a graphical user interface to the PLC controls, and to provide authorized personnel access for setting limits, diagnostics, viewing trouble logs, etc. Motion controls shall not be by touchscreen.

d. Controls: All passenger boarding bridge motion controls shall be the momentary contact (deadman) type. All motion controls shall be located to be relative to the function of the passenger boarding bridge being controlled (i.e., with raise and lower functions, the "RAISE" push button will be located above the "LOWER" push button). The control console includes the following control switches and indications.

(1) Master Key Switch, Off/Operate/Auto (Automatic Leveling), with key only removable in the "Off" or "Auto" position.

(2) Power On (Green illuminated) (Black Button).

(3) Emergency Stop (Red Mushroom Button lit when depressed).

(4) Lamp Test (Black Button).

(5) Cab Rotate Left and Right (White illuminated) (Black Button).

(6) Canopy Up/Down Left Side (White illuminated) (Green Button/Arrow).

(7) Canopy Up/Down Right Side (White illuminated) (Green Button/Arrow).

(8) Cab Floor in Auto On/Off (White illuminated) (Black ON Button, Red OFF Button).

(9) Cab Floor in Manual Tilt Left or Right (White illuminated).

(10) Travel Warning Bell (Blue Button).

(11) Steering Left or Right (White Illuminated) (Blue Button/Arrow).

(12) Forward or Reverse Spring Loaded 2-way Joystick.

(13) Vertical Up or Down (White illuminated) (Blue Button/Arrow).

(14) Flood Lights On/Off (White illuminated) (Black ON Button, Red OFF Button).

(15) Ventilator On/Off (White illuminated) (Black ON Button, Red OFF Button).

(16) 400-Hz On/Cable Deployed Flashing Light (Red lens illuminated) (Horizontal drive interlock applied).

(17) Lift Column Fault (Red illuminated).

(18) Canopy Down (Red illuminated).

(19) Auto Level On (Amber illuminated).

(20) Auto Level Alarm for Auto Level Failure (Red illuminated with audible alarm).

(21) Swing Limit Warning (Red illuminated with audible alarm).

(22) Swing Digital Readout (Black Button).

(23) Height Meter and Swing Read Meter (LED).

(24) Wheel Position Indicator, showing arrow and wheels.

(25) Preconditioned Air in Use Flashing Light (Green). (Horizontal drive interlock applied).

(26) Bridge Precooling/Preheating On/Off (White illuminated) (Black ON button, Red OFF button).

e. Labeling: All switches and/or push buttons shall be labeled. Each function shall be spelled out (i.e. "Canopy", "Extend", "Retract").

f. Warning devices (unless otherwise noted, see indication method above):

(1) A cab floor height indicator shall show when the cab floor elevation is at the proper height (theoretically correct) for each aircraft to be serviced.

(2) A wheel position indicator shall show the orientation of the wheels along with the true tunnel centerline, regardless of the cab's rotational position.

(3) An amber light to indicate that the auto level function is energized and operating.

(4) An auto level malfunction shall be indicated with a red light and shall be accompanied by an audible warning.

(5) A swing limit reached shall be indicated on the HMI, or with a red light on the console.

(6) A red light shall indicate when the aircraft closure is in the down position (aircraft closure must be retracted before the bridge can be moved).

(7) For electro-mechanical vertical drive systems, a red light shall indicate a lift column malfunction has occurred.

(8) A light shall indicate if the cab floor de-icer is on or off (if applicable).

(9) If a pushbutton type switch is used, a light shall indicate if the adjustable cab floor is in the automatic or manual mode.

(10) Switch On/Off with light for the rotunda roof mounted exhaust fan.

(11) Warning flashing 60W amber rotating beacon under cab when bridge is in Operation Mode only.

(12) 110 Volt Travel Alarm Bell (98 decibels at 10 feet).

g. Preconditioned Air Handling Unit Precool/Preheat: Provide controls to allow the operation of the precool/preheat function of the preconditioned air unit in conjunction with the rotunda ventilator. Coordinate controls with the preconditioned air unit manufacturer.

3. Hydraulic Manual Control System for Emergency Use: Each passenger boarding bridge that uses a hydraulic motion or lift control system shall be equipped with a manual control (dead man type) system to permit bridge operation at ground level in the event of a complete control system failure. The controls shall be located in a safe area so the operator has a clear unobstructed view of the aircraft spacer interface, and the passenger boarding bridge will not injure the operator in any way while manually maneuvering the passenger boarding bridge at ground level.

4. Interlocks:

a. For 40 Hz, cable hoist, water cabinet hoses and PC Air units installed to serve the passenger loading bridge, the units shall be interlocked with the bridge control circuit so that the bridge cannot be moved away from the aircraft while these units are in operation and the cable hoist is not in the full UP position.

b. Alarms shall be activated in the area of the loading bridge operator console, in the event that the bridge motion controls are activated if either of the above mentioned conditions exist.

c. It is the responsibility of the Passenger Loading Bridge manufacturer to ensure the compatibility of all bridge controls to be monitored via the Airport System Building Management System (BMS).

d. The PBB manufacturer must coordinate with the PCA and 400 Hz supplier to monitor all vital functions of operations for each piece of equipment and integrate into the BMS.

e. Recommended monitoring points will be submitted for review and consideration. Note: The airport reserves the right to change and/or modify each point for monitoring.

f. The PBB shall interlock and be compatible with the visual Docking Guidance System (VDSS) so as to notify the BDGS System if the PBB is not in a safe position to allow aircraft docking.

g. General: The control system logic shall preclude damage to circuits or mechanical systems due to simultaneous contrary control signals or an otherwise unsafe control signal combination.

h. Contrary Control Signal Interlock: All boarding bridge motion shall be precluded whenever contrary control signals (i.e., extend and retract) are activated simultaneously.

i. Control Console Doors: Provide manually overridable safety interlock switches on all control console doors; upper console, console face and console front door.

j. Canopy Interlock: Interlock shall prevent all forward or reverse horizontal drive operation when canopy is lowered. All passenger boarding bridge motion, except auto-leveling, shall be possible only when the canopy is in a

fully retracted position. Provide for a dead man-type mechanical override to permit the retraction only in case of mechanical emergency or bridge failure with the canopy not in the fully retracted position.

k. Auto-level Interlock: No bridge movement shall be allowed other than that signaled by auto-level operation when bridge is in "AUTO" mode.

l. PCA Interlock: Interlock shall prevent horizontal motion when PCA is operating. The control console shall be equipped with flashing light to indicate when PCA is operating.

m. 400-Hz Interlock: Interlock shall prevent horizontal drive operation when the 400-Hz unit is engaged or any cable hoist is lowered. The control console shall be equipped with flashing light to indicate when the 400-Hz cable is lowered or the unit is operating when the keyed operator is in "ON" mode.

5. Limit Switches: Electrical limit switches shall be provided on all passenger boarding bridge movement actuator systems, cab spacer and canopy system. These shall include fail-safe proximity limit switches activated near the end of horizontal and vertical travel. These switches shall de-energize their respective actuator systems when contacted.

a. Bridge extension and retraction: Provide three limit switches, one proximity for slow down, one proximity for stop, and one mechanical for ultimate stop.

b. Cab rotation: Provide limit switches to control the extremes of cab rotation.

c. Drive wheel: Provide proximity limit switches to control oversteer of drive wheels.

d. Rotunda rotation: The rotunda shall be equipped with two double throw, double action adjustable limit switches in each direction to control the traversable area of the bridge. If the bridge activates the proximity for stop limit switch, travel in the limited direction shall be disallowed. If the bridge activates the ultimate stop due to failure of the proximity for stop, all power shall be disconnected, stopping the bridge. The limit switch located on the rotunda shall be reset locally by a bypass switch inside the control console.

e. Tunnel slope: Provide slope limit switch that allows tunnel slope to be adjusted from 10% slope up to 10% slope down. If limit switch is activated, travel in the directions of increasing slope shall be disallowed.

f. Cab Spacer: Provide limit switches mounted one on each end and one at the centerline of the front of the spacer to stop the bridge when the spacer contacts the aircraft.

g. Proximity Sensor: Provide proximity sensor to detect when aircraft fuselage is approximately 2 feet away from cab spacer. At this point, the bridge rate of travel shall be slowed to not more than 6 feet per minute. Detection distance shall be adjustable from 0 feet to 6 feet. Sensor shall be rated for outdoor installation.

h. 45-degree Sensors: Provide two additional proximity sensors mounted on side of cab at 45-degree angle to activate slow down and stop functions when bridge is approaching aircraft at an angle. Sensors shall be rated for outdoor installation. Distances shall be set per PBB manufacturer's recommendations.

i. All infrared proximity sensors shall be Sensopart FT 88 series or Perrerl and Fuchs Series 28. Provide metallic shade over each sensor as required to prevent sensor blinding by sunlight. Control system shall be programmed such that sensor trip initiate slow down or stop, as required, such that an inadvertent trip triggered by sunlight will initiate slow down or stop, as required.

j. Bump Sensor: Provide two bump sensors which stop bridge movement when cab is at close proximity to aircraft.

6. Anti-Collision System: Provide proximity sensoring and interlock system to prevent collision of the bridge with aircraft, including wing and engines. Provide primary collision avoidance system to prevent collision of new passenger boarding bridge and existing passenger boarding bridge. Install collision avoidance kit on existing bridge and upgrade existing controls as required. Also install secondary laser collision avoidance system with sensors installed on each bridge as required per PBB manufacturer's recommendations.

K. Cabinet or housing for AC drive packs shall be:

1. Waterproof.

2. Equipped with a service light.

3. Equipped with a thermostatically controlled heat strip.

L. Automatic Leveling:

1. Passenger boarding bridge shall be equipped with an automatic leveling device. The auto-leveling system shall automatically respond to small changes in aircraft elevation that occur during aircraft loading and unloading to maintain a constant relationship between the aircraft floor and the boarding bridge floor.

a. The auto-leveling system shall be engaged when the master key switch is positioned to "AUTO."

b. The leveling system shall not exert any stress on the aircraft.

c. The leveling device actuating mechanism or sensor which contacts the aircraft shall be located on the right side of the cab behind the canopy actuator cover.

d. The leveling system shall function reliably on all aircraft specified regardless of door location, fuselage contour, and aircraft doorsill height and shall allow a range of adjustment of at least six inches up or down from a neutral position.

e. The auto-leveler circuit shall include an adjustable solid-state or PLC sustained travel timer. The timer shall limit the automatic leveler's continuous response in either direction to an adjustable range from 1.6 to 6 seconds. A fault condition shall be identified when the timer has tripped. Upon sensing of a fault condition, all motor power shall be disconnected, and audible and visual alarms shall be energized at the control console which shall be audible at the terminal door.

f. When the timer circuit is interrupted, the vertical lift system shall automatically be locked in position and de-energized, and a vertical travel brake automatically engaged.

M. Lighting:

1. Exterior Lighting:

a. Cab ceiling exterior fluorescent light: Two bulb sealed 48-inch 40W light.

b. Cab undercarriage exterior flood lights: Minimum of two, 150W explosion-proof to illuminate apron ahead of PBB.

c. Tunnel undercarriage flood light: 150W explosion-proof to illuminate drive column wheel bogey area.

2. Interior Lighting: Provide separate lighting circuits for the apron drive passenger boarding bridges and the fixed walkways. Each shall be controlled independently by three-way switches located at the cab and rotunda and each end of the fixed walkway. Lights shall be placed every eight (8) feet maximum in the boarding bridge and fixed walkway or as otherwise required to meet the required illumination level.

a. Fixtures: 2 feet by 4 feet recessed with white anodized aluminum finish or approved equal.

b. Lamps: Cool white, high output, energy saving fluorescent lights, 3 each fixture.

c. Ballast shall be provided for 0ºF cold weather rated applications.

d. Tunnel: Fixtures and lamps as specified above.

e. Rotunda: Fixtures and lamps as specified above.

3. Illumination Level: Intensity of illumination will be measured at the floor.

a. Tunnel, Fixed Walkway and Cab: 28 foot-candles average.

b. Control Panel: 60 foot-candles average. Switched near control panel.

c. Emergency Lighting: 5 foot-candle minimum as measured from the floor-level.

4. Emergency lighting ballast shall be provided in the following locations at a minimum to meet the required illumination level when power is lost. The red power indicating light shall be located in the tunnel light fixture.

a. Rotunda ceiling light.

b. "A" tunnel middle and transition ramp.

c. "B" tunnel middle and transition ramp.

d. "C" tunnel middle and cab.

e. Cab external light.

f. Emergency lighting ballast shall be provided where needed throughout the length of the fixed walkway to meet the required illumination level when power is lost.

5. Emergency Fluorescent Lamp Power Supply: Provide self-contained battery powered inverter unit for direct mounting in designated fluorescent fixtures. Provide unit with 120Vac input, fully automatic two rate charger, nickel-cadmium battery, automatic low voltage battery disconnect, AC "ON" pilot light, and test switch. Unit shall automatically transfer to battery supply on loss of normal AC power and operate one fluorescent lamp with a minimum output of 1100 lumens for 1-1/2 hours.

6. All lighting fixtures shall have adequate access for lamp replacement and fixture cleaning.

7. Provide electrical circuit for lighted sign mounted on exterior of cab indicating gate number.

N. Windows: Provide windows as follows:

1. Cab: Provide clear safety glass to permit operator at control console full view of the aircraft contact area. Provided a wire reinforced safety glass window to the left side of the control station.

2. Cab roll-up side curtains: Provide two wire-reinforced glass windows in every panel. The windows shall be in the low normal positions on the right side and high normal position on the left side.

O. Utilities:

1. Telephone Service: The apron drive bridge telescoping tunnels shall be fixed with an under-bridge, 4-pair 22-AWG armored sheath with PVC jacket flex cable telephone service from cab to rotunda. Connect from the boarding bridge to service provided at the exterior terminal wall. Terminate conductors in outlet in cab. An outlet for the installation of telephone equipment shall be provided on left side wall adjacent to the control console approximately 54 inches above the floor. Gate user will provide the phone.

2. Convenience Outlets: Ground Fault Circuit Interrupter (GFCI) duplex outlets (unswitched 120V, 1 phase, 20 Amp) shall be located as indicated below and shall be supplied by 20A circuit breakers dedicated to receptacles only:

a. Terminal end of fixed walkways.

b. Every 25 feet of fixed walkway length.

c. Rotunda.

d. Aircraft end of "A" tunnel.

e. Aircraft end of "B" tunnel.

f. Left side wall of the cab, adjacent to the operator's control console.

g. Drive column wheel carriage crossbeam.

h. Roof near lift columns.

i. Near rotunda column.

3. Power: The apron drive bridge telescoping tunnels shall be equipped with an under-bridge cable carrier transport system, for the power transmission cables to the 400-Hz frequency converter, boarding bridge, and preconditioned air unit.

4. Smoke Detector Alarm Signal: Provide smoke detector with dry contacts to close on alarm and provide #16 AWG, 2-conductor wire across the boarding bridge and fixed walkway to communicate the dry contacts back to a junction box near the terminal wall.

5. PCA Condensate Return: The apron drive bridge telescoping tunnels shall be equipped with an under-bridge flexible tubing condensate return line with a minimum diameter of 3/4-inch. Provide sufficient tubing length to reach termination points at the rotunda column and connect to the preconditioned air

unit. The bridge manufacturer shall coordinate with the PCA manufacturer regarding locations and connection methods. The condensate return line shall deliver condensate from the PCA unit mounted behind drive wheels to the boarding bridge rotunda column where it will be discharged into an apron-mounted hub drain. Condensate return line shall be capable of "drain-down" for winterization.

2.07 A380 UPPER DECK SERVICE:

A. Provide features necessary for passenger boarding bridge to serve the upper deck U1 door of the Airbus A380 aircraft where indicated on the Drawings.

B. Passenger boarding bridge manufacturer shall be responsible for designing and providing all features necessary for the passenger boarding bridge to safely and successfully service the A380 U1 door. Passenger boarding bridges serving the A380 U1 door shall meet all of the requirements of these Specifications and the Drawings, except as otherwise necessary for the passenger boarding bridge manufacturer to provide a safe and successful product. Any features necessary that deviate from these Specifications or the Drawings shall be identified by the Bidder in their Bid Documents.

C. Features for passenger boarding bridges serving the A380 U1 door shall include, but not be limited to:

1. Provide infrared proximity sensors including 45-degree sensors in accordance 2.6 I.5, g-i. Upgrade control system as required to accommodate new sensors.

2. Provide collision avoidance system to prevent collision with adjacent passenger boarding bridges and collision with aircraft, including wing and engines. Provide all equipment necessary for primary and secondary collision avoidance system as described in 2.6, I.6.

3. Canopy or cab spacer modifications as necessary.

4. Vertical and horizontal drive modifications as necessary.

5. Additional video systems as necessary for safe operation.

6. Provide means to stabilize the bridge, such as outriggers on the wheel bogie.

2.08 ACCESSORIES:

A. Ventilator: Provide a 3,000 cfm power ventilator installed on the roof of the rotunda for use with bridge precooling/preheating. Ventilator shall be equipped with a back draft damper.

1. Provide switches in the fan housing and on the console.

2. Provide smoke detector in cab above the console to automatically shutdown the ventilator in event of a fire and send signal to main building fire alarm system.

B. Provide tunnel ice scrapers that ride on "A" and "B" tunnels.

C. Mirrors: Provide two 18-inch circular convex safety mirrors with stainless steel backing. Locate on the left side of the cab to enable the operator to have view of the apron and drive wheels and on service platform railing to allow operator to view the bottom of the service stairs from the control console.

D. Handrails: Interior tunnel handrails shall be ADA compliant (1-1/4" to 1-1/2" O.D.), mounted at a height of 34" to 38" above floor surface, with a clearance from the

sidewall of 1-1/2" and with return ends. Handrails shall be brushed aluminum. Provide handrails in the following locations:

1. Fixed walkway full length on both sides. Handrails are to be installed continuously including where walls are skewed.
2. Transition ramp areas, both sides of the tunnel. The handrail shall extend over the transition ramps and shall be sloped at a uniform dimension above the ramp.
3. Cab and tunnel roof handrails to provide OSHA-approved access to serviceable roof accessible components.

E. Passenger boarding bridge precooling/preheating grille and duct connection to preconditioned air unit. Grille shall be mounted as far forward (toward cab end of tunnel) as possible in order to allow precooling/preheating with the bridge fully retracted. Coordinate location, size, and other requirements with preconditioned air handling unit manufacturer.

F. A-Frame: Provide two service A-frame structures suitable to straddle and support the boarding bridge from the ground. It shall be designed to support the weight of the bridge for servicing undercarriage components, and the cab lifting mechanisms. Furnish all cables, chains, and hoists as required to raise/lower the boarding bridge for service. The A-frame shall be delivered prior to Substantial Completion.

G. Tow Bar: Provide two tow bars designed and constructed to be stored, transported and connected to the boarding bridge undercarriage for towing of a disabled unit. Tow bars shall be configured for connection to a standard height hitch on a pickup truck.

H. Gate Sign: Provide gate sign mounted on right side of cab, complete with photocell mounted under cab, wiring and circuit overcurrent protection and disconnect. Provide a flat, framed illuminated gate sign for high visibility. The terminal letter and gate numbers shall be 12 inches high each, black on white background. The gate sign shall be highly visible to approaching aircraft from any angle at a distance. The gate sign shall be lighted for visibility at night and 115Vac power shall be provided and connected by boarding bridge manufacturer.

2.09 AUXILIARY SYSTEMS COORDINATION AND PROVISIONS:

A. 400 Hertz System:

1. The Contractor shall provide all necessary mounting provisions (i.e., drilled holes and any necessary reinforcement) for the 180 kVA, 400Hz point-of-use unit and cable hoists on the side of the PBB.
2. The Contractor shall coordinate mounting provisions for the 400 Hz power equipment and insure the required mounting provisions are factory installed and finished prior to delivery of the PBB.
3. The 400 Hz unit size will be rated at 180 kVA and combined with 28.5Vdc Unit where indicated.
4. The Contractor shall provide structural mechanism and all electrical cables to support and operate 400 Hz/28.5Vdc units on the side of the loading bridge, C Tunnel.

B. Preconditioned Air System (PCA):

1. The Contractor shall provide all required mounting provisions (i.e., drilled holes and any necessary reinforcement) for the PCA air handling unit, air duct, hose

basket, bridge pre-conditioning grilles and duct, thermostats, and switches and provide a 3000 cfm rooftop ventilator unit mounted on the roof of the rotunda. The PC Air unit shall be bridge-mounted on a support frame.

2. Control wires from a terminal box under the cab near the lift column to a terminal box on the face of the rotunda rigid frame shall be factory installed. Control wires shall include two (2), twisted shielded pairs, #18 AWG and 20 #18 insulated conductors suitable for 24Vac or DC, all rated and routed as Class II control wiring.

3. The cabin temperature sensor wall plate in the bridge cab shall be factory installed.

4. Mounting provisions for all PCA equipment shall be factory installed and finished prior to delivery of the PBB.

5. The Contractor shall provide structural mechanism and all electrical cables to support and operate PCA units.

C. Existing Gate F3 Collision avoidance system:

1. Provide collision avoidance system on the existing F3 PBB to prevent collision with adjacent PBB and collision with aircraft, including wings and engine. Provide all equipment and controls upgrades necessary.

2. Provide infrared proximity sensors including 45-degree sensors. Upgrade existing bridge control system as required to accommodate new sensors.

2.10 FINISHES:

A. All interior and exterior surfaces shall be protected and free of corrosion.

B. Exterior Paint System: All exterior steel surfaces shall be protected from corrosion by the following.

1. Surface Preparation: Contaminants shall be removed from surfaces in accordance with SSPC-SP1 (Solvent Cleaning) requirements and commentaries. Exterior steel surfaces shall be dry abrasive blast cleaned in accordance with SSPC-SP6 (Commercial Blast Cleaning) at 1.5-2.0 mils profile depth. All sand, grit and dust shall be blown free of all surfaces and crevices prior to painting.

2. First Coat: Chromate-free epoxy primer, total dry film thickness of 5 mils over the entire surface.

3. Second Coat: Catalyzed polyurethane enamel, total dry film thickness 2 mils minimum.

4. Third Coat: Catalyzed polyurethane enamel, total dry film thickness 2 mils minimum. Color in accordance with list below.

5. Total exterior dry film thickness: Nine (9) mils minimum.

C. Exposed Interior Paint System:

1. Surface Preparation: Contaminants shall be removed from surfaces in accordance with SSPC-SP1 (Solvent Cleaning) requirements and commentaries. Exposed interior steel surfaces shall be cleaned in accordance with SSPC-SP3 (Power Tool Cleaning) at 1-3 mils profile depth. The cab surface shall be dry abrasive blast cleaned in accordance with SSPC-SP6 (Commercial Blast Cleaning) at 1-3 mils profile depth.

2. First Coat: Chromate-free epoxy primer, total dry film thickness of 5 mils over the entire surface.
3. Finish Coat: Catalyzed polyurethane enamel, total dry film thickness of 3 mils minimum. Color in accordance with list below.
4. Total interior dry film thickness: Eight (8) mils minimum.

D. Non-Exposed Interior Paint System:

1. Surface Preparation: Contaminants shall be removed from surfaces in accordance with SSPC-SP1 (Solvent Cleaning) requirements and commentaries. The minimum surface preparation for all non-exposed interior surfaces shall be in accordance with SSPC-SP3 (Power Tool Cleaning) at 1-3 mils profile depth.
2. Primer Coat: Rust inhibitive chromate free primer, total dry film thickness of 1-2 mils over the entire surface.

E. Exterior colors and finishes shall be as follows:

1. Tunnels, cab, top, sides, underside: Custom color as selected by Architect (likely silver or light gray).
2. Cab curtain side covers: Custom color as selected by Architect.
3. Service stairs and landing: Galvanized steel.
4. Upper lift column section, inner and outer tubes, lower drive column section and rotunda support column below the bearing: Custom color as selected by Architect.
5. Aircraft closure hood & side skirts: Custom color as selected by Architect.
6. Cab area forward of the cab doors, actuator covers and the outside door face: Manufacturer's standard cover.

F. Interior colors and finishes shall be as follows:

1. Wall trim: Aluminum/black centers if applicable.
2. Tunnel end trim: Custom color as selected by Architect.
3. Ceiling to wall trim: Black.
4. Kick plate: Black.
5. "B" and "C" Tunnel Rain Gutters: Aluminum.
6. Carpet molding: Aluminum.
7. Cab and bubble floor: Black ribbed rubber.
8. Ceilings: White.
9. Rotunda & cab walls: Custom color as selected by Architect.
10. Rotunda and cab galvanized curtains shall not be painted.
11. Carpet: Purchased by PBB manufacturer, installed in plant. Custom Atlanta DOA logo carpet, color to be selected by Architect. See attached data sheets for approved manufacturers' of logo carpet.
12. Interior Tunnel Walls:

a. Interior wall treatment shall consist of steel or aluminum panels or 7/16-inch (minimum) wall panels laminated on both sides to prevent bowing, four feet on centers with aluminum trim and recessed black accept strips. Provide water drain holes in the bottom J-channel.

13. Interior Floor:

a. Tunnels and rotunda floors shall be constructed of minimum 3/4-inch marine grade plywood A-B, seven-ply minimum or galvanized steel.

b. The cab bubble area floor shall be constructed of 3/4-inch minimum marine grade plywood A-B, seven-ply minimum with outside edges sealed with fiberglass resin, or galvanized steel.

c. The exterior cab floor shall be constructed of aluminum or galvanized steel.

d. Transition ramps shall be constructed of 1-1/8-inch marine grade plywood A-B or galvanized steel. Transition ramps shall be hinged. "A" tunnel ramp shall be full width of tunnel. Nosing on ramps shall have abrasive anti-skid aluminum surface. Ramps shall not cut or mark the tunnel floor the ramp is riding over. Ramps shall be covered with 1/4-inch ribbed fire-resistant black rubber with anti-skid surface and yellow chamfered edge.

e. Tunnels and rotunda floors, except as noted, shall be carpeted. Carpet shall be supplied by the Contractor and factory installed by boarding bridge manufacturer. Provide 1-1/2-inch wide carpet bar screwed into the floor between carpet and ribbed rubber in the cab.

f. Cab Floor Finish: One-quarter inch ribbed fire-resistant black rubber with anti-skid surface shall be installed from terminal side of service door to the aircraft spacer assembly. Rain gutter ends, door threshold and rubber matting seams shall be sealed with black silicone. Ribs shall be oriented perpendicular to tunnel centerline.

14. Architectural Metal and Trim Items: Anodized aluminum or stainless steel with satin finish.

15. Paints and carpet adhesives shall have a maximum VOC of 3.5 lbs./gal for field applied applications or as otherwise limited by local regulations. Stated VOC shall be unthinned maximum as certified by the manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:

1. The Contract Documents do not indicate the location of each aircraft position at each gate. The Contractor shall be responsible for verifying all locations of aircraft positions for the aircraft indicated on the Aircraft Gate Usage Schedules and advise the Owner's Representative of any conflict or code violations prior to beginning the fabrication of the passenger boarding bridges. Any modification to the Documents as necessary to eliminate conflicts or code violations will be made by the Owner's Representative.

2. Verify the exact Terminal Building door sill and bridge and fixed walkway foundation elevation, and foundation bolt condition, size, and patterns, and all dimensions at each gate prior to fabrication and installation.

3. Verify apron elevations at each bridge and fixed section location. Coordinate these elevations with the bridge operation requirements, layout and maximum slope.

4. Notify the Owner's Representative of any discrepancies with Contract Documents, passenger boarding bridge, or fixed walkway requirements.

B. Pre-Installation Conference:

1. Before commencing passenger boarding bridge installation, conduct a pre-installation conference at the Project Site with the passenger board bridge system manufacturer, installer, Owner's Representative, and other interested parties to review procedures, schedules, and coordination of the passenger boarding bridge and fixed walkway installation with other elements of the Work.

3.02 INSTALLATION

A. Structural Support Elements:

1. All anchor bolts shall be protected from bending and damage during construction. Provide anchor and leveling nuts. Nuts shall meet the requirements of ASTM A449 and shall be galvanized. All zinc coating damaged shall be cleaned and repaired with galvanizing repair primer meeting the requirements of Federal Specification TT-P-641 G (1), Type II.

2. An approved non-shrink grout shall be used underneath the column base plate and leveling-plate. Grout shall be a no-iron mix to avoid rust marks. Grouting of the rotunda base plate shall be formed and poured using the holes in the base plate. Grouting by dry packing and filling the center area with bags and blocks will not be acceptable. The grouting shall be done to American Concrete Institute or structural standards and as approved by the Owner's Representative.

a. Grout shall be 3 inches minimum and 7 inches maximum, and within grout manufacturer's recommended thickness range.

b. Setting of rotunda requires a leveling nut and washer on each anchor bolt on the underside of the rotunda or fixed walkway base plate and two nuts and one washer on the top.

3. Carpet Installation:

a. Prior to installation, verify with the Owner's Representative all edging techniques, lines of demarcation between carpeted and hard surfaced floor and wall areas, and treatment at doors and thresholds.

b. Install the carpet by direct glue down method, free of wrinkles. Adhesive and primer shall be compatible.

c. Install edge strips where carpeting abuts other flooring including door openings where thresholds are not indicated. Secure edge strips with countersunk flat head stainless steel screws at 12 inches o.c. maximum.

d. Finished appearance shall be smooth, level, free from misalignment, neatly cut and closely fitted at projections and openings, with joints as close and inconspicuous as possible.

e. Remove spots immediately with cleaner or solvent recommended by carpet manufacturer.

f. Vacuum the carpet and cover with non-staining, protective materials.

g. After the carpet installation is complete, clean all drains, gutters and rain diverters to remove any excess material, construction debris and carpet cutouts, to provide an unobstructed free flowing drainage system.

3.03 FIELD QUALITY CONTROL

A. Tests: Perform all Field Performance Tests as required by NFPA 415 and to meet the requirements of SECTION 01810 - COMMISSIONING.

B. Inspection:

1. Preliminary Inspection:

a. Manufacturer's representative shall perform a functional inspection and demonstration of each PBB at the installation site in the presence of the Owner's Representative.

b. Verification of compliance with this Specification shall be accomplished by inspection, review of data, demonstration, testing, or combination of these.

c. PBB shall operate smoothly and quietly. Any jerking or noise shall be remedied by PBB adjustment and/or lubrication as recommended by the manufacturer.

2. Final Acceptance Inspection:

a. Owner's Representative Commissioning Agent shall perform the final system verification testing and inspection of the PBBs after full compliance by the Installing Contractor and manufacturer of all outstanding punch list items as determined from the preliminary inspection and meeting the requirements of SECTION 018100 - COMMISSIONING.

b. Full acceptance of the unit shall be made in writing to the Contractor after satisfactory completion of all punch list items as determined by the Owner's Representative and Commissioning Agent.

C. Manufacturer's Field Services:

1. Provide qualified manufacturer's technical representative and service personnel during the entire installation of the boarding bridge to assure a proper installation, and to ensure adequate and reliable field service support to correct any and all equipment failures that may occur during the initial operating period. This representation shall be available to the Owner's Representative at no charge for the first 60 days after installation. The manufacturer's field service representative shall ensure the installer follows:

a. The manufacturer's field installation manual.

b. Compliance with all safety requirements.

c. Accurate and complete reports and records maintenance.

d. Latest service bulletins.

3.04 DEMONSTRATION

A. Training Requirements:

1. The Contractor shall conduct training utilizing prepared texts, slides, actual boarding bridges, and other instructional aids as appropriate.

2. Provide a minimum forty (40) hours of operator and forty (40) hours of maintenance training by a qualified manufacturer's representative for the boarding bridges purchased under this Contract. Each type of training shall be divided into at least 5 separate sessions.

   a. Training shall be conducted at the installation site and in classrooms as designated and provided by the Owner's Representative.

   b. Maintenance training shall include proper demonstration of cut-away models of critical parts, full instruction of proper maintenance and trouble shooting, and instructions on proper use of manuals. Operator training shall include proper demonstration as well as actual use of correct bridge operations to avoid damaging the equipment by improper use of the controls.

   c. Training dates shall be mutually agreed upon by the Contractor and the Owner's Representative and shall be at dates prior to scheduled commercial service of the boarding bridges.

3. The Owner's Representative will assign the individuals and/or companies to be trained.

4. Provide six (6) sets of DVDs of complete video recorded training sessions conducted for this Project.

5. Training shall be accomplished in accordance with Closeout Procedures, SECTION 017700.

END OF SECTION 347713

EXHIBIT F; INDEX OF DRAWINGS

CITY OF ATLANTA
DEPARTMENT OF AVIATION
HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

FC-8075

F3 A360 RECONFIGURATION

EXHIBIT "F" – INDEX OF DRAWINGS

The following drawings form a part of the contract:

DRAWING NO. DRAWING TITLE

GENERAL	
G000	COVER SHEET
G002	GENERAL NOTES & SYMBOLS
G100	DRAWING INDEX
G200	LOCATION PLAN W HAUL ROUTE AND CONTROL NOTES
G201	SCOPE LIMITS
G202	CONSTRUCTION PHASING & SEQUENCING DIAGRAM
G204	OCCUPANCY/EGRESS DIAGRAM - LIFE SAFETY PLAN
CIVIL	
C101	EXISTING CONDITIONS PLAN
C102	OPERATIONAL PLAN
C103A	PAVEMENT MARKING PLAN
C103B	PAVEMENT MARKING PLAN
C103C	PAVEMENT MARKING PLAN
C103D	MARKING DETAILS
C104	DEMOLITION PLAN
C105A	PAVING PLAN
C105B	EXISTING APRON UTILITIES MODIFICATION PLAN
C106A	CIVIL DETAILS
C106B	CIVIL DETAILS
C201	AIRCRAFT LAYOUT PLAN
C202	ARRIVAL MANEUVER PLAN
C203	DEPARTURE MANEUVER PLAN
C204	PASSENGER BOARDING BRIDGE PLAN AND SCHEDULE
C205	AIRCRAFT SYSTEM DETAILS
C206	AIRCRAFT DOCKING SYSTEM NOTES, LEGEND, & ABBREVIATIONS
C207	AIRCRAFT DOCKING SYSTEM AND EFSO ELECTRICAL PLAN
C208	AIRCRAFT DOCKING SYSTEM DETAILS & SCHEDULES
C209	EFSO SYSTEM DETAILS

STRUCTURAL	
S001	STRUCTURAL GENERAL NOTES
S002	STRUCTURAL GENERAL NOTES
S010	AXONOMETRIC VIEW
S101	PLANS -- DEMO & PROPOSED - ARRIVALS LEVEL
S102	PLANS -- DEMO & PROPOSED - APRON LEVEL
S103	PLANS -- DEMO & PROPOSED - DEPARTURES LEVEL
S104	PLANS -- DEMO & PROPOSED - LOW ROOF
S301	SUBSTRUCTURE TYPICAL DETAILS
S302	SUBSTRUCTURE DETAILS
S303	SUBSTRUCTURE DETAILS
S304	SUBSTRUCTURE DETAILS
S305	SUBSTRUCTURE DETAILS
S306	SUBSTRUCTURE DETAILS
S310	SUPERSTRUCTURE SECTIONS AND DETAILS
S401	SUPERSTRUCTURE TYPICAL DETAILS
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S403	SUPERSTRUCTURE DETAILS
S410	BUILDING SECTIONS
S501	COLUMN SCHEDULE AND DETAILS
S601	BEAM SCHEDULE AND DETAILS
S602	CONCRETE BEAM SCHEDULE
ARCHITECTURAL	
A100	PLANS- DEMO, PROPOSED & REFLECTED CEILING - ARRIVALS LEVEL
A101	PLANS- DEMO, PROPOSED & REFLECTED CEILING- APRON LEVEL
A102	PLANS- DEMO, PROPOSED & CEILING - DEPARTURES LEVEL
A103	PLANS - DEMO, PROPOSED & REFLECTED CEILING PLAN - ROOF LEVEL
A200	PLAN - FINISH FLOOR - ARRIVALS-DEPARTURES
A201	PLAN - FINISH FLOOR - APRON LEVEL
A400	ENLARGED PLANS - ARRIVALS
A401	ENLARGED PLANS - APRON LEVEL
A402	ENLARGED PLANS - DEPARTURES LEVEL
A403	ENLARGED PLANS - EGRESS STAIR
A404	ENLARGED PLANS - COMMUNICATION STAIR
A405	ENLARGED PLANS - TEMPORARY SPACE
A501	EXTERIOR ELEVATIONS - EAST - DEMO-PROPOSED
A502	EXTERIOR ELEVATIONS - NORTH & SOUTH
A600	INTERIOR ELEVATIONS - ARRIVALS LEVEL
A601	INTERIOR ELEVATIONS - ARRIVALS LEVEL
A602	INTERIOR ELEVATIONS - LINE OFFICE WEST
A603	INTERIOR ELEVATIONS - APRON LEVEL

A604	INTERIOR ELEVATIONS - DEPARTURES LEVEL
A605	INTERIOR ELEVATIONS - DEPARTURES LEVEL
A701	BUILDING SECTIONS - EAST
A702	BUILDING SECTIONS - WEST
A703	BUILDING SECTION - NORTH
A704	BUILDING SECTIONS - NORTH
A721	EXTERIOR WALL SECTIONS
A722	EXTERIOR WALL SECTIONS
A801	EXTERIOR WALL SECTION DETAILS
A802	EXTERIOR WALL SECTION DETAILS
A803	EXTERIOR WALL SECTION DETAILS
A804	EXTERIOR WALL SECTION DETAILS
A805	EXTERIOR WALL SECTION DETAILS
A810	EXTERIOR WALL SECTION DETAILS - BLOW UP
A811	EXTERIOR WALL SECTION DETAILS - BLOW UP
A820	EXTERIOR PLAN DETAIL - ARRIVAL LEVEL
A821	EXTERIOR PLAN DETAIL - APRON LEVEL
A822	EXTERIOR PLAN DETAIL - APRON LEVEL
A823	EXTERIOR PLAN DETAIL - DEPARTURES LEVEL
A824	EXTERIOR PLAN DETAIL - DEPARTURES LEVEL
A830	EXTERIOR PLAN DETAIL - BLOW UP
A831	EXTERIOR PLAN DETAIL - BLOW UP
A910	INTERIOR PARTITION SYSTEM DETAILS
A920	INTERIOR FLOORING SYSTEM DETAILS
A930	DOOR AND ROOM FINISH SCHEDULE
A931	INTERIOR OPENING SYSTEM DETAILS
A940	INTERIOR CEILING SYSTEM DETAILS
A941	METAL PANEL CEILING SYSTEM
A951	STAIR & RAILING SYSTEM DETAILS
A952	INTERIOR MILLWORK DETAILS
A953	INTERIOR MILLWORK DETAILS
A954	INTERIOR MILLWORK DETAILS
A955	INTERIOR PLAN DETAILS
A956	INTERIOR SECTION DETAILS
SIGNAGE	
AG100	ARRIVALS LEVEL SIGN LOCATION PLAN
AG101	APRON LEVEL SIGN LOCATION PLAN
AG102	DEPARTURES LEVEL SIGN LOCATION PLAN
AG201	SIGNAGE DETAILS
ELECTRICAL/FIRE ALARM	
E000	ELECTRICAL SYMBOL LEGEND, LIGHT FIXTURE SCHEDULE AND GENERAL NOTES
E001	ELECTRICAL LIGHT FIXTURE DETAILS

E100	ARRIVALS LEVEL - ELECTRICAL POWER, LIGHTING AND DEMO PLANS
E100A	ARRIVALS/APRON LEVEL - ELECTRICAL LIGHTING PLAN - SECTION
E101	APRON LEVEL - ELECTRICAL POWER, LIGHTING AND DEMO PLANS
E101A	APRON LEVEL - ELECTRICAL POWER PLAN
E101B	APRON LEVEL - ELECTRICAL DEOM/NEW LIGHTING PLAN
E102	DEPARTURES LEVEL - ELECTRICAL POWER, LIGHTING AND DEMO PLANS
E103	ROOF LEVEL - ELECTRICAL PLAN
E104	ELECTRICAL APRON LEVEL - SWING PLANS POWER
E200	ARRIVALS, APRON, AND DEPARTURES LEVEL - ELECTRICAL FIRE ALARM PLANS
E500	ELECTRICAL DISTRIBUTION AND SWITCHBOARD PANELS AND DETAILS
E501	ELECTRICAL PANELBOARDS
E502	ELECTRICAL DELTA SPACE PANELBOARDS AND DETAILS
E503	ELECTRICAL EXISTING PANELBOARDS AND DETAILS
FIRE-PROTECTION	
F000	ABBREVIATIONS-DETAILS-LEGEND AND GENERAL NOTES
F100	FIRE SUPPRESSION PLANS - ARRIVALS LEVEL
F101	FIRE SUPPRESSION PLANS - APRON LEVEL
F102	FIRE SUPPRESSION PLANS - DEPARTURE LEVEL
MECHANICAL	
M000	HVAC LEGEND AND GENERAL NOTES
M101	HVAC DUCTWORK ARRIVALS LEVEL PLAN
M102	HVAC DUCTWORK APRON LEVEL PLAN
M103	HVAC DUCTWORK DEPARTURES LEVEL PLAN
M104	HVAC ROOF PLAN
M201	HVAC PIPING ARRIVALS LEVEL PLAN
M202	HVAC PIPING APRON LEVEL PLAN
M203	HVAC PIPING DEPARTURES LEVEL PLAN
M400	HVAC SCHEDULES
M500	HVAC DETAILS
M501	HVAC DETAILS
M600	HVAC CHILLED AND HOT WATER PIPING SCHEMATICS
M900	HVAC CONTROLS
PLUMBING	
P000	PLUMBING LEGEND, SCHEDULES, AND GENERAL NOTES
P101	PLUMBING ARRIVALS LEVEL PLAN
P102.D	PLUMBING APRON LEVEL PLAN - DRAINAGE
P102.P	PLUMBING APRON LEVEL PLAN - PRESSURE
P103	PLUMBING DEPARTURES LEVEL PLAN
P104	PLUMBING ROOF LEVEL PLAN
P300	PLUMBING ENLARGED NEW WORK PLANS AND RISER DIAGRAMS

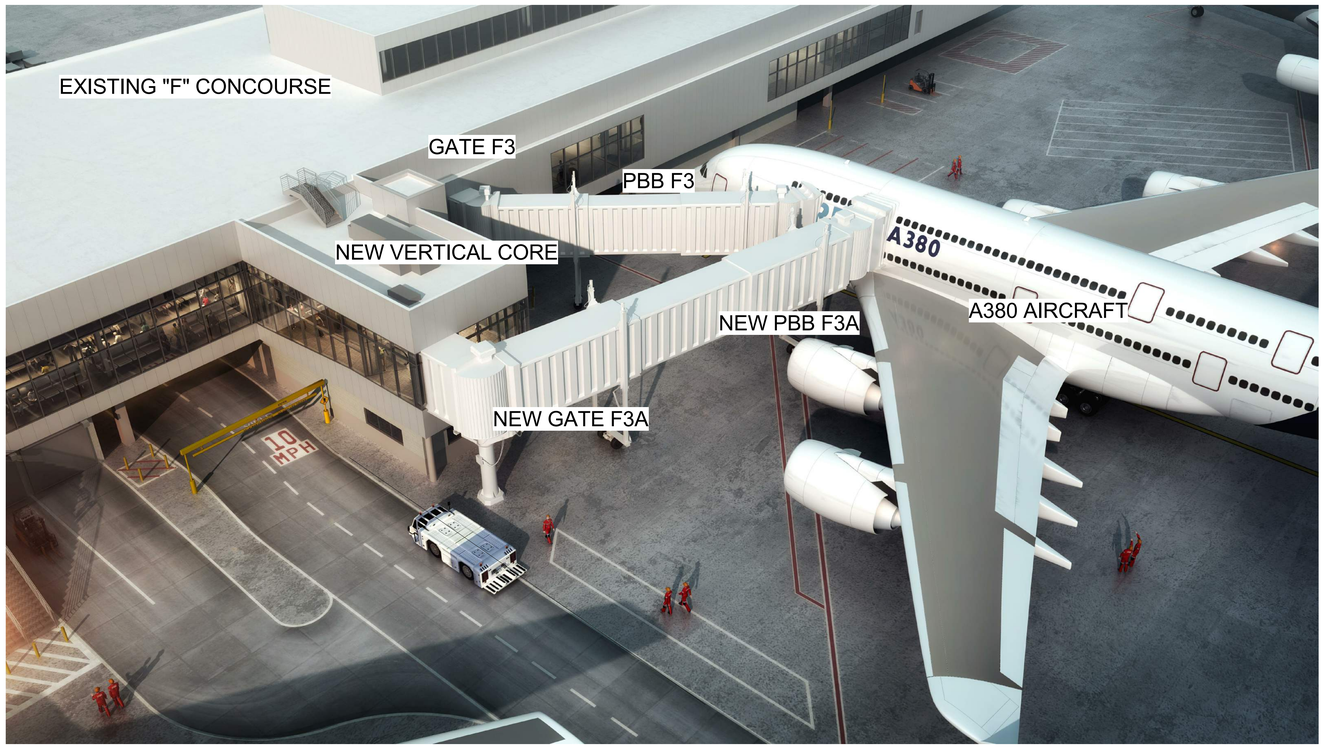
P500	PLUMBING DETAILS
TELECOMMUNICATIONS/IT/SOUND	
T001	COMMUNICATIONS LEGEND AND ABBREVIATIONS
T100	TELECOM FLOOR PLANS DEMO-PROPOSED-RCP ARRIVALS LEVEL
T101	TELECOM FLOOR PLANS DEMO-PROPOSED-RCP APRON LEVEL
T102	TELECOM FLOOR PLANS DEMO-PROPOSED-RCP DEPARTURES LEVEL
T401	ENLARGED IDF ROOM 3514
T402	ENLARGED IDF ROOM 4512
T403	TELECOM SWING SPACE PLAN
T601	CUPPS BLOCK DIAGRAM
T602	MUFIDS BLOCK DIAGRAM
T603	PUBLIC ADDRESS SYSTEM BLOCK DIAGRAM
T605	DISTRIBUTED ANTENNA BLOCK DIAGRAM
T801	SPEAKER MOUNTING DETAILS
T802	REMOTE ACCESS UNIT MOUNTING DETAIL
SECURITY	
TY001	SECURITY LEGEND AND ABBREVIATIONS
TY100	SECURITY FLOOR PLANS DEMO-PROPOSED-RCP ARRIVALS LEVEL
TY101	SECURITY FLOOR PLANS DEMO-PROPOSED-RCP APRON LEVEL
TY102	SECURITY FLOOR PLANS DEMO-PROPOSED-RCP DEPARTURES LEVEL
TY601	ACCESS CONTROL SYSTEM BLOCK DIAGRAM
TY602	VIDEO SURVEILLANCE SYSTEM BLOCK DIAGRAM
TY801	ACS DETAILS
TY802	ACS DETAILS
TY803	VSS DETAILS
VERTICAL TRANSPORTATION	
VT01	GENERAL ELEVATOR INFORMATION
VT02	PLANS AND HOISTWAY SECTION ELEVATOR 1
VT03	WELLWAY PLAN AND SECTION ESCALATOR 1

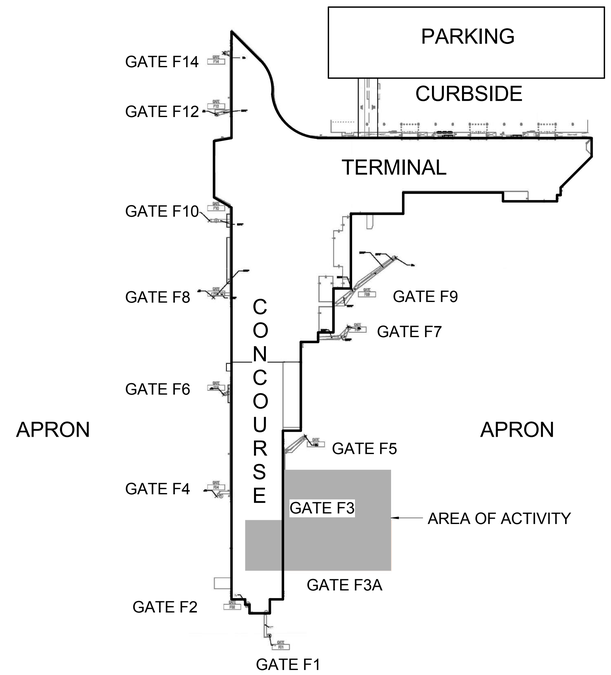
Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE - A380 GATE F3 RECONFIGURATION

WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

BID DOCUMENTS





PROJECT LOCATION -- INTERNATIONAL TERMINAL & CONCOURSE

N
W E
S

DRAWING SERIES (DRAWING INDEX G100)

G - SERIES	-	GENERAL INFORMATION
C - SERIES	-	CIVIL APRON & AIRCRAFT INFRASTRUCTURE/SYSTEMS
S - SERIES	-	STRUCTURAL
A - SERIES	-	ARCHITECTURAL / INTERIORS / FF&E
F - SERIES	-	FIRE PROTECTION
M - SERIES	-	MECHANICAL
P - SERIES	-	PLUMBING
E - SERIES	-	ELECTRICAL / FIRE ALARM
T - SERIES	-	TELECOM
TY - SERIES	-	SECURITY
AG - SERIES	-	SIGNAGE
VT - SERIES	-	VERTICAL TRANSPORTATION

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p

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Sheet Title
COVER SHEET

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number
G000

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LIST OF ABBREVIATIONS

NOTE: ABBREVIATIONS WITH xx SUFFIXES (ex: TLxx) ARE DESIGNATIONS THAT RELATE TO MATERIAL OR SYSTEM TYPES DESCRIBED IN THE PROJECT SPECIFICATIONS (e.g. TL01)

A	
A/C	AIR CONDITIONING
AB	AIR BARRIER
ACC	ACCESSIBLE
ACOUS	ACOUSTICAL
ACxx	ACOUSTICAL CEILING
AD	AREA DRAIN
ADA	AMERICANS WITH DISABILITIES ACT
ADAAG	ADA ACCESSIBILITY GUIDELINES
ADD	ADDITIONAL
ADJ	ADJUSTABLE
ADxx	ACCESS DOOR
AFF	ABOVE FINISH FLOOR
AGGR	AGGREGATE
ALT	ALTERNATE
ALUM	ALUMINUM
ANOD	ANNODIZED
APPD	APPROVED
APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
AUTO	AUTOMATIC
AV	AUDIO VISUAL
B	
B/	BOTTOM OF (SEE OTHER WORD)
BD	BOARD
BGxx	BUMPER GUARD
BLDG	BUILDING
BLK	BLOCK
BRK	BRICK
BSMT	BASEMENT
BUR	BUILT-UP ROOFING
C	
C	CHANNEL
C/C	CENTER TO CENTER
CAB	CABINET
CAT	CATEGORY
CB	CATCH BASIN
CBD	CHALK BOARD
CBU	CEMENTITIOUS BACKER UNIT
CEM	CEMENT
CER	CERAMIC
CGxx	CORNER GUARD
CH	CHILLER
CI	CAST IRON
CIP	CAST-IN-PLACE
CJ	CONTROL JOINT / CONSTRUCTION JOINT
CL	CENTER LINE
CLG	CEILING
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
CNTR	COUNTER
CO	CLEANOUT
COL	COLUMN
CONC	CONCRETE
COND	CONDITION
CONN	CONNECTION
CONT	CONTINUOUS
COORD	COORDINATE
CORR	CORRIDOR
CPTxx	CARPET
CTR	CENTER
CTSK	COUNTERSUNK
CW	COLD WATER (PIPING)
D	
D	DEDICATED CIRCUIT
DA	DISABLED ACCESS
DB	DECIBEL
DBL	DOUBLE
DEG	DEGREE
DEMO	DEMOLITION
DEPT	DEPARTMENT
DET	DETAIL
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DIFF	DIFFUSER
DIM	DIMENSION
DIS	DISABLED
DISP	DISPENSER
DMPF	DAMPPROOFING
DMT	DEMOUNTABLE
DN	DOWN
DO	DOOR OPENING
DP	DEEP, DEPTH
DPTN	DEMOUNTABLE PARTITION
DR	DOOR
DRN	DRAIN
DS	DOWNSPOUT
DW	DISHWASHER
DWG	DRAWING
E	
EA	EACH
EB	EXPANSION BOLT (EXPANSION ANCHOR)
EFS	EXTERIOR FINISH SYSTEM
EIFS	EXTERIOR INSULATION AND FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRICAL
EMERG	EMERGENCY
ENCL	ENCLOSURE
EP	ELECTRICAL PANELBOARD
EQ	EQUAL
EQUIP	EQUIPMENT
EWC	ELECTRICAL WATER COOLER
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
F	
F/	FACE OF (SEE OTHER WORD)
FA	FIRE ALARM
FABxx	FABRIC
FC	FILE CABINET
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FDN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FF	FINISH FLOOR
FF&E	FURNITURE, FINISHES & EQUIPMENT
FH	FLAT HEAD
FHC	FIRE HOSE CABINET
FIN	FINISH
FIXT	FIXTURE
FL	FLOOR
FLUOR	FLUORESCENT
FLxx	FLASHING
FPT	FIRE PROTECTION
FPxx	FIREPROOFING
FR	FRAME
FRTW	FIRE RETARDANT TREATED WOOD
FT	FEET
FTG	FOOTING
FURN	FURNITURE
FURR	FURRING
FWP	FABRIC WRAPPED PANEL
G	
G	GROUND
GA	GAUGE / GAGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR, GENERAL CONTRACT
GFRC	GLASS FIBER REINFORCED CONCRETE
GFRG	GLASS FIBER REINFORCED GYPSUM
GLxx	GLASS
GR	GRADE
GWB	GYPSUM WALLBOARD
H	
HB	HOSE BIBB
HC	HOLLOW CORE
HCP	HANDICAPPED
HDW	HARDWARE
HM	HOLLOW METAL
HO	HOLD-OPEN
HORIZ	HORIZONTAL
HPT	HIGH POINT
HR	HOUR
HRC	HOSE REEL CABINET
HRxx	HANDRAIL
HS	HEAT STRENGTHENED (GLASS)
HSS	HOLLOW STRUCTURAL SECTION
HT	HEIGHT
HVAC	HEATING, VENTILATING, AIR CONDITIONING
HW	HOT WATER
HYDR	HYDRAULIC
I	
ICC	INTERNATIONAL CODE COUNCIL
ID	INSIDE DIAMETER / DIMENSION
IG	ELECTRICAL ISOLATED GROUND
IN	INCH
INCAND	INCANDESCENT
INCL	INCLUDED / INCLUDING
INFO	INFORMATION
INSxx	INSULATION
INT	INTERIOR
INTERM	INTERMEDIATE
INV	INVERT
IPS	INTERNATIONAL PIPE STANDARD
IRMA	INVERTED ROOF MEMBRANE ASSEMBLY
J	
JAN	JANITOR
JC	JANITOR'S CLOSET
JST	JOIST
JSxx	JOINT SEALANT
JT	JOINT
K	
K	KIP (1000 LB)
KG	KILOGRAM
KIT	KITCHEN
KO	KNOCKOUT
KPL	KICK PLATE
L	
L	LONG (OR LITER ON METRIC DOCUMENTS)
LAB	LABORATORY
LAM	LAMINATE / LAMINATION
LAT	LATERAL
LAV	LAVATORY
LB	POUND
LF	LINEAR FOOT
LKRxx	LOCKER
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LPT	LOW POINT
LT	LIGHT
LV	LOW VOLTAGE
LVR	LOUVER
LWC	LIGHTWEIGHT CONCRETE
M	
M	METER
MACH	MACHINE
MAINT	MAINTENANCE
MAS	MASONRY
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MCC	MOTOR CONTROL CENTER
MDF	MEDIUM DENSITY FIBERBOARD
MDO	MEDIUM DENSITY OVERLAY PLYWOOD
MECH	MECHANICAL
MEP	MECHANICAL, ELECTRICAL, PLUMBING
MEZZ	MEZZANINE
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MM	MILLIMETER
MO	MASONRY OPENING
MPS	MOTORIZED PROJECTION SCREEN
MPxx	METAL PANEL
MS	MACHINE SCREW
MTD	MOUNTED
MTG	MOUNTING
MTL	METAL
MULL	MULLION
N	
N	NEWTON
NA	NOT APPLICABLE
NC	NOISE CRITERIA
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NPS	NOMINAL PIPE SIZE
NRC	NOISE REDUCTION COEFFICIENT
NTS	NOT TO SCALE
O	
OA	OUTSIDE AIR
OC	ON CENTER
OCEW	ON CENTER EACH WAY
OD	OUTSIDE DIAMETER/DIMENSION
ODxx	OVERHEAD DOOR
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
OGxx	OVERHEAD GRILLE
OH	OVER HEAD
OP	OPERABLE PARTITION
OPNG	OPENING
OPP	OPPOSITE
OPP HD	OPPOSITE HAND
ORD	OVERFLOW ROOF DRAIN
OXY	OXYGEN
P	
PAR	PARALLEL
PAV	PAVER
PBD	PARTICLEBOARD
PC	PRECAST CONCRETE
PDF	POWDER DRIVEN FASTENER
PERF	PERFORATED
PERIM	PERIMETER
PERP	PERPENDICULAR
PF	POINT OF FROG
PI	POINT OF INTERSECTION
PL	PLATE
PLAxx	PLASTER
PLBG	PLUMBING
PLF	POUNDS PER LINEAR FOOT
PLxx	PLASTIC LAMINATE
POL	POLISHED
PR	PAIR
PREFAB	PREFABRICATED
PROJ	PROJECT
PSF	POUNDS PER SQUARE FOOT
PTD	PAINTED
PTN	PARTITION
PTxx	PAINT
Q	
QC	QUALITY CONTROL
QTY	QUANTITY
R	
R	RADIUS
RA	RETURN AIR
RCP	REFLECTED CEILING PLAN
RD	ROOF DRAIN
REC	RECESSED
RECPT	RECEPTACLE
REF	REFERENCE
REFL	REFLECTED / REFLECTIVE / REFLECT
REFR	REFRIGERATOR
REG	REGISTER
REINF	REINFORCED / REINFORCING
REL	RELOCATE
REM	REMOVABLE
REQ	REQUIRE / REQUIRED
REV	REVISION / REVISED
RFxx	RESILIENT FLOOR
RM	ROOM
RO	ROUGH OPENING
RSxx	ROOFING SYSTEM
RWL	RAIN WATER LEADER
S	
SA	SUPPLY AIR
SAN	SANITARY
SC	SOLID CORE
SCHED	SCHEDULE
SD	STORM DRAIN
SECT	SECTION
SF	SQUARE FEET/FOOT
SHR	SHOWER
SHT	SHEET
SIM	SIMILAR
SM	SQUARE METER
SMS	SHEET METAL SCREW
SP	STANDPIPE
SPEC	SPECIFICATION
SPKR	SPEAKER
SPR	SPRINKLER
SQ	SQUARE
SSK	SERVICE SINK
SSMxx	SIMULATED STONE MATERIAL
SST	STAINLESS STEEL
STA	STATION
STD	STANDARD
STL	STEEL
STMS	SELF-TAP SHEET METAL SCREW
STOR	STORAGE
STRL	STRUCTURAL
STxx	STONE
SUSP	SUSPENDED
SYMM	SYMMETRICAL
T	
T	TREAD / THERMOSTAT
T&G	TONGUE AND GROOVE
T/	TOP OF (SEE OTHER WORD)
TAxx	TOILET ACCESSORY
TEL	TELEPHONE OR TELECOM
TEMP	TEMPERATURE
TGB	TOGGLE BOLT
THK	THICKNESS
THRES	THRESHOLD
THRU	THROUGH
TKBD	TACKBOARD
TMPD	TEMPERED
TV	TELEVISION
TYP	TYPICAL
TZxx	TERRAZZO
U	
UL	UNDERWRITERS LABORATORY
UNFIN	UNFINISHED
UON	UNLESS OTHERWISE NOTED
UR	URINAL
V	
VDSxx	VISUAL DISPLAY SURFACE
VERT	VERTICAL
VEST	VESTIBULE
VIF	VERIFY IN FIELD
VPxx	VENEER PLASTER
VR	VAPOR RETARDER
W	
W	WIDE, WIDTH
W/	WITH
W/O	WITHOUT
WBxx	WALL BASE
WC	WATER CLOSET
WCxx	WALL COVERING
WD	WOOD
WDS	WOOD SCREW
WDW	WINDOW
WFxx	WINDOW FILM
WPSxx	WATERPROOFING SYSTEM
WPT	WORK POINT
WPxx	WALL PANELING
WSCT	WAINSCOT
WT	WEIGHT
WTxx	WINDOW TREATMENT
WW	WALL TO WALL
WWF	WELDED WIRE FABRIC

GENERAL NOTES

A. GENERAL NOTES:

1. THE CONTRACTOR SHALL PROVIDE COMPLETE PROJECT SYSTEMS AND COMPONENTS AND COMPLY WITH ALL REQUIREMENTS INDICATED ON THE PROJECT DOCUMENTS.
2. WORK WITHIN THE AREA BOUNDARIES INDICATED IN THE PROJECT DOCUMENTS, AND COMPLY WITH ALL APPLICABLE BUILDING CODE, REGULATION, & ORDINANCE REQUIREMENTS. OCCUPANTS ADJACENT TO THE PROJECT AREA BOUNDARIES SHALL CONTINUE UNINTERRUPTED OCCUPANCY DURING CONSTRUCTION OF THE PROJECT
3. VERIFY FIELD CONDITIONS AND COORDINATION WITH THE PROJECT DOCUMENTS PRIOR TO PROCEEDING WITH THE WORK.
4. COORDINATE THE WORK WITH ALL REQUIREMENTS INDICATED IN THE PROJECT DOCUMENTS.
5. PERFORM THE WORK AT THE PROJECT SITE DURING NORMAL BUSINESS HOURS, UNLESS OTHERWISE NOTED.
6. COORDINATE THE WORK WITH EQUIPMENT, FURNISHINGS, AND SYSTEMS PROVIDED BY THE OWNER.

B. DEFINITIONS:

1. "TYPICAL" OR "TYP" INDICATES IDENTICAL COMPLETE SYSTEM SHALL BE PROVIDED FOR EACH OCCURRENCE OF THE CONDITION NOTED.
2. "SIMILAR" INDICATES COMPLETE SYSTEM AND COMPONENTS SHALL BE PROVIDED COMPARABLE TO THE CHARACTERISTICS FOR THE CONDITION NOTED.
3. "AS REQUIRED" INDICATES COMPONENTS REQUIRED TO COMPLETE THE NOTED, SYSTEM AS INDICATED IN THE PROJECT DOCUMENTS, SHALL BE PROVIDED.
4. "ALIGN" INDICATES ACCURATELY PROVIDE FINISH FACES OF MATERIALS IN STRAIGHT, TRUE, AND PLUMB RELATION TO ADJACENT MATERIALS.

C. DIMENSIONS:

1. DIMENSIONS ARE INDICATED TO THE CENTERLINE OF THE STRUCTURAL GRID, FACE OF CONCRETE WALL, NOMINAL FACE OF CMU WALL, FACE OF PARTITION TYPE AS SCHEDULED, UON
2. ALIGNMENT OF PARTITIONS AND FINISHES AS SCHEDULED SHALL BE STRAIGHT, TRUE & PLUMB. THE PRIORITY FOR PROJECT DIMENSIONS SHALL BE IN THE FOLLOWING ORDER:

   A . MIN DIMENSION FOR ACCESSIBILITY CLEARANCE & BUILDING CODE REQUIREMENT
   B . LARGE SCALE DETAILS
   C . SMALL SCALE DETAILS
   D . ENLARGED VIEWS
   E . FLOOR PLANS AND ELEVATIONS
3. FLOOR ELEVATIONS ARE INDICATED TO THE FACE OF THE STRUCTURAL SLAB, UNLESS OTHERWISE NOTED.
4. VERTICAL DIMENSIONS ARE INDICATED FROM THE FLOOR ELEVATION TO FACE OF FINISHED MATERIAL AT THE DIMENSION POINT, UNLESS NOTED ABOVE FINISH FLOOR - "AFF".
5. CEILING HEIGHTS ARE INDICATED FROM THE FLOOR ELEVATION TO THE FACE OF SUSPENDED CEILING SYSTEM OR FACE OF FINISH MATERIAL AS SCHEDULED.
6. DIMENSIONS SHOWN ON THE DRAWINGS SHALL INDICATE THE REQUIRED SIZE, CLEARANCE, AND DIMENSIONAL RELATIONSHIP BETWEEN PROJECT SYSTEMS AND COMPONENTS. DIMENSIONS SHALL NOT BE DETERMINED BY SCALING THE DRAWINGS.

D. DRAWING SET ORGANIZATION:

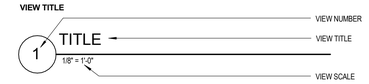
1. EACH DRAWING SET SHEET IS IDENTIFIED BY THE SHEET NUMBER IN THE LOWER RIGHT HAND CORNER OF THE DRAWING TITLE BLOCK. THE SHEET TITLE PROVIDES A GENERAL DESCRIPTION OF THE CONTENTS OF THE SHEET.
   SHEET NUMBER EXAMPLE: A201
   "A" INDICATES THE DISCIPLINE THAT CREATED THE DRAWING
   "2" INDICATES THE DRAWING CATEGORY CONTAINED ON THE SHEET
   "01" INDICATES THE SHEET NUMBER
2. SHEET NUMBERS MAY INCLUDE SUPPLEMENTAL CHARACTERS TO PROVIDE ADDITIONAL INFORMATION, SUCH AS DRAWING CONTENT, PROJECT SECTOR OR PHASE. REFER TO THE DRAWING INDEX FOR A COMPLETE LIST OF SHEETS INCLUDED IN THE DOCUMENT SET.
   EXAMPLE: EL201A
   "EL" INDICATES THE DISCIPLINE THAT CREATED THE DRAWING AND THE DRAWING CONTENT = ELECTRICAL LIGHTING
   "A" INDICATES SECTOR "A" OF PLAN SHEET "201". REFER TO THE PROJECT KEY PLAN OR COMPOSITE PLAN INDICATING THE RELATIONSHIP OF THE SECTORS.
3. DRAWING SET INDEX INDICATES THE COMPLETE LIST OF SHEETS CONTAINED IN THE DRAWING SET, INDEXED BY DISCIPLINE, SHEET NUMBER AND SHEET TITLE, IN SEQUENTIAL ORDER. NOTE THAT ALL SEQUENTIAL SHEET NUMBERS MAY BE NOT USED IN THE DRAWING SET.
4. DISCIPLINE IDENTIFICATION, IN ORDER BOUND IN THE DRAWING SET. REFER TO THE DRAWING SET INDEX FOR DISCIPLINE CONTAINED IN THIS DRAWING SET:
   G GENERAL INFORMATION
   C CIVIL — M MECHANICAL
   S STRUCTURAL — E ELECTRICAL
   A ARCHITECTURAL — TTY TELECOMMUNICATIONS
   F FIRE PROTECTION — AG SIGNAGE
   P PLUMBING — VT VERTICAL TRANSPORTATION
5. STANDARD DRAWING CATEGORY IDENTIFICATION. REFER TO THE DRAWING SET INDEX FOR FOR SPECIFIC DISCIPLINES, CATEGORIES, AND SHEET NUMBERS CONTAINED IN THIS DRAWING SET:

DWG CAT	C	S	A/I	F/P/M/E	TTY	AG	VT
0	GENERAL NOTES, SYMBOLS, DIAGRAMS						
1	PAVING	COMPOSITE / BASE PLANS					
2	SYSTEMS	FLOOR / LAYOUT PLANS					
3		SUPER-STRUCTURE DETAILS	RCP	RISERS & DIAGRAMS			
4		SUB-STRUCTURE DETAILS & SECTIONS	ENLARGED VIEWS	SCHEDULES	ENLARGED VIEWS		
5		COLUMN SCHEDULES & DETAILS	EXTERIOR ELEVATIONS	DETAILS			
6		BEAM SCHEDULES & DETAILS	INTERIOR ELEVATIONS		SYSTEM BLOCK DIAGRAMS		
7			SECTIONS				
8			EXTERIOR DETAILS		DETAILS		
9			INTERIOR DETAILS	CONTROL DIAGRAMS			

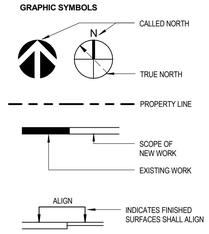
PROJECT NOTES

ANNOTATION SYMBOLS

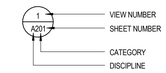
VIEW TITLE



GRAPHIC SYMBOLS



SHEET REFERENCE SYMBOL



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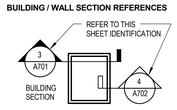

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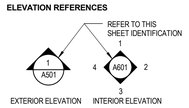

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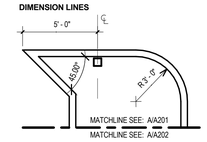
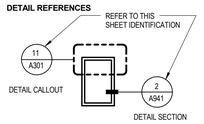


DETAIL REFERENCES



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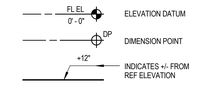
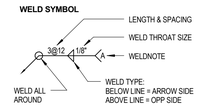
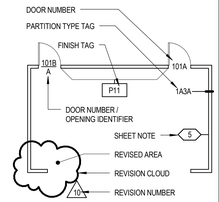


ROOM NAME / NUMBER SYMBOL

WELD SYMBOL



PARTITION TYPE, DOOR, AND MISC SYMBOLS



BUILDING SUMMARY

1. PROJECT ADDRESS:

Hartsfield-Jackson Atlanta International Airport
6000 North Terminal Parkway
Atlanta, GA 30320

2. APPLICABLE CODES & ORDINANCES:

INTERNATIONAL BUILDING CODE (IBC) – 2012 EDITION.

INTERNATIONAL FIRE CODE (IFC) – 2012 EDITION.

INTERNATIONAL MECHANICAL CODE (IMC) – 2012 EDITION.

INTERNATIONAL PLUMBING CODE (IPC) – 2012 EDITION.

INTERNATIONAL ENERGY CONSERVATION CODE (IECC) – 2009 EDITION.

NFPA 101: LIFE SAFETY CODE – 2012 EDITION.

NFPA 13: STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS – 2010 EDITION.

NFPA 70: NATIONAL ELECTRICAL CODE – 2011 EDITION.

NFPA 415: STANDARD ON AIRPORT TERMINAL BUILDINGS, FUELING RAMP DRAINAGE, AND LOADING WALKWAYS – 2013 EDITION.

GEORGIA STATE AMENDMENTS TO THE INTERNATIONAL BUILDING CODE

CHAPTER 120-3-20: GEORGIA ACCESSIBILITY CODE FOR BUILDINGS AND FACILITIES.

CHAPTER 120-3-3: GEORGIA RULES AND REGULATIONS FOR THE STATE MINIMUM FIRE SAFETY STANDARDS.

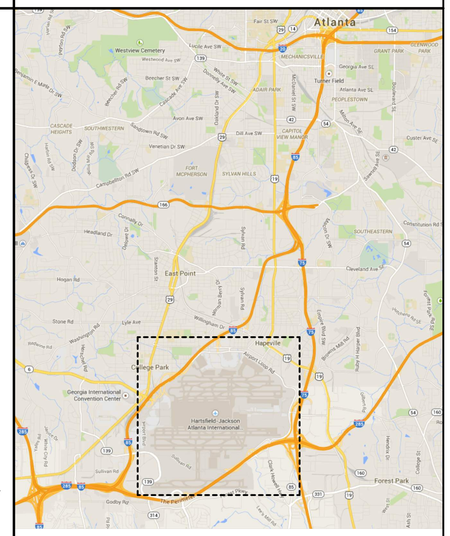
CHAPTER 120-3-11: GEORGIA RULES AND REGULATIONS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS.

ASME/ANSI A17.1: SAFETY CODE FOR ELEVATORS AND ESCALATORS

3. GENERAL BUILDING DESCRIPTION:

AVIATION AND TRANSPORTATION (AIRPORT)

LOCATION MAP



PROJECT AREA

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p

Hartsfield Jackson + Partnership
191 Peachtree Street, NE
Suite 2250
Atlanta, Ga 30303
Phone: 404-439-9000

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1056 SPRING STREET, N.W.
ATLANTA, GA 30309-3818
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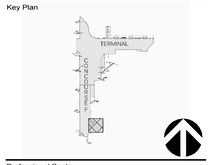
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: Author Reviewed by: Checker

Project No:

Sheet Title

GENERAL NOTES & SYMBOLS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

G002

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G202	CONSTRUCTION PHASING & SEQUENCING DIAGRAM
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C103C	Pavement Marking Plan
C103D	Pavement Marking Plan
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C105B	Existing Apron Utilities Modification Plan
C106A	Civil Details
C106B	Civil Details
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C206	AIRCRAFT DOCKING SYSTEM NOTES, LEGEND, & ABBREVIATIONS
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A803	EXTERIOR WALL SECTION DETAILS
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A953	INTERIOR MILLWORK DETAILS
A954	INTERIOR MILLWORK DETAILS
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VT03	WELLWAY PLAN AND SECTION ESCALATOR 1

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p

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ATLANTA, GA 30309-3818
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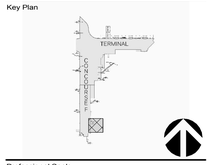
F: (404) 876-6841

Key Plan



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Drawn by: Author Reviewed by: Checker

Project No:

Sheet Title

DRAWING INDEX

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Sheet Number

G100

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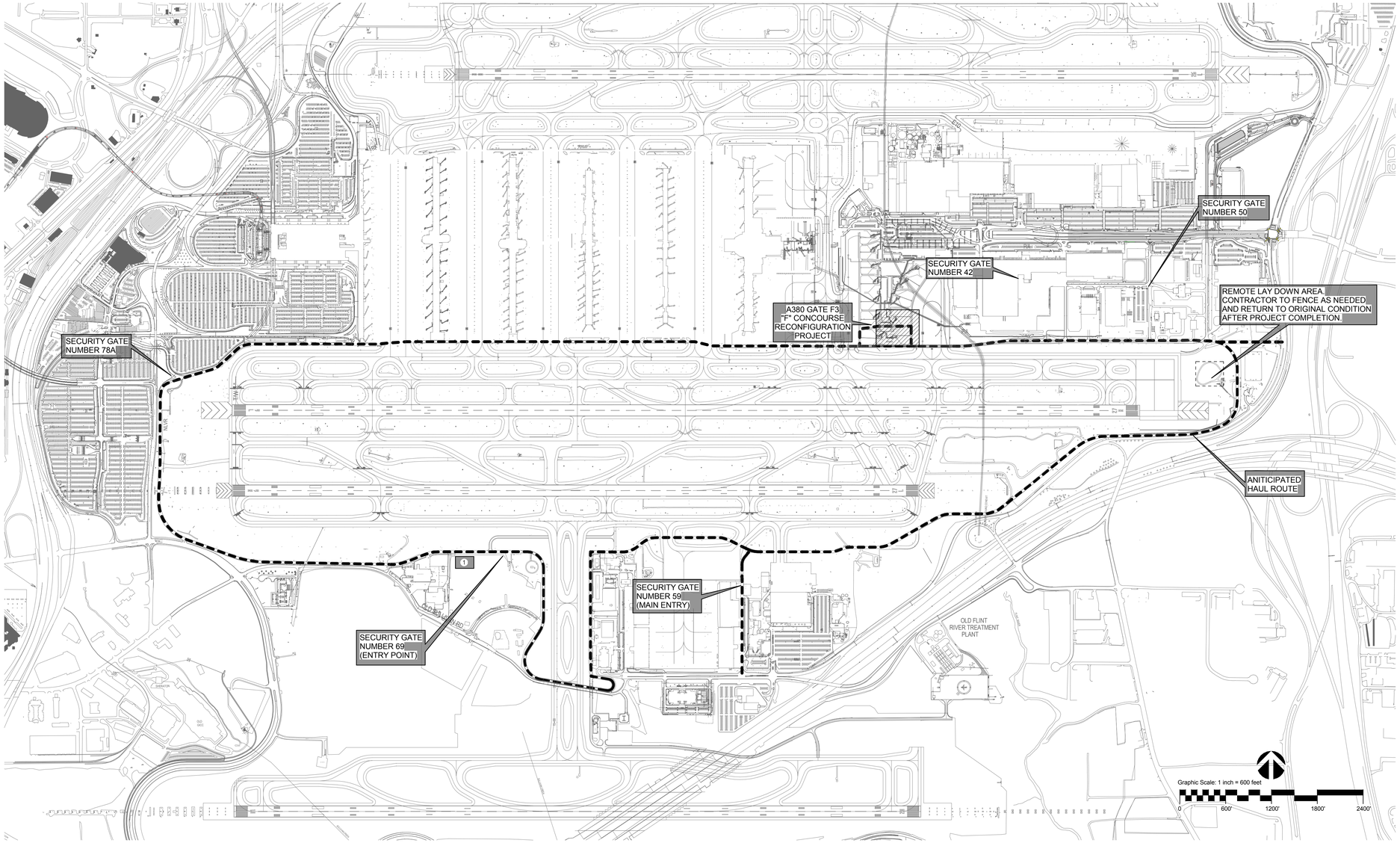

1 CONSTRUCTION CONTROL PLAN

1" = 600'-0"

NOTES:

1. ALL CONSTRUCTION WILL OCCUR WITHIN THE SECURITY IDENTIFICATION DISPLAY AREA (SIDA) AND AIRCRAFT OPERATIONS AREA (AOA). THE SIDA IS THE AIRPORT SECURITY AREA WITH RESTRICTED ACCESS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR BEING FAMILIAR WITH ALL REQUIREMENTS FOR ENTERING AND OPERATING IN THE SIDA AND AOA. THE CONTRACTOR SHALL REMAIN RESPONSIBLE FOR KEEPING ADVISED OF ANY CHANGES IN REQUIREMENTS AND TO ADHERE TO THE CURRENT REGULATIONS INCLUDING THE REGULATIONS FOR SECURITY BADGING AND FINGERPRINTING OF CONTRACTOR'S PERSONNEL.

2. ALL CONTRACTOR PERSONNEL, INCLUDING SUBCONTRACTORS, SHALL BE BADGED AND FINGERPRINTED PER ATL - DOA SECURITY REGULATIONS.

3. THIS PROJECT IS LOCATED ADJACENT TO ACTIVE AIRCRAFT RAMP AREAS. THEREFORE, ALL CONSTRUCTION ACTIVITIES SHALL BE CONDUCTED IN A MANNER ACCEPTABLE TO THE CITY OF ATLANTA (CITY) AND TBI TO PROVIDE ACCEPTABLE LEVELS OF SAFETY, SECURITY, AND ACCESS FOR ALL AIRPORT OPERATIONS. PERIODIC MEETINGS WILL BE HELD TO COORDINATE THE ACTIVITIES OF THIS CONTRACT WITH OTHER AIRPORT OPERATIONS.

4. THE CONTRACTOR, WITH THE APPROVAL OF THE CITY, SHALL ESTABLISH THE EXACT LIMITS OF THE CONTRACTOR'S STAGING AREAS FOR MATERIALS STOCKPILING, OFFICE TRAILERS, AND PARKING. TEMPORARY SECURITY FENCING ACCEPTABLE TO THE CITY SHALL ENCLOSE THE PUBLIC ACCESS AREAS.

5. THE CONTRACTOR'S ACCESS ROUTE TO THE PROJECT SITE SHALL BE THROUGH GATE NO. 59 (LOOP ROAD).

A. OPERATION OF ALL VEHICLES AND EQUIPMENT ON AIRPORT PROPERTY SHALL COMPLY WITH SIDA ACCESS REGULATIONS.

B. THE LOCATION OF ACCESS AND HAUL ROUTES ARE AS SHOWN ON THIS SHEET. USE OF UNAUTHORIZED HAUL ROUTES SHALL NOT BE ACCEPTABLE.

C. ROADS USED BY CONTRACTOR FOR ACCESS OR HAULING SHALL BE KEPT CLEAN AND ACCESSIBLE TO ALL OTHER AIRPORT TRAFFIC FOR THE ENTIRE DURATION OF THE PROJECT. HAUL TRUCKS MUST BE COVERED AND ANY SPILLAGE OR DEBRIS BUILD-UP PROMPTLY REMOVED FROM ALL HAUL ROUTES AND PUBLIC ROADS. NO SEPARATE PAYMENT SHALL BE MADE FOR KEEPING THE ROADS CLEAR AND ACCESSIBLE.

6. ALL EXCESS PRODUCED BY THE CONTRACTOR'S OPERATIONS SHALL BE DISPOSED OF OFF AIRPORT PROPERTY AT NO COST TO THE CITY.

7. THE CONTRACTOR SHALL COOPERATE WITH THE FAA AND THE CITY WHEN ALIGNING CONSTRUCTION FLOODLIGHTS SO AS NOT TO INTERFERE WITH AIRCRAFT PILOT'S OR AIR TRAFFIC CONTROLLER'S VISION.

8. FAA REGULATIONS FOR USE OF CRANES AND OTHER ELEVATED EQUIPMENT WILL BE STRICTLY ENFORCED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING FAA FORM 7460 TO THE CITY AND OBTAINING FAA APPROVAL PRIOR TO THE CONTRACTOR'S USE OF ANY ELEVATED EQUIPMENT. ALLOW A MINIMUM OF 45 DAYS FOR THE FORM 7460 TO PROCESS THROUGH THE FAA. THE TBI WILL COORDINATE WITH THE DOA OPERATIONS DEPARTMENT IN SUBMITTING THE CONTRACTOR'S FORM 7460. THE CONTRACTOR MUST PROVIDE TBI THE SCHEDULE OF CRANE OPERATIONS, CRANE SWING RADIUS, CRANE WEIGHT AND THE CRANE'S MAXIMUM WORKING HEIGHT FOR THE PROJECT IN ORDER TO BEGIN PROCESSING FORM 7460.

9. WORK AROUND THE EXISTING UNDERGROUND UTILITIES SHALL BE PERFORMED IN A MANNER THAT WILL AVOID DAMAGES TO THE UTILITIES. PRIOR TO COMMENCING WITH THE WORK, THE CONTRACTOR SHALL ACCURATELY LOCATE OR CONTACT THE APPROPRIATE UTILITY COMPANY TO LOCATE ABOVE AND BELOW GROUND UTILITIES WHICH MAY BE AFFECTED BY THE WORK. THE CONTRACTOR SHALL PROTECT ALL UTILITIES NOT DESIGNATED FOR REMOVAL, RELOCATION, OR REPLACEMENT IN THE COURSE OF THE CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE 72 HOURS OF ADVANCED NOTICE TO THE UTILITY OWNER, CITY AND FAA PRIOR TO BEGINNING CONSTRUCTION IN THE VICINITY OF THE EXISTING UTILITY LINE. FOR EXISTING UTILITY LOCATION ASSISTANCE CALL THE UNDERGROUND UTILITIES PROTECTION CENTER (UPC) AT 1-800-282-7411 AND FAA AT (404) 689-1280.

10. THIS PROJECT IS WITHIN AN AREA OF CONTINUOUS LARGE JET AIRCRAFT OPERATION. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT HIS EMPLOYEES, EQUIPMENT AND WORK IN PROGRESS FROM AIRCRAFT NOISE AND JET ENGINE BLAST.

11. THE CONTRACTOR SHALL COOPERATE WITH EXISTING AND FUTURE CONTRACTORS WORKING IN THE AREA. AT ALL TIMES THE CONTRACTOR WILL COORDINATE HIS EFFORTS TO MAINTAIN THE NECESSARY CONSTRUCTION ACCESS ROUTES AND TO ASSURE THAT ALL CONTRACTS CONTINUE ON A TIMELY BASIS.

12. THE CONTRACTOR SHALL COMPLY WITH ALL LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS THAT ARE PERTINENT TO THIS WORK. ADDITIONALLY THE CONTRACTOR SHALL COMPLY WITH TBI CONSTRUCTION AND GUIDELINE REQUIREMENTS. THE CONTRACTOR SHALL HAVE THE RESPONSIBILITY TO OBTAIN AND PAY ALL COSTS ASSOCIATED WITH THE PERMITS AND LICENSES REQUIRED TO ACCOMPLISH THIS WORK.

13. THE CONTRACTOR SHALL ESTABLISH A SYSTEM OF VISUAL AIDS FOR MARKING AND DELINEATING THE LIMITS OF HIS WORK AREA ON THE AIRCRAFT RAMPS DURING CONSTRUCTION. THE SYSTEM MUST BE EASILY DISTINGUISHABLE DURING NIGHTTIME WORK. NO SEPARATE PAYMENT SHALL BE MADE FOR INSTALLING, RELOCATING, MAINTAINING OR REMOVAL OF THE BARRICADES. THE COST OF THE BARRICADES SHALL BE INCLUDED IN THE PRICE BID FOR TRAFFIC CONTROL. A DETAILED PLAN OF MATERIALS SHALL BE SUBMITTED TO THE CITY FOR APPROVAL PRIOR TO THE START OF ANY WORK UNDER THIS CONTRACT. COMPLIANCE WITH THE APPROVED PLAN WILL BE STRICTLY ENFORCED. THE CITY MAY REQUIRE CHANGES TO THE ESTABLISHED PLAN WHENEVER IT IS NECESSARY TO PREVENT DISRUPTION OF AIRPORT OPERATIONS. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE SPECIFICATIONS FOR FURTHER INFORMATION REGARDING RESTRICTIONS AND PENALTIES.

14. CONCOURSE GATE CLOSURES WILL BE REQUIRED WITHIN THE PROJECT AREA. THE CONTRACTOR MUST REQUEST GATE CLOSURES THROUGH THE CITY. THIS REQUEST MUST INDICATE THE AREA NEEDED AND TIME(S) REQUIRED FOR THE OPERATIONS WITHIN THIS AREA. WORK IN THIS AREA MAY ONLY BE SCHEDULED BETWEEN THE HOURS OF 2200 AND 0600 EACH DAY. THE AIRPORT RESERVES THE RIGHT TO SHIFT ANY APPROVED CLOSURE PERIODS TO ALLEVIATE AIRCRAFT/GATE CONGESTION WHEN WEATHER CONDITIONS DICTATE.

15. ALL HAULING AND REMOVAL OF DEMOLITION AND CONSTRUCTION DEBRIS SHALL BE CONDUCTED DURING OFF-PEAK HOURS. ALL DELIVERIES AND REMOVALS ARE TO BE COORDINATED WITH DOA AND TBI THROUGH THE OWNER'S REPRESENTATIVE.

16. CONTRACTOR SHALL PREPARE AND SUBMIT A LOGISTICS PLAN SHOWING STORAGE AREA, TEMPORARY OFFICE AREA, AND SUBCONTRACTORS VEHICLE PARKING. LOGISTICS PLAN SHALL BE COORDINATED WITH OWNER, PM, AND ENGINEERING PRIOR TO SUBMITTAL TO THE DOA FOR REVIEW AND APPROVAL.

LEGEND

1	TENTATIVE LOCATION FOR CONTRACTOR OFFICE, PARKING AREA, AND LAYDOWN YARD
- - - - - -	DRIVE ACCESS / HAUL ROUTE
▨	PROJECT LOCATION

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

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A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
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TASK ORDER No. : 001

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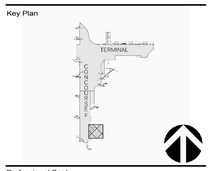
Key Plan



Professional Seals

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3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: Author Reviewed by: Checker

Project No:

Sheet Title

LOCATION PLAN W HAUL ROUTE AND CONTROL NOTES

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

G200

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GENERAL NOTE:

1. THE INTENT OF THIS EXHIBIT SHEET IS TO PROVIDE A GENERAL DESCRIPTION OF THE AREAS AFFECTED BY THE A380 GATE F3 & F3A RECONFIGURATION PROJECT. EXISTING BUILDING SYSTEMS AFFECTED BY THE PROJECT COULD ENCROACH OUTSIDE SCOPE LIMIT AREAS. CONTRACTOR TO VERIFY, PRIOR TO BID, FOR FINAL CONFIRMATION OF LIMITS.

2. 24/7/365 OPERATIONS MUST BE MAINTAINED OUTSIDE OF LIMITS. ANY INTERSECTING INFRASTRUCTURE & SYSTEMS AFFECTING AIRPORT OPERATIONS WITHIN LIMIT AREAS MUST BE MAINTAINED & REROUTED IF NEEDED DURING CONSTRUCTION.

3. TEMPORARY SHUTDOWNS MUST STAY WITHIN A 5 HOUR WINDOW & SHOULD BE SCHEDULED WITH THE AIRPORT PRIOR TO IMPLEMENTING WORK.

SHADING LEGEND

SHADE 1
LIGHT RENOVATION

SHADE 2
NEW CONSTRUCTION

SHADE 3 (NO SHADE)
EXISTING

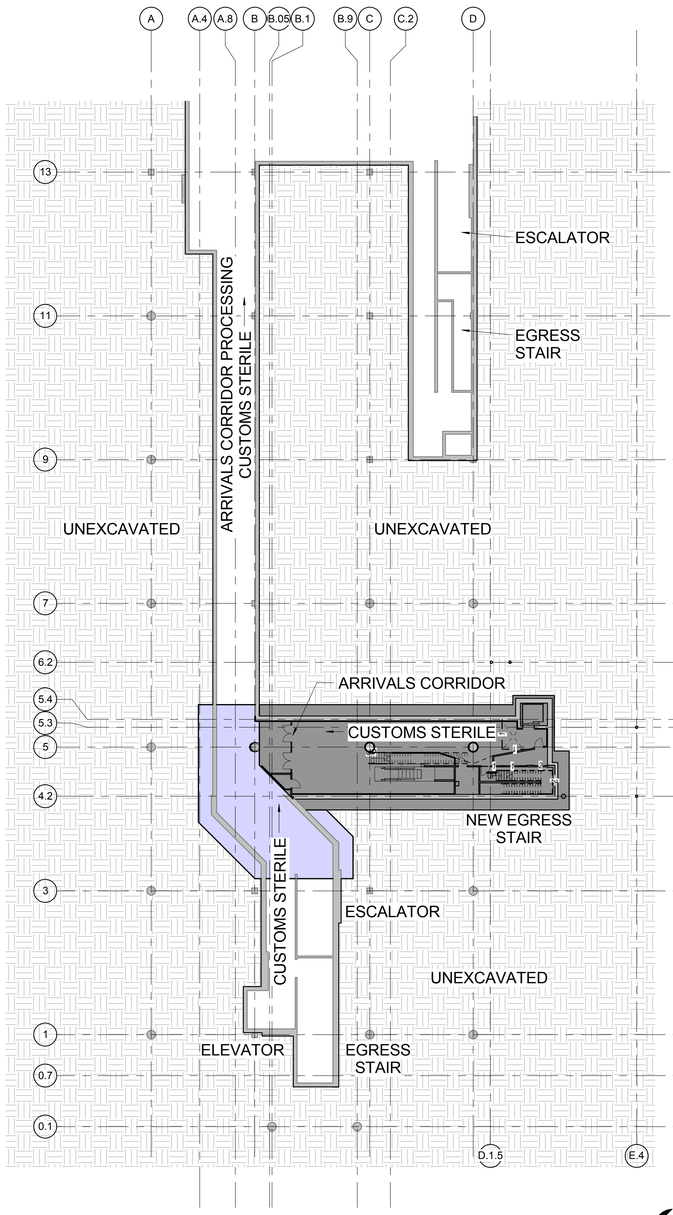
CONSTRUCTION BARRIER TYPES

A •• A •• A •• A •• GYP BOARD FINISH

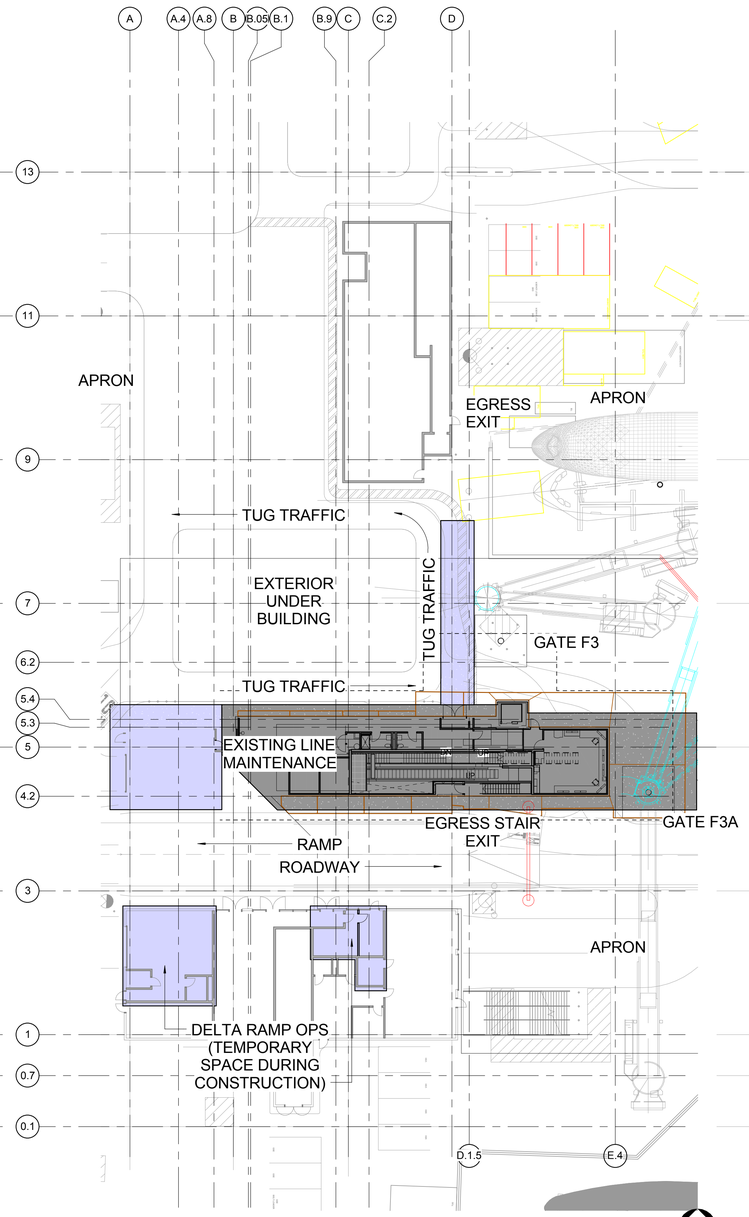
B •• B •• B •• B •• ----------

C •• C •• C •• C •• ----------

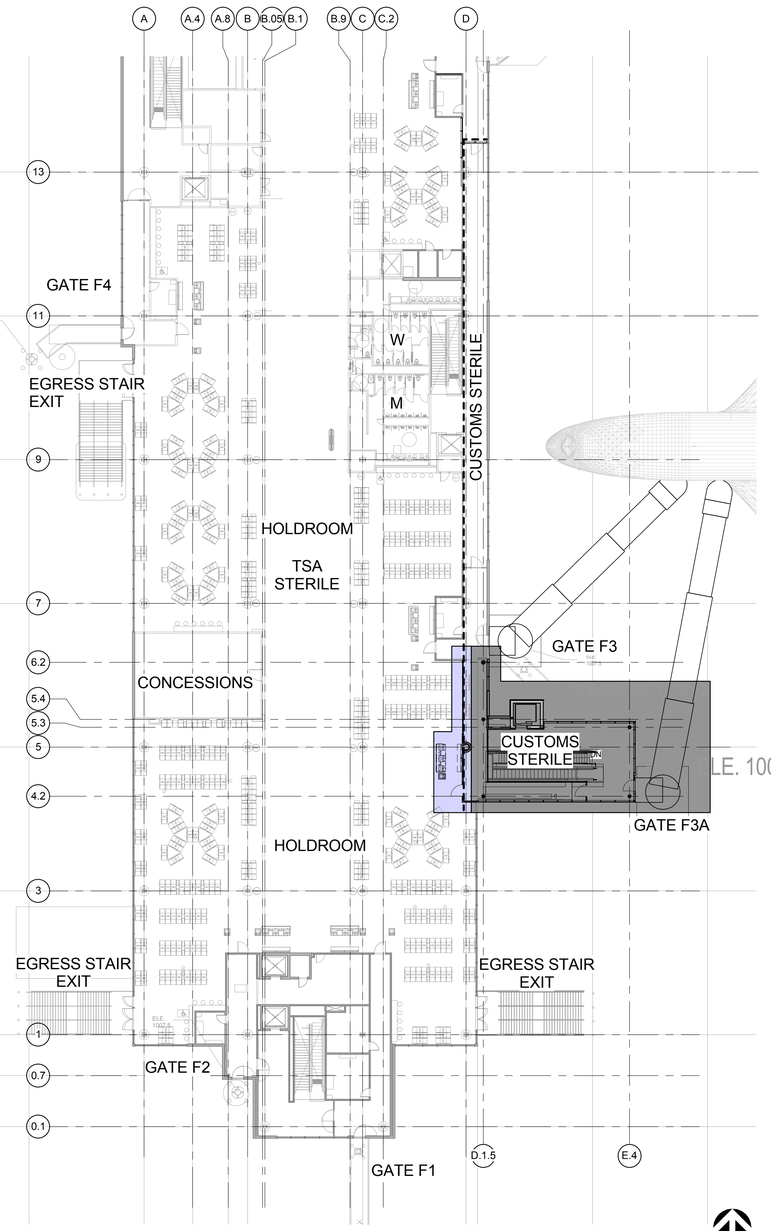
D •• D •• D •• D •• ----------



1 SCOPE LIMITS - ARRIVALS LEVEL
3/64" = 1'-0"



2 SCOPE LIMITS - APRON LEVEL
3/64" = 1'-0"



3 SCOPE LIMITS - DEPARTURES LEVEL
3/64" = 1'-0"

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Key Plan

Professional Seals

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

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SCOPE LIMITS

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Sheet Number

G201

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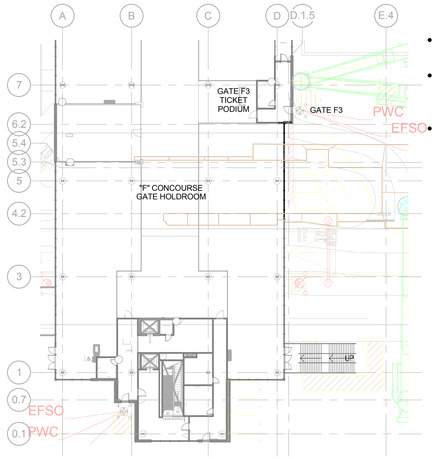
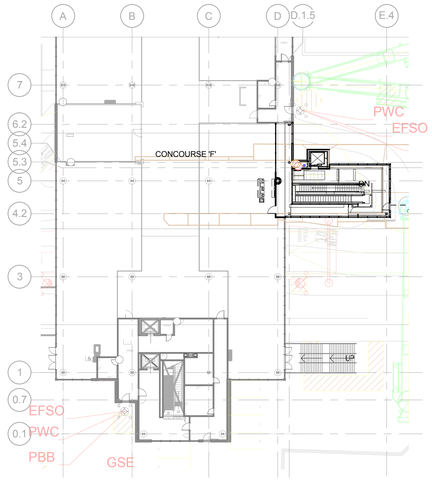
PHASE 1
RELOCATION - DEMOLITION - EXCAVATION
UTILITY REROUTE FOUNDATION



DEPARTURES LEVEL- PHASE 1 PLAN
1/32" = 1'-0"

- NO CONTINUOUS CONSTRUCTION ACTIVTY
- CONTRACTOR TO VERIFY EXISTING UTILITY PRIOR TO BID.
- CONTRACTOR TO COORDINATE EXTENTS OF DEMOLITION WITH LIMITS OF NEW CONSTRUCTION AND PROCEED PER SPEC SECTION 024119 - SELECTIVE DEMOLITION.

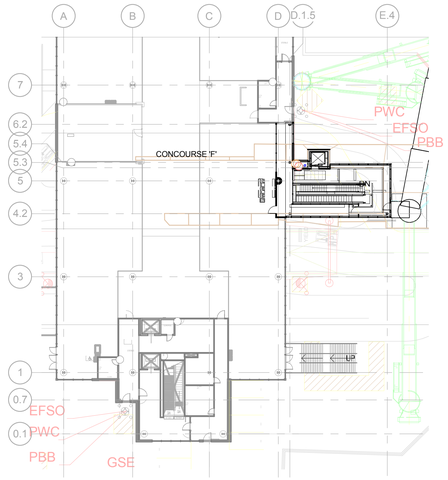
PHASE 2
STRUCTURE - TEMP. ENCLOSURE - VT INSTALLATION
EXTERIOR SHELL



DEPARTURES LEVEL- PHASE 2 PLAN
1/32" = 1'-0"

- CONSTRUCT NEW CAST IN PLACE CORE & STEEL STRUCTURES
- PROVIDE TEMPORARY WATERPROOF ENCLOSURE
- REMOVE EXISTING EXTERIOR WALL & SOFFIT IN SCOPE
- PROVIDE TEMPORARY CONSTRUCTION BARRIER AT GATE HOLDROOM AREA
- EXISTING TICKETING COUNTER MUST REMAIN OPERATIONAL AT ALL TIMES
- CONSTRUCT NEW SLAB AT CORRIDOR EXTENSION
- REMOVE TEMPORARY EXTERIOR ENCLOSURE

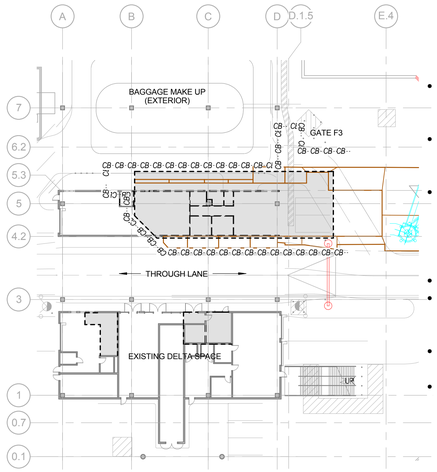
PHASE 3
INTERIOR FINISHES
EQUIPMENT INSTALLATION



DEPARTURES LEVEL- PHASE 3 PLAN
1/32" = 1'-0"

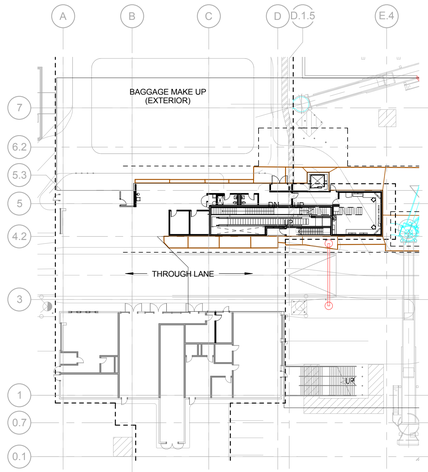
CONSTRUCTION BARRIER LIMIT (ALL PHASES)

- CONSTRUCT / INSTALL ESCALATOR ELECTRICAL SYSTEMS
- CONSTRUCT INTERIOR FINISHES & SYSTEMS AT VERTICAL CORE & GATE HOLDROOM PODIUM
- INTERIOR FINISHES & SEATING REALIGNMENT



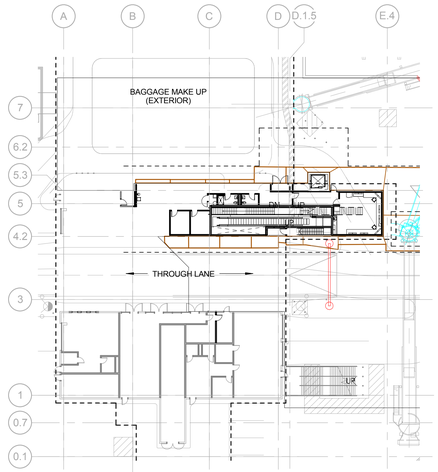
APRON LEVEL- PHASE 1 PLAN
1/32" = 1'-0"

- PLACEMENT OF REMOVABLE CONCRETE "JERSEY BARRIER" PERIMETER
- REMOVE EXISTING STRIPING AND ALL TEMPORARY STRIPING
- INSTALL TEMPORARY ELECTRICAL, IT, AND MILLWORK INFRASTRUCTURE FOR TEMPORARY DELTA OPS SPACE.
- MOVE DELTA OPS.
- DEMO EXISTING DELTA OPS AND PARTIAL LINE MAINTENANCE SPACES
- LAY OUT CONSTRUCTION WORK LIMITS - REF CIVIL
- ESTABLISH TRAFFIC CONTROL PLAN - REF CIVIL



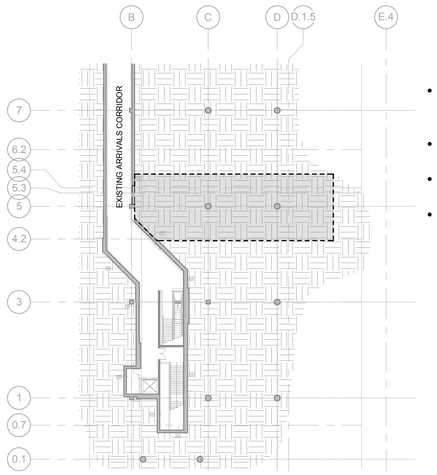
APRON LEVEL-PHASE 2 PLAN
1/32" = 1'-0"

- CONSTRUCT CAST IN PLACE & STEEL STRUCTURE
- PROVIDE TEMPORARY WATERPROOF EXTERIOR ENCLOSURE
- CONSTRUCT NEW WALLS



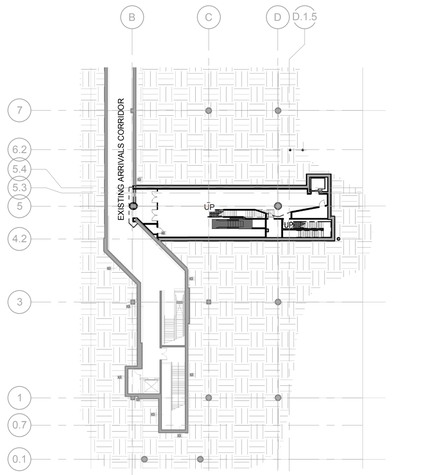
APRON LEVEL-PHASE 3 PLAN
1/32" = 1'-0"

- CONSTRUCT OF INTERIOR FINISHES
- INSTALL JETBRIDGE F-3A & SYSTEMS
- INSTALL AIRCRAFT STRIPING
- TEST FIT AIRCRAFT A380
- MOVE DELTA OPS BACK TO PERMANENT LOCATION
- REMOVE TEMPORARY PARTITIONS



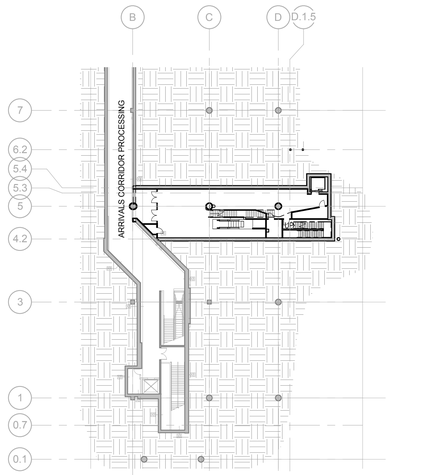
ARRIVALS LEVEL- PHASE 1 PLAN
1/32" = 1'-0"

- REROUTE EXISTING UTILITIES BOTH ABOVE AND BELOW GROUND AS REQUIRED.
- EXCAVATE / SHORE NEW VERTICAL CORE
- INSTALL PERMANENT UTILITIES
- IMPLEMENT PASSENGER BOARDING BRIDGE, FOUNDATION AND EXCAVATION.



ARRIVALS LEVEL- PHASE 2 PLAN
1/32" = 1'-0"

- CONSTRUCT CAST IN PLACE FOUNDATION, WALLS, COLUMNS, & SLAB
- CONSTRUCT JET BRIDGE FOUNDATION
- INSTALL VERTICAL TRANSPORTATION PROJECT COMPONENTS
- PROVIDE TEMPORARY CORRIDOR CONSTRUCTION BARRIER REF A100
- CUT THROUGH TO EXISTING ARRIVALS CORRIDOR



ARRIVALS LEVEL- PHASE 3 PLAN
1/32" = 1'-0"

- CONSTRUCT / INSTALL INTERIOR FINISHES & SYSTEMS
- CONNECT NEW ARRIVALS CORRIDOR
- REMOVE TEMPORARY PARTITION

- CONTRACTOR RESPONSIBLE FOR FINAL CONSTRUCTION PHASING & SEQUENCING OF ALL ACTIVITIES

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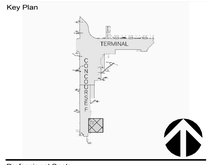
Key Plan



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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: Author Reviewed by: Checker

Project No:

Sheet Title

CONSTRUCTION PHASING & SEQUENCING DIAGRAM

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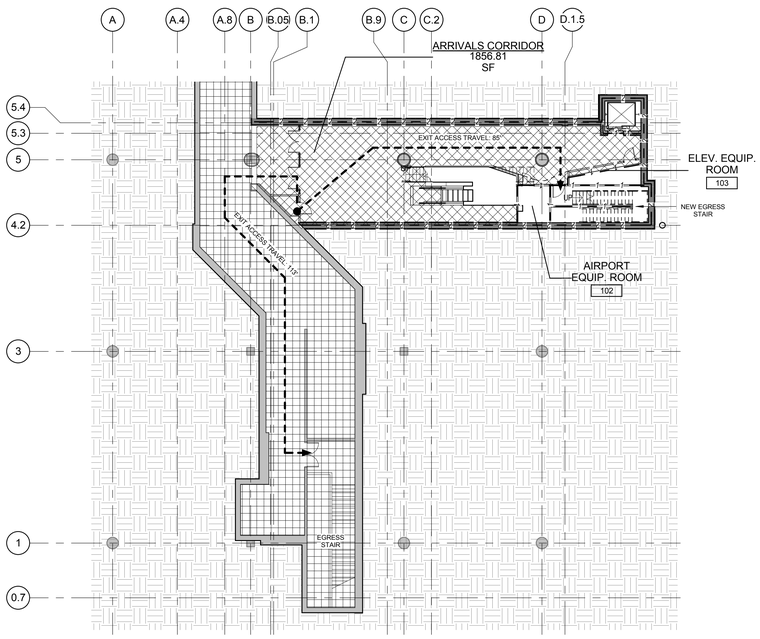
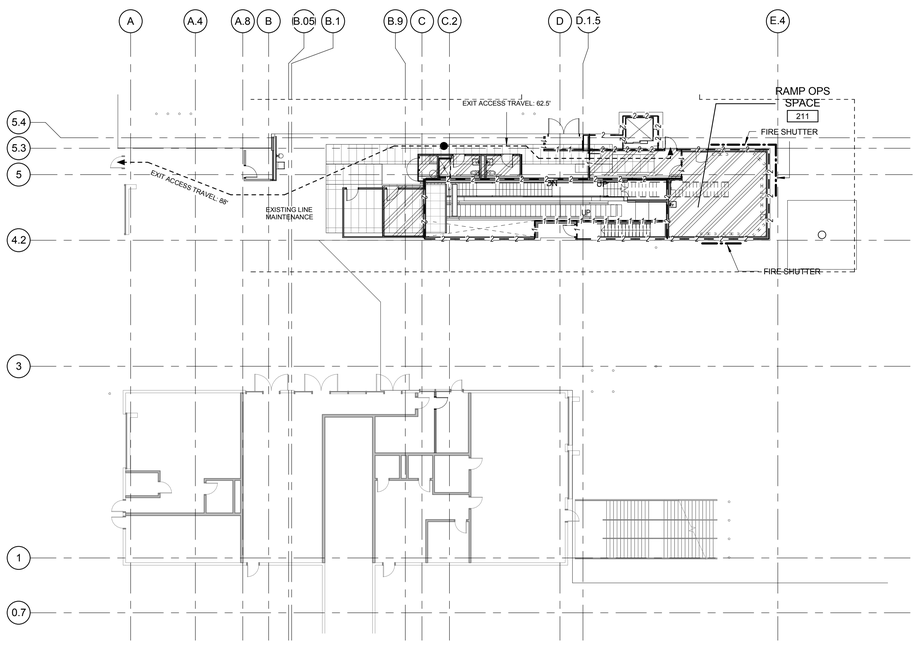
Sheet Number

G202



1 EGRESS FLOOR PLAN - ARRIVALS LEVEL
1/16" = 1'-0"

0 4 8 16 32 FT.



2 EGRESS FLOOR PLAN - APRON LEVEL
1/16" = 1'-0"

0 4 8 16 32 FT.

GENERAL DESCRIPTION

A. PROJECT NAME: ATLANTA INTERNATIONAL TERMINAL GATE F3 A380 RENOVATION

B. PROJECT LOCATION: ATLANTA, GEORGIA

C. APPLICABLE CODES: (AS ADOPTED AND AMENDED BY THE STATE OF GEORGIA)

THE CODES OF RECORD IN THE STATE OF GEORGIA INCLUDE THE INTERNATIONAL BUILDING CODE (IBC), 2012 EDITION WITH GEORGIA DEPARTMENT OF COMMUNITY AFFAIRS (DCA) AMENDMENTS AND CHAPTER 120-3-3 MODIFICATIONS AND NFPA 101, LIFE SAFETY CODE (LSC), 2012 EDITION AS MODIFIED BY CHAPTER 120-3-3. OTHER CODES APPLICABLE TO THE ATLANTA INTERNATIONAL TERMINAL GATE F3 A380 RENOVATION PROJECT ARE LISTED BELOW:

1. INTERNATIONAL BUILDING CODE (IBC) – 2012 EDITION.

2. INTERNATIONAL FIRE CODE (IFC) – 2012 EDITION.

3. INTERNATIONAL MECHANICAL CODE (IMC) – 2012 EDITION.

4. INTERNATIONAL PLUMBING CODE (IPC) – 2012 EDITION.

5. INTERNATIONAL ENERGY CONSERVATION CODE (IECC) – 2009 EDITION.

6. NFPA 101: LIFE SAFETY CODE – 2012 EDITION.

7. NFPA 13: STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS – 2010 EDITION.

8. NFPA 70: NATIONAL ELECTRICAL CODE – 2011 EDITION.

9. NFPA 415: STANDARD ON AIRPORT TERMINAL BUILDINGS, FUELING RAMP DRAINAGE, AND LOADING WALKWAYS – 2013 EDITION.

10. GEORGIA STATE AMENDMENTS TO THE INTERNATIONAL BUILDING CODE

11. CHAPTER 120-3-20: GEORGIA ACCESSIBILITY CODE FOR BUILDINGS AND FACILITIES.

12. CHAPTER 120-3-3: GEORGIA RULES AND REGULATIONS FOR THE STATE MINIMUM FIRE SAFETY STANDARDS.

13. CHAPTER 120-3-11: GEORGIA RULES AND REGULATIONS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS.

14. ASME/ANSI A17.1: SAFETY CODE FOR ELEVATORS AND ESCALATORS

NOTE: APPLICATION OF ALL REQUIRED CODES IS PURSUANT TO GEORGIA CHAPTER 120-3-3 *RULES AND REGULATIONS FOR THE STATE MINIMUM FIRE SAFETY STANDARDS.*

D. OCCUPANCY CLASSIFICATION: CODE REFERENCE

1. GROUP A-3 – ASSEMBLY (HOLDING ROOMS, WAITING AREAS) IBC 303.4

2. GROUP S-2 – STORAGE ROOMS, MECHANICAL ROOMS, ELECTRICAL ROOMS IBC 311.3

E. CONSTRUCTION TYPE:
TYPE IB IBC TABLE 503

F. FIRE SUPPRESSION:
THE SPRINKLER SYSTEM FOR THE NEW VERTICAL CORE WILL BE AN EXTENSION OF NFPA 13 THE EXISTING INTERNATIONAL TERMINAL AUTOMATIC SPRINKLER SYSTEM IN ACCORDANCE WITH THE LSC 9.7.

G. FIRE ALARM/VOICE COMMUNICATION:
THE FIRE ALARM AND DETECTION SYSTEM FOR THE NEW VERTICAL CORE WILL BE AN NFPA 72 EXTENSION OF THE EXISTING INTERNATIONAL TERMINAL FIRE ALARM AND DETECTION SYSTEM IN ACCORDANCE WITH THE LSC 9.6.

II. HEIGHT AND AREA LIMITS
MAXIMUM ALLOWED CODE REFERENCE
A. HEIGHT: 11-STORIES IBC TABLE 503

B. AREA: UNLIMITED IBC TABLE 503

THE NEW VERTICAL CORE WILL BE AN EXTENSION OF THE EXISTING INTERNATIONAL TERMINAL AND WILL ADHERE TO THE HEIGHT AND AREA LIMITS OF THE EXISTING STRUCTURE.

OCCUPANCY SCHEDULE

Level	AREA NAME	AREA FUNCTION PER NFPA 101 AND IBC	AREA CLACS. AREA	AREA CLACS. SF/OCC.	Area Capacity Multiplier	OCCUPANT LOAD	Stair Capacity Multiplier	Ramp Capacity Multiplier	EXIT WIDTH IN FT STAIR	EXIT WIDTH IN FT CORR.	# of EXITS
ARRIVALS LEVEL	ARRIVALS CORRIDOR	NFPA 101_ASSEMBLY USE_LESS CONCENTRATED USE, WITHOUT FIXED SEATING (NET)	1856.81 SF	15.00 SF	124.28	124	0.3	0.2	3.11	2.07	2
ARRIVALS LEVEL: 1						124					
3 - APRON LEVEL	ELECTRICAL	NFPA 101_STORAGE_IN OTHER THAN STORAGE AND MERCANTILE OCCUPANCIES	54.63 SF	500.00 SF	0.60	1	0.3	0.2	0.01	0.01	1
3 - APRON LEVEL	LINE MAINTENANCE - NEW	NFPA 101_BUSINESS USE	821.90 SF	100.00 SF	8.71	9	0.3	0.2	0.22	0.15	1
3 - APRON LEVEL	LINE MAINTENANCE - OFFICE	NFPA 101_BUSINESS USE	160.04 SF	100.00 SF	2.09	2	0.3	0.2	0.05	0.03	1
3 - APRON LEVEL	LINE MAINTENANCE - SUPPORT	NFPA 101_BUSINESS USE	196.71 SF	100.00 SF	2.46	2	0.3	0.2	0.06	0.04	1
3 - APRON LEVEL: 4						14					
4 - DEPARTURES LEVEL	DEPARTURE CORRIDOR	NFPA 101_ASSEMBLY USE_LESS CONCENTRATED USE, WITHOUT FIXED SEATING (NET)	1180.60 SF	15.00 SF	79.20	79	0.3	0.2	1.98	1.32	2
4 - DEPARTURES LEVEL: 1						79					
					TOTAL OCCUPANT LOAD	217					

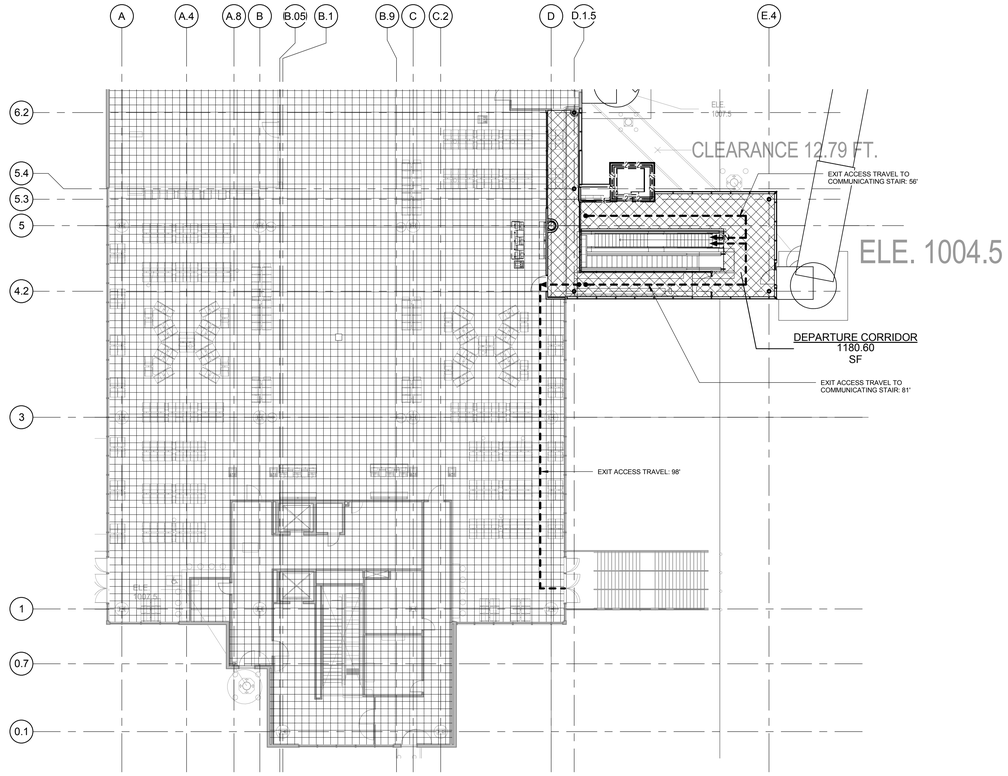
OCCUPANCY LEGEND

- ASSEMBLY (UNCONCENTRATED) - NEW VERTICAL CORE 15 NET NFPA 101 TABLE 7.3.1.2
- BUSINESS USE 100 GROSS NFPA 101 TABLE 7.3.1.2
- ACCESSORY STORAGE AREAS 500 GROSS NFPA 101 TABLE 7.3.1.2
- EXISTING SPACE - NO NEW WORK / AREA NOT IN SCOPE

GRAPHIC LEGEND

DESCRIPTION	SYMBOL
1-HOUR FIRE BARRIER	
2-HOUR FIRE BARRIER	
TRAVEL DIST. TO AN EXIT	7'
FIRE SHUTTER	

NOTE: PROVIDED FIRE SHUTTER SYSTEM ON ALL GLAZED GLASS (BELOW 7' FINISH FLOOR) @ ARRIVALS LEVEL



3 EGRESS FLOOR PLAN - DEPARTURES LEVEL
1/16" = 1'-0"

0 4 8 16 32 FT.

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TASK ORDER No. : 001

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Hartsfield Jackson + Partnership
191 Peachtree Street, NE
Suite 2250
Atlanta, GA 30303
Phone: 404-439-9000

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ATLANTA, GA 30303
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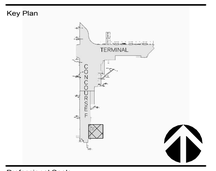
F: (404) 439-9001

CHASM
1513 E CLEVELAND AVE SUITE 200B
EAST POINT, GA 30344
P: (404) 305-0050
F: (404) 305-8868

STANLEY, LOVE-STANLEY P.C.
1056 SPRING STREET, N.W.
ATLANTA, GA 30309-3818
P: (404) 876-3055
F: (404) 876-6841

Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: Author Reviewed by: Checker

Project No:

Sheet Title

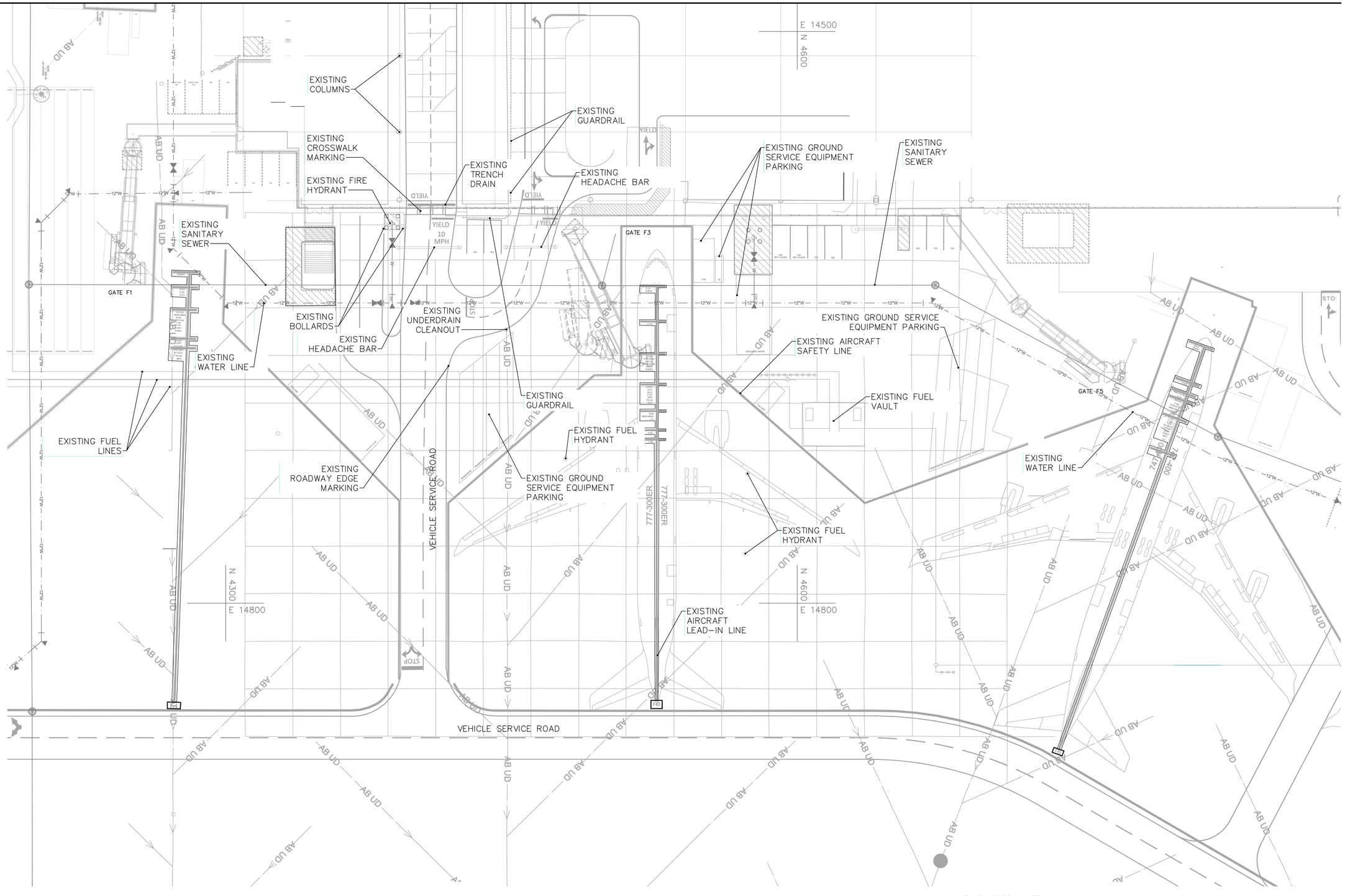
OCCUPANCY/EGRESS DIAGRAM - LIFE SAFETY PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

G204

4/15/2015 11:09:43 PM



UTILITY DISCLAIMER

UTILITIES MAY EXIST WHICH ARE NOT SHOWN ON THE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING ALL UTILITY COMPANIES HAVING UTILITIES WITHIN OR ADJACENT TO THE WORK AREA. THE CONTRACTOR SHALL HAVE THE UTILITIES FIELD LOCATED AND COORDINATE WITH UTILITY COMPANIES TO HAVE THEM RELOCATED WHEN NECESSARY OR ADAPTED FOR TIE-INS.

EXISTING CONDITIONS PLAN 1 / C101

0 10' 20' 40'
SCALE IN FEET

NORTH

811 Know what's below. Call before you dig. Dial 811. Utilities PROTECTION CENTER
DIG SAFELY! 800-282-7411

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No.: 001

h-j+p

Hartsfield Jackson + Partnership
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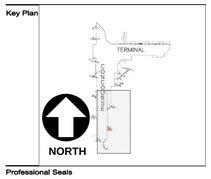
Key Plan



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3	ISSUE FOR 95% CONSTRUCTION DOCUMENTS	01-23-2015
4	ISSUE FOR 100% CONSTRUCTION DOCUMENTS	03-23-2015
5	ISSUE FOR BID DOCUMENTS	04-17-2015

Drawn by: JG Reviewed by: DLS

Project No: 14.01002.00

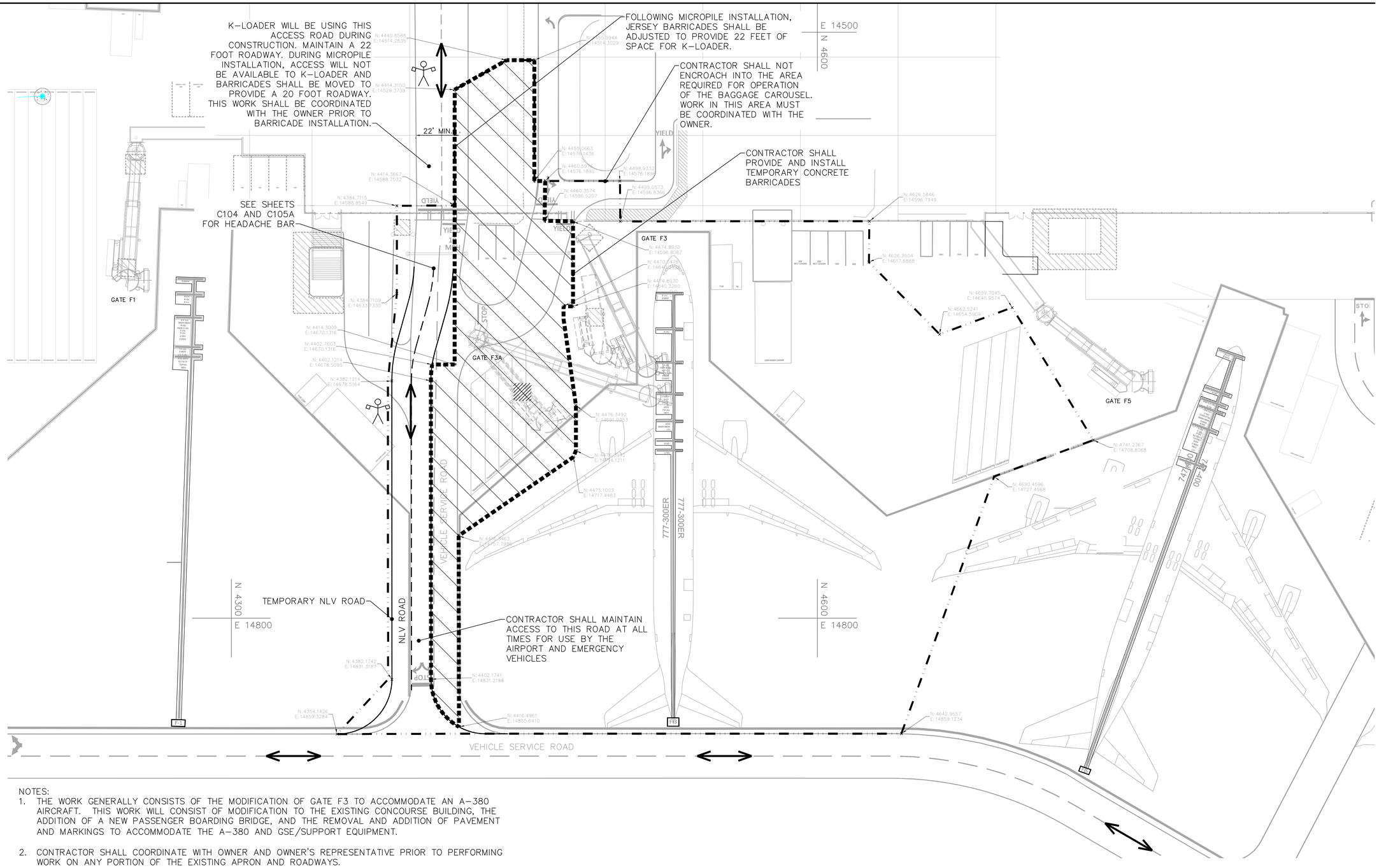
Sheet Title

EXISTING CONDITIONS PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

C101



NOTES:

1. THE WORK GENERALLY CONSISTS OF THE MODIFICATION OF GATE F3 TO ACCOMMODATE AN A-380 AIRCRAFT. THIS WORK WILL CONSIST OF MODIFICATION TO THE EXISTING CONCOURSE BUILDING, THE ADDITION OF A NEW PASSENGER BOARDING BRIDGE, AND THE REMOVAL AND ADDITION OF PAVEMENT AND MARKINGS TO ACCOMMODATE THE A-380 AND GSE/SUPPORT EQUIPMENT.
2. CONTRACTOR SHALL COORDINATE WITH OWNER AND OWNER'S REPRESENTATIVE PRIOR TO PERFORMING WORK ON ANY PORTION OF THE EXISTING APRON AND ROADWAYS.
3. GATE F3 WILL BE IN USE DURING CONSTRUCTION. GROUND SERVICE EQUIPMENT AND OTHER AIRPORT VEHICLES WILL BE UTILIZING THE EXISTING VEHICLE SERVICE ROAD FOR THE DURATION OF CONSTRUCTION.
4. THE EXISTING PAVEMENT MARKINGS ARE TO BE OBLITERATED AS SHOWN ON SHEET C104 AND REMARKED AS SHOWN ON SHEET C103A, C103B, AND C103C.
5. DELAYS DUE TO AIRCRAFT, EMERGENCIES, AND OTHER AIRPORT OPERATIONAL IMPACTS MAY OCCUR. THESE SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT.
6. AIRPORT AND EMERGENCY VEHICLES SHALL HAVE THE RIGHT OF WAY OVER CONSTRUCTION TRAFFIC.
7. ORIENTATION ON PLAN SHEET MAY DIFFER FROM OTHER PLAN SHEETS.
8. CONTRACTOR SHALL PROVIDE SUFFICIENT FLAGMEN TO MAINTAIN VEHICLE TRAFFIC ALONG VEHICLE SERVICE ROAD SOUTH OF THE BUILDING CONSTRUCTION AREA AT ALL TIMES.
9. FLAGMEN SHALL GIVE RIGHT OF WAY TO ALL AIRPORT AND EMERGENCY VEHICLES OVER CONSTRUCTION VEHICLES AT ALL TIMES.
10. GATE F3 MUST REMAIN OPEN AND IN OPERATION DURING CONSTRUCTION AT ALL TIMES UNLESS OTHERWISE COORDINATED WITH THE OWNER.

OPERATIONAL PLAN 1 / C102

0 10' 20' 40'
SCALE IN FEET

NORTH

LEGEND

- SCOPE OF WORK LIMITS
- ROAD OPEN TO VEHICLES
- FLAG PERSONS
- CONTRACTOR ONSITE STAGING AREA
- TEMPORARY CONCRETE JERSEY BARRICADES

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
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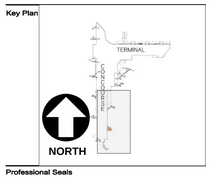
Key Plan



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3	ISSUE FOR 95% CONSTRUCTION DOCUMENTS	01-23-2015
4	ISSUE FOR 100% CONSTRUCTION DOCUMENTS	03-23-2015
5	ISSUE FOR BID DOCUMENTS	04-17-2015

Drawn by: JG Reviewed by: DLS

Project No: 14.01002.00

Sheet Title

OPERATIONAL PLAN

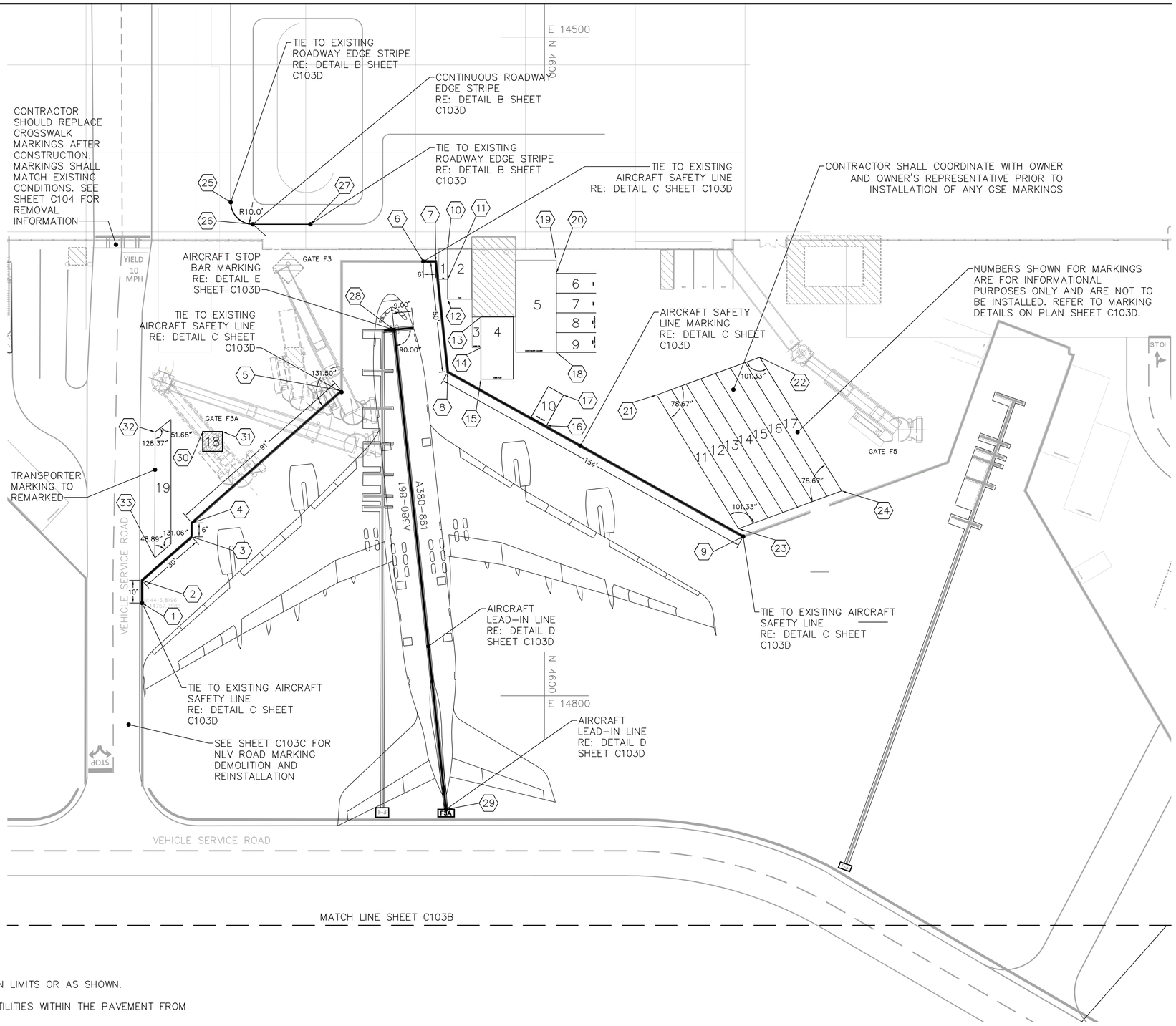
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

C102

PARKING SPACE NO.	DESCRIPTION	DIMENSIONS
1	T/B	14' X 4'
2	TUG	23' X 11'
3	A380 T/B	14' X 4'
4	A380 TUG	28.35' X 14.75'
5	CONTAINER LOADER	42' X 18.5'
6	GSE	9' X 18'
7	GSE	9' X 18'
8	GSE BELT LOADER	9' X 18'
9	GSE BELT LOADER	9' X 18'
10	FUEL CART	16' X 8'
11	TRANSPORTER	71.4' X 7.15'
12	TRANSPORTER	71.4' X 7.15'
13	TRANSPORTER	71.4' X 7.15'
14	TRANSPORTER	71.4' X 7.15'
15	TRANSPORTER	71.4' X 7.15'
16	TRANSPORTER	71.4' X 7.15'
17	TRANSPORTER	71.4' X 7.15'
18	STOW POSITION MARKING	9' X 9'
19	TRANSPORTER	57' X 9.5'

POINT NO.	NORTHING	EASTING
1	4416.8196	14757.7986
2	4416.8198	14747.4338
3	4439.4765	14727.6141
4	4439.4772	14721.2858
5	4507.6254	14661.0761
6	4544.8231	14602.2328
7	4550.5325	14602.2446
8	4555.9795	14652.6045
9	4690.4596	14727.4968
10	4555.9225	14596.4461
11	4555.9225	14610.4461
12	4555.9225	14619.4461
13	4571.0639	14627.5108
14	4571.0639	14641.5108
15	4571.0639	14655.8571
16	4600.8879	14677.0418
17	4608.6726	14663.0633
18	4605.3904	14643.6271
19	4605.3904	14601.6183
20	4605.3904	14607.6183
21	4651.0844	14663.0461
22	4698.0042	14645.8413
23	4688.3568	14723.9365
24	4735.2766	14706.7318
25	4457.1943	14575.2704
26	4467.1943	14585.2704
27	4493.4389	14585.2704
28	4531.5506	14633.3432
29	4555.1802	14851.7906
30	4444.4438	14679.748
31	4453.4438	14679.748
32	4422.7223	14679.9063
33	4422.6504	14737.2053



GENERAL MARKING NOTES:

1. MATCH TO EXIST MARKING AT THE APPROXIMATE RECONSTRUCTION LIMITS OR AS SHOWN.
2. CONTRACTOR SHALL PROTECT ALL LIGHT FIXTURES AND OTHER UTILITIES WITHIN THE PAVEMENT FROM BEING PAINTED.
3. REFERENCE SHEET C12.1.1 THROUGH C12.1.5 FOR PBB INFORMATION.
4. ORIENTATION ON PLAN SHEET MAY DIFFER FROM OTHER PLAN SHEETS.
5. CONTRACTOR MUST COORDINATE WITH ENGINEER AND AIRPORT PRIOR TO INSTALLATION OF PROPOSED MARKINGS.
6. CONTRACTOR SHALL VERIFY EXISTING MARKINGS AND PROPOSED TIE IN LOCATIONS PRIOR TO BEGINNING THIS WORK.
7. CONTRACTOR SHALL ADVISE OWNER AND OWNER'S REPRESENTATIVE IMMEDIATELY IF MARKING AS SHOWN ON THE PLANS DO NOT MATCH/TIE TO EXISTING MARKINGS.
8. NORTHING AND EASTING ARE SHOWN ON THE PLANS FOR REFERENCE ONLY. CONTRACTOR SHALL FIELD VERIFY AND COORDINATE WITH OWNER AND OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION OF ANY PROPOSED MARKING.

LEGEND

PROPOSED SAFETY LINE
PROPOSED MARKING
31 COORDINATE REFERENCE POINT

PAVEMENT MARKING PLAN 1 / C103

0 10' 20' 40'
SCALE IN FEET

NORTH

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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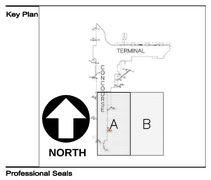
Key Plan



Professional Seals

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4	ISSUE FOR 100% CONSTRUCTION DOCUMENTS	03-23-2015
5	ISSUE FOR BID DOCUMENTS	04-17-2015

Drawn by: JG Reviewed by: DLS

Project No: 14.01002.00

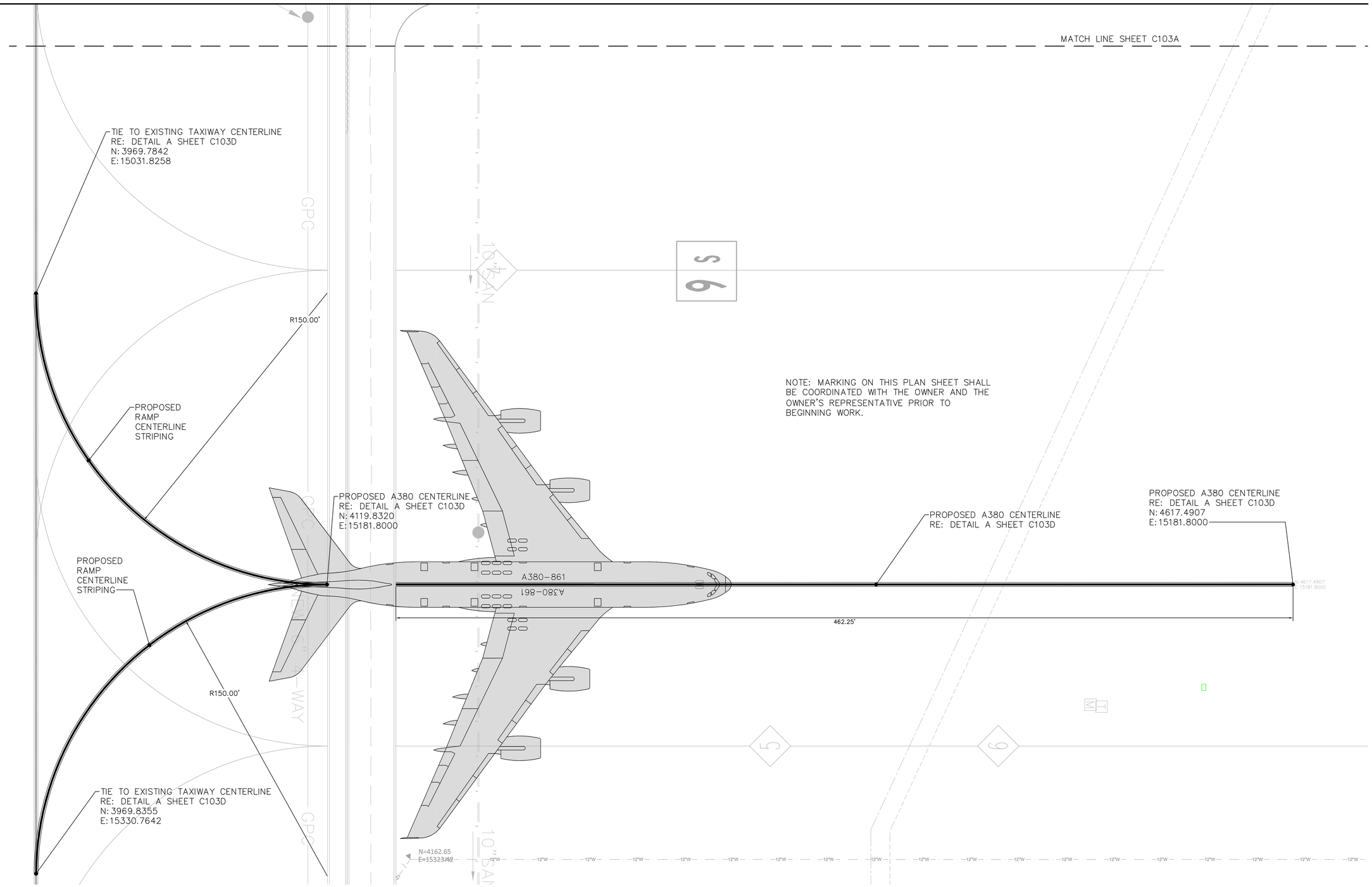
Sheet Title

PAVEMENT MARKING PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

C103A



NOTE: MARKING ON THIS PLAN SHEET SHALL BE COORDINATED WITH THE OWNER AND THE OWNER'S REPRESENTATIVE PRIOR TO BEGINNING WORK.

GENERAL MARKING NOTES:

1. MATCH TO EXIST MARKING AT THE APPROXIMATE RECONSTRUCTION LIMITS OR AS SHOWN.
2. CONTRACTOR SHALL PROTECT ALL LIGHT FIXTURES AND OTHER UTILITIES WITHIN THE PAVEMENT FROM BEING PAINTED.
3. REFERENCE SHEET C12.1.1 THROUGH C12.1.5 FOR PBB INFORMATION.
4. ORIENTATION ON PLAN SHEET MAY DIFFER FROM OTHER PLAN SHEETS.
5. CONTRACTOR MUST COORDINATE WITH ENGINEER AND AIRPORT PRIOR TO INSTALLATION OF PROPOSED MARKINGS.
6. CONTRACTOR SHALL VERIFY EXISTING MARKINGS AND PROPOSED TIE IN LOCATIONS PRIOR TO BEGINNING THIS WORK.
7. CONTRACTOR SHALL ADVISE OWNER AND OWNER'S REPRESENTATIVE IMMEDIATELY IF MARKING AS SHOWN ON THE PLANS DO NOT MATCH/TIE TO EXISTING MARKINGS.
7. NORTHING AND EASTING ARE SHOWN ON THE PLANS FOR REFERENCE ONLY. CONTRACTOR SHALL FIELD VERIFY AND COORDINATE WITH OWNER AND OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION OF ANY PROPOSED MARKING.

LEGEND

PROPOSED RAMP AND A380 CENTERLINE STRIPING

PAVEMENT MARKING PLAN

1 / C103

0 10' 20' 40'
SCALE IN FEET

NORTH

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
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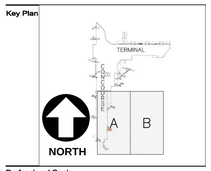
Key Plan



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3	ISSUE FOR 95% CONSTRUCTION DOCUMENTS	01-23-2015
4	ISSUE FOR 100% CONSTRUCTION DOCUMENTS	03-23-2015
5	ISSUE FOR BID DOCUMENTS	04-17-2015

Drawn by: JG Reviewed by: DLS

Project No: 14.01002.00

Sheet Title

PAVEMENT MARKING PLAN

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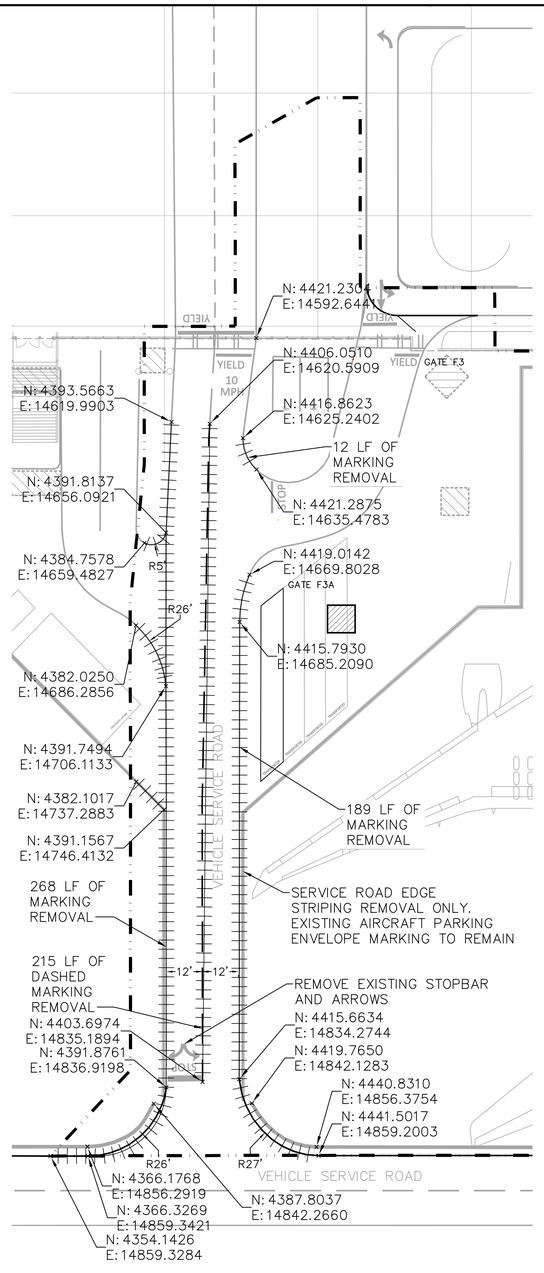
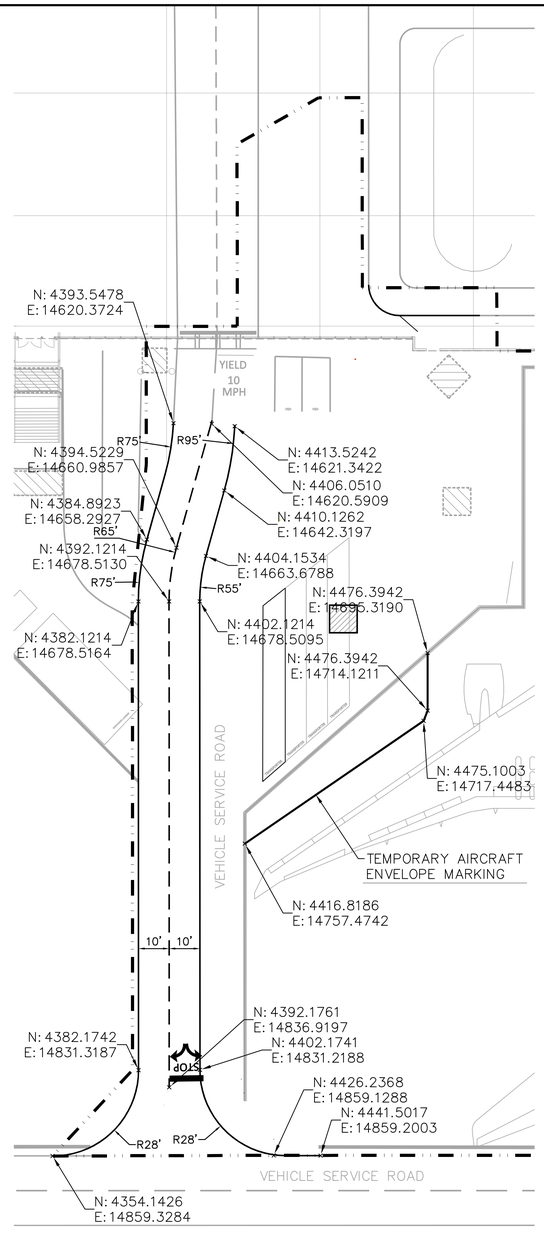
Sheet Number

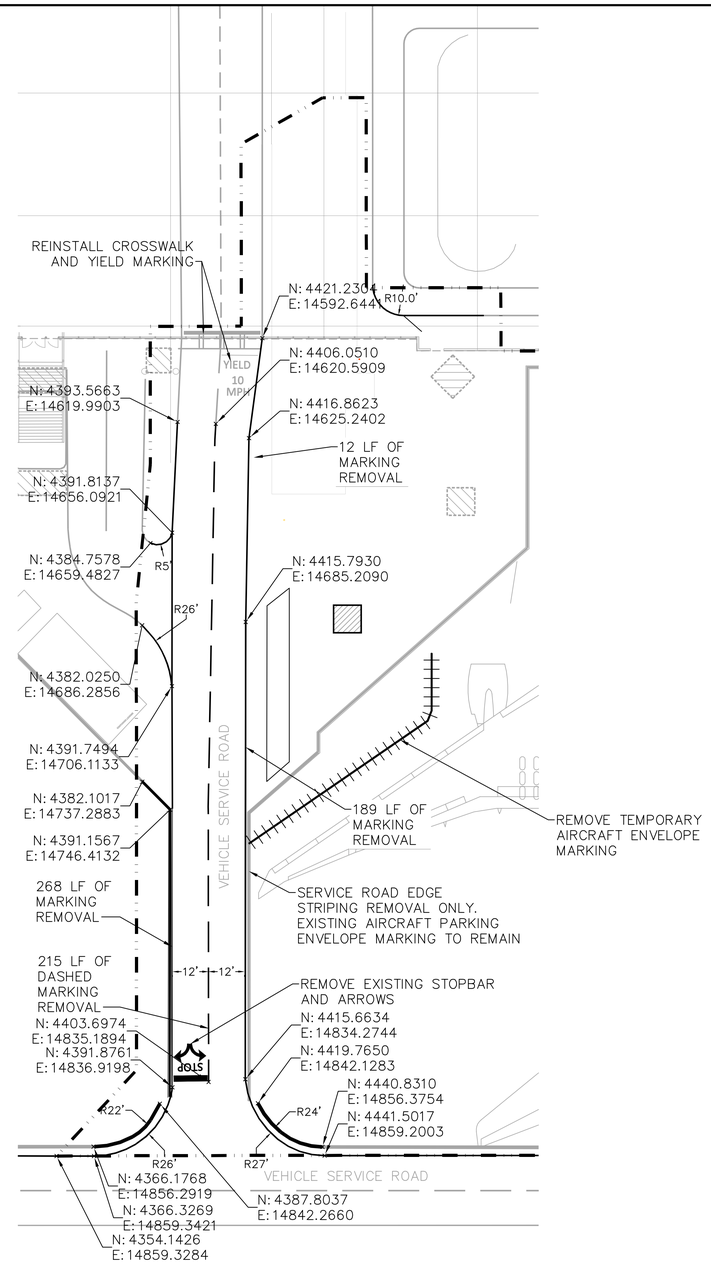
C103B



NLVR MARKING REMOVAL PLAN



NLVR PROPOSED TEMPORARY MARKING PLAN
NOTE: THESE MARKINGS SHALL BE REMOVED FOLLOWING CONSTRUCTION AND A PERMANMENT NLV ROAD SHALL BE INSTALLED.



NLVR PROPOSED FINAL MARKING PLAN

GENERAL MARKING NOTES:

1. MATCH TO EXIST MARKING AT THE APPROXIMATE RECONSTRUCTION LIMITS OR AS SHOWN.
2. CONTRACTOR SHALL PROTECT ALL LIGHT FIXTURES AND OTHER UTILITIES WITHIN THE PAVEMENT FROM BEING PAINTED.
3. REFERENCE SHEET C12.1.1 THROUGH C12.1.5 FOR PBB INFORMATION.
4. ORIENTATION ON PLAN SHEET MAY DIFFER FROM OTHER PLAN SHEETS.
5. CONTRACTOR MUST COORDINATE WITH ENGINEER AND AIRPORT PRIOR TO INSTALLATION OF PROPOSED MARKINGS.
6. CONTRACTOR SHALL VERIFY EXISTING MARKINGS AND PROPOSED TIE IN LOCATIONS PRIOR TO BEGINNING THIS WORK.
7. CONTRACTOR SHALL ADVISE OWNER AND OWNER'S REPRESENTATIVE IMMEDIATELY IF MARKING AS SHOWN ON THE PLANS DO NOT MATCH/TIE TO EXISTING MARKINGS.
8. NORTHING AND EASTING ARE SHOWN ON THE PLANS FOR REFERENCE ONLY. CONTRACTOR SHALL FIELD VERIFY AND COORDINATE WITH OWNER AND OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION OF ANY PROPOSED MARKING.

NOTES:

1. THIS PLAN SHEET IS FOR MARKING TEMPORARY AND PERMANENT NLV ROAD ONLY. SEE PLANSHEETS C103A–D FOR ALL APRON MARKINGS.
2. EXISTING NLV ROAD REMOVAL AND TEMPORARY NLV ROAD MARKING INSTALLATION SHALL OCCUR PRIOR TO THE INSTALLATION OF TEMPORARY CONCRETE JERSEY BARRICADES. CONTRACTOR SHALL COORDINATE REMOVAL OF EXISTING MARKING AND INSTALLATION OF PROPOSED MARKING WITH OWNER PRIOR TO BEGINNING CONSTRUCTION. TEMPORARY LOCATION OF MARKINGS MAY AFFECT ADJACENT GATE F–1.
3. ALL MARKING WORK MUST BE COORDINATED WITH THE OWNER AND OWNER'S REPRESENTATIVE PRIOR TO BEGINNING WORK.

LEGEND

- PROPOSED SAFETY LINE
- SCOPE OF WORK LIMITS
- PROPOSED NLVR MARKING
- NLVR MARKING TO BE REMOVED

PAVEMENT MARKING PLAN 1 / C103

0 10' 20' 40'
SCALE IN FEET

NORTH

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
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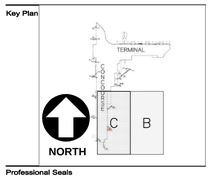

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5	ISSUE FOR BID DOCUMENTS	04-17-2015

Drawn by: JG Reviewed by: DLS

Project No: 14.01002.00

Sheet Title

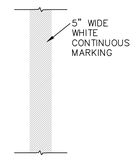
PAVEMENT MARKING PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

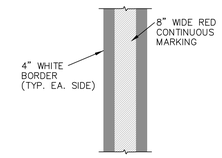
Sheet Number

C103C

A C106D PERMANENT TAXIWAY CENTERLINE MARKING N.T.S.

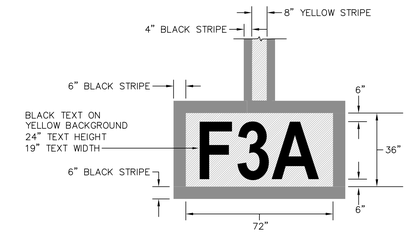


B C106D ROADWAY EDGE MARKING N.T.S.

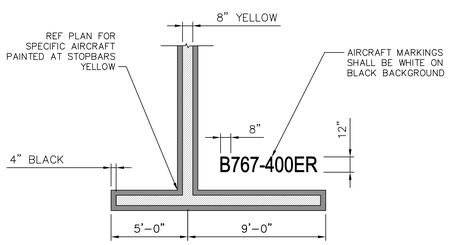


NOTE: DIMENSIONS APPROXIMATE. MATCH EXISTING LINE WIDTHS.

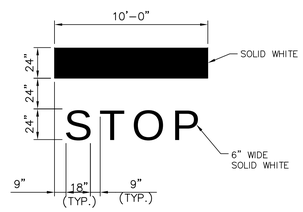
C C106D AIRCRAFT SAFETY LINE MARKING N.T.S.



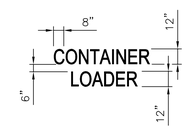
D C106D AIRCRAFT LEAD-IN LINE MARKING N.T.S.



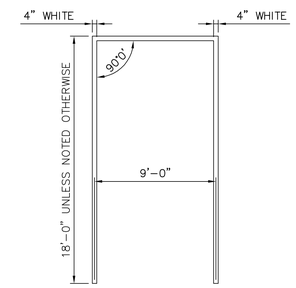
E C106D AIRCRAFT STOP BAR MARKING N.T.S.



F C106D STOP BAR MARKING N.T.S.

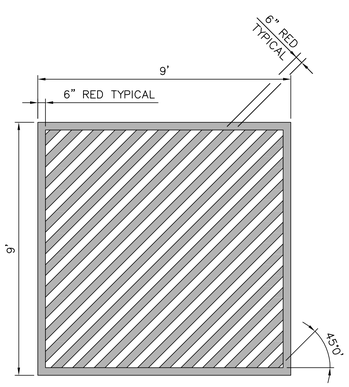


G C106D GSE/POV PARKING MARKING N.T.S.

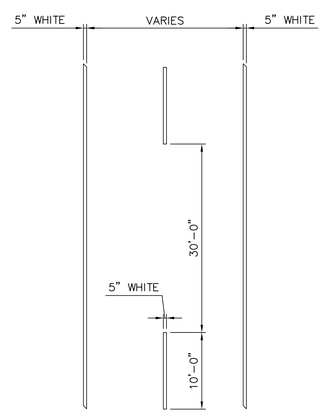


H C106D GROUND SERVICE EQUIPMENT AND VEHICLE PARKING MARKING N.T.S.

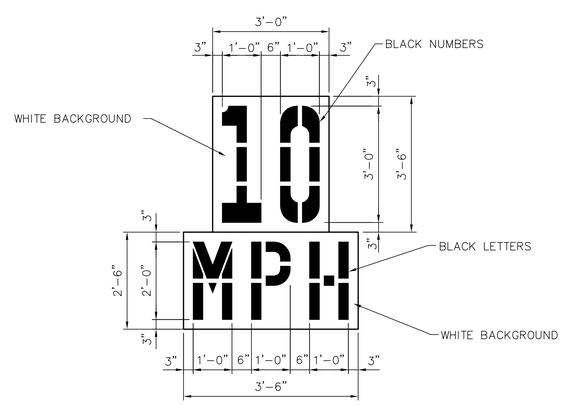
NOTE: ALL STRIPING ANGLES FOR GSE AND VEHICLE PARKING MARKINGS UNLESS OTHERWISE NOTED ON THE PLANS



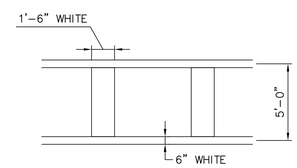
J C106D PASSENGER BOARDING BRIDGE STOW POSITION MARKING N.T.S.



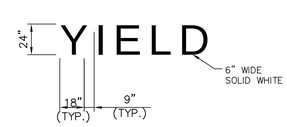
K C106D VEHICLE SERVICE ROAD AND CENTERLINE MARKING N.T.S.



L C106D MAX SPEED N.T.S.



M C106D CROSSWALK N.T.S.



N C106D YIED STRIPING N.T.S.

NOTES:

1. STOP BAR MARKINGS SHALL BE REFLECTIVE WHITE IN ACCORDANCE WITH THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).
2. STOP BAR SHOULD BE PLACED IN ACCORDANCE WITH THE MUTCD UNLESS OTHERWISE NOTED. THEN CONTRACTOR SHALL LOCATE AND HAVE ENGINEER APPROVAL PRIOR TO PLACEMENT OF STOP BAR.

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A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No.: 001

h-j+p
Hartsfield Jackson + Partnership
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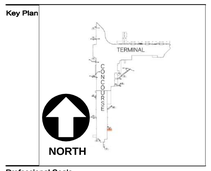
Key Plan



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2	ISSUE FOR 65% CONSTRUCTION DOCUMENTS	10-30-2014
3	ISSUE FOR 95% CONSTRUCTION DOCUMENTS	01-23-2015
4	ISSUE FOR 100% CONSTRUCTION DOCUMENTS	03-23-2015
5	ISSUE FOR BID DOCUMENTS	04-17-2015

Drawn by: JG Reviewed by: DLS

Project No: 14.01002.00

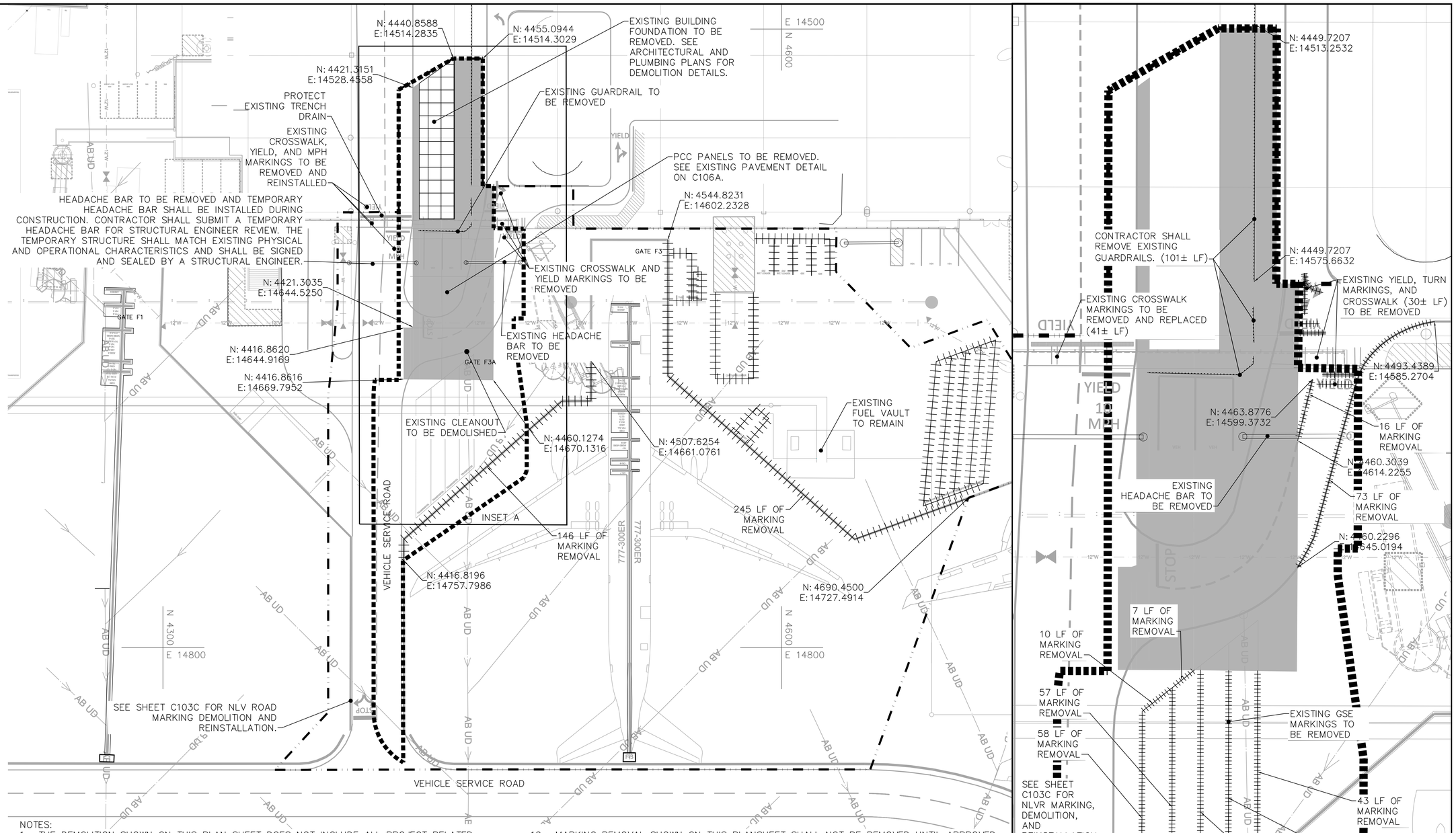
Sheet Title

MARKING DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

C103D



NOTES:

1. THE DEMOLITION SHOWN ON THIS PLAN SHEET DOES NOT INCLUDE ALL PROJECT RELATED DEMOLITION. REFER TO THE FOLLOWING SHEETS FOR OTHER PROJECT DEMOLITION REQUIREMENTS:
   - EXISTING PBB DEMOLITION PLAN C12.1.1 THROUGH C12.1.5
2. THE CONTRACTOR IS RESPONSIBLE FOR ALL CONSTRUCTION SURVEYING PRIOR TO BEGINNING WORK. ANY DEVIATIONS FROM EXISTING CONDITIONS AS SHOWN ON THE PLANS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER.
3. THE CONTRACTOR SHALL PROVIDE THE ENGINEER THEIR EXISTING GROUND SURVEY PRIOR TO STARTING WORK.
4. A FULL DEPTH VERTICAL SAWCUT IS REQUIRED AT ALL CONCRETE AND ASPHALT SURFACES AND PAVEMENTS AT THE DEMOLITION LIMIT.
5. CONTRACTOR SHALL PROTECT ALL ITEMS NOT TO BE DEMOLISHED INCLUDING BUT NOT LIMITED TO: LIGHTING, STRUCTURES, MARKING, MANHOLES, INLETS, ETC.
6. ANY ITEMS NOT SCHEDULED FOR REMOVAL THAT ARE DAMAGED DURING CONSTRUCTION SHALL BE REPLACED BY CONTRACTOR AT NO COST TO THE OWNER, IN A MANNER ACCEPTABLE TO THE OWNER. FINAL INSTALLED/REPAIRED SURVEY SHALL BE SUBMITTED TO THE OWNER FOR REVIEW. NO REIMBURSEMENT WILL BE MADE. ANY SURFACE DAMAGE OR CRACKING OF EXISTING CONCRETE OR AC PAVEMENTS CAUSED BY CONTRACTOR OR SUBCONTRACTORS SHALL BE REMOVED AND/OR REPAIRED AS DETERMINED BY THE OWNER AT THE CONTRACTOR'S EXPENSE.
7. PAVEMENT AREAS MAY BE CLOSED TO TRAFFIC WHEN PRIOR APPROVAL HAS BEEN OBTAINED FROM OWNER AND/OR TBI.
8. GSE PARKING TO BE COORDINATED WITH AIRPORT AND ENGINEER PRIOR TO INSTALLATION.
9. PAVEMENT REMOVAL LENGTHS ARE ALONG THE LINE AND BETWEEN THE TWO CORRESPONDING NORTHING AND EASTINGS.
10. MARKING REMOVAL SHOWN ON THIS PLANSHEET SHALL NOT BE REMOVED UNTIL APPROVED BY OWNER AND SHALL OCCUR FOLLOWING BUILDING EXPANSION CONSTRUCTION.
11. CONTRACTOR SHALL COMPLY WITH P-501 SPECIFICATION FOR ANY DISTURBANCE OF EXISTING BASE AND SUBBASE MATERIAL TO REMAIN. DISTURBANCE OF THIS MATERIAL TO INSTALL PROPOSED DRAINS, UTILITIES, AND OTHER PROPOSED UTILITIES SHALL BE REPAIRED AS INDICATED IN P-501.
12. COORDINATES SHOWN ARE FOR INFORMATIONAL PURPOSES ONLY AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CONTRACTOR SHALL ADVISE THE OWNER AND OWNER'S REPRESENTATIVE IF DEVIATIONS ARE DISCOVERED.
13. DEMOLITION ITEMS LOCATED OUTSIDE OF JERSEY BARRICADES SHALL BE COORDINATED WITH THE OWNER.
14. LINEAR FEET OF MARKING REMOVAL IS APPROXIMATE AND SHOULD BE VERIFIED BY THE CONTRACTOR. FOR CLARITY, MEASUREMENTS FOR MARKINGS HAVE ONLY BEEN INCLUDED IN SOME AREAS.

UTILITY DISCLAIMER

UTILITIES MAY EXIST WHICH ARE NOT SHOWN ON THE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING ALL UTILITY COMPANIES HAVING UTILITIES WITHIN OR ADJACENT TO THE WORK AREA. THE CONTRACTOR SHALL HAVE THE UTILITIES FIELD LOCATED AND COORDINATE WITH UTILITY COMPANIES TO HAVE THEM RELOCATED WHEN NECESSARY OR ADAPTED FOR TIE-INS.

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DEMOLITION PLAN 1 C104

0 10' 20' 40'
SCALE IN FEET

NORTH

LEGEND

- EXISTING MARKING TO BE OBLITERATED
- CONCRETE PAVEMENT TO BE REMOVED (20" PCC)
- BUILDING FOUNDATION TO BE REMOVED (SEE ARCHITECTURAL PLANS)
- SCOPE OF WORK LIMITS
- TEMPORARY CONCRETE JERSEY BARRICADES

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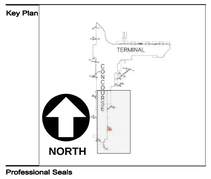

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4	ISSUE FOR 100% CONSTRUCTION DOCUMENTS	03-23-2015
5	ISSUE FOR BID DOCUMENTS	04-17-2015

Drawn by: JG Reviewed by: DLS

Project No: 14.01002.00

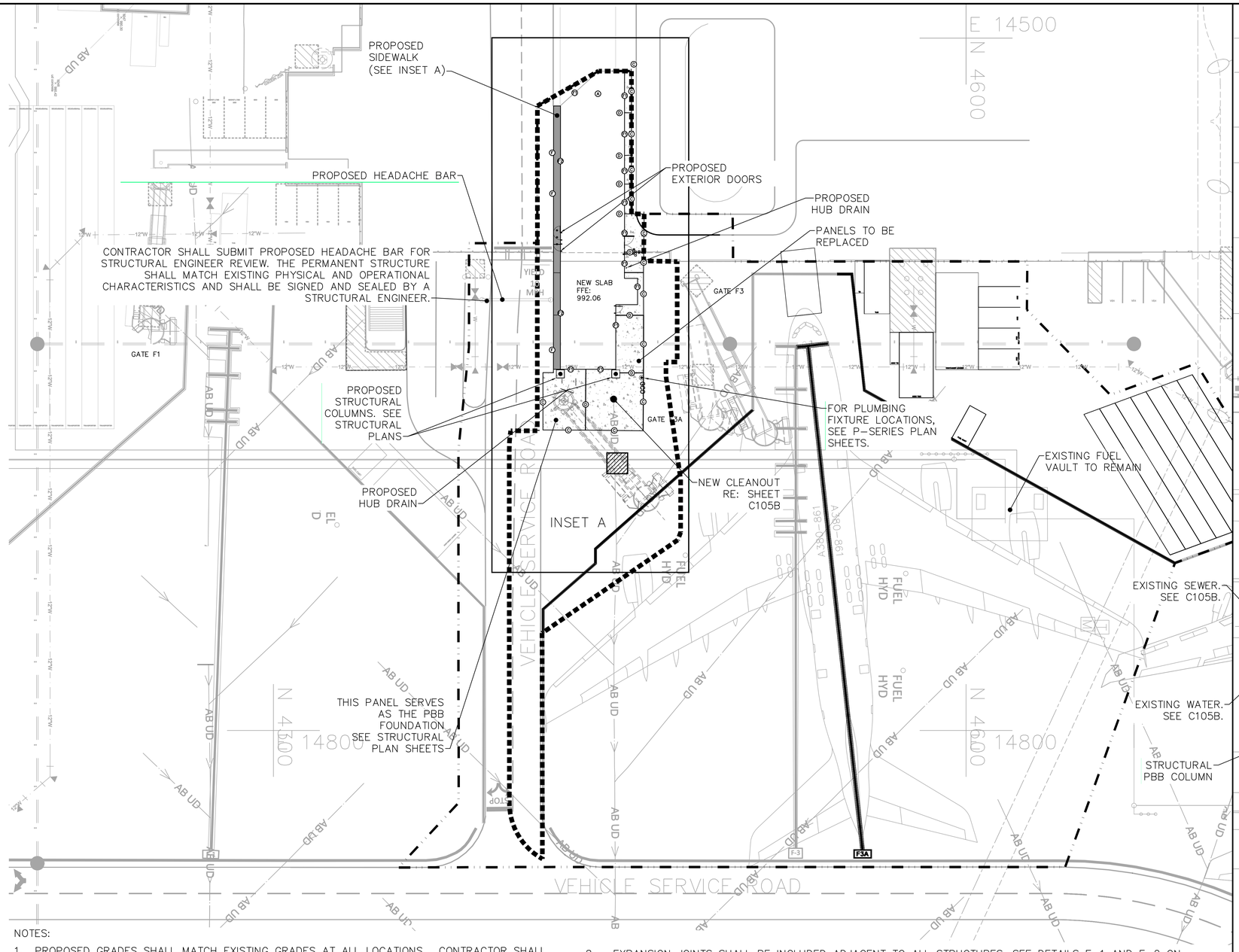
Sheet Title

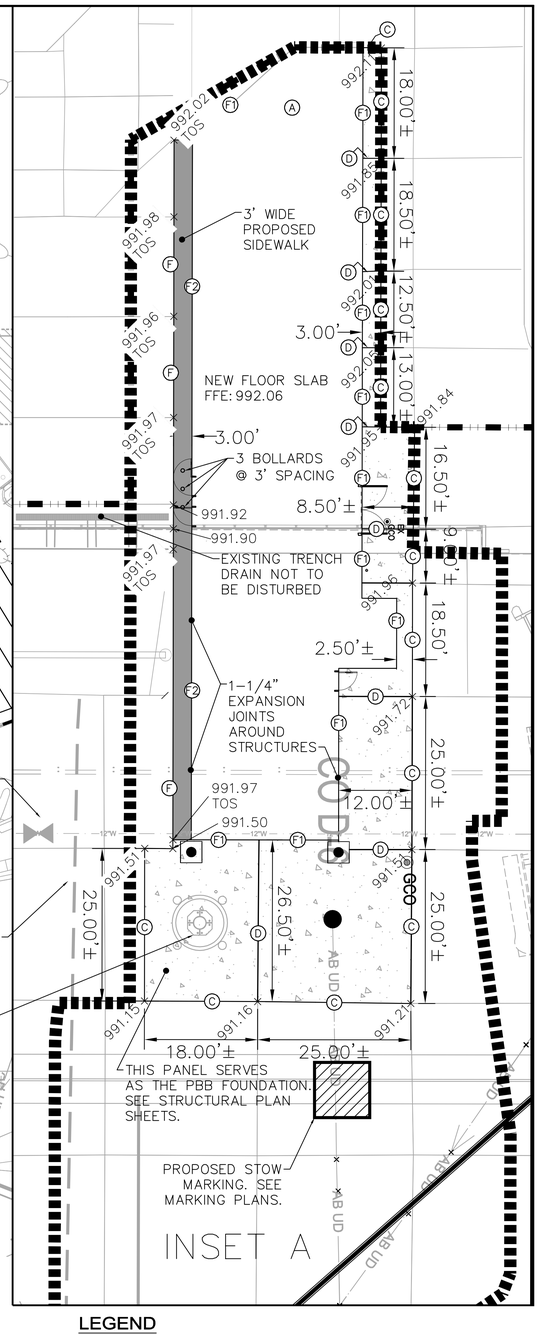
DEMOLITION PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

C104





NOTES:

1. PROPOSED GRADES SHALL MATCH EXISTING GRADES AT ALL LOCATIONS. CONTRACTOR SHALL ENSURE POSITIVE DRAINAGE IN ALL LOCATIONS AND SHALL TAKE ALL NECESSARY MEASURES TO AVOID PONDING.
2. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES TO PROTECT FROM DAMAGE ALL EXISTING IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE. ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR RECONSTRUCTED, SATISFACTORY TO THE OWNER, AT THE EXPENSE OF THE CONTRACTOR.
3. THE CONTRACTOR SHALL BEAR FULL RESPONSIBILITY FOR THE PROTECTION OF ALL UTILITIES. UTILITIES SHOWN ON THE PLANS WERE PROVIDED BY AS-BUILTS. CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
4. EXCAVATION IN AREAS OF EXISTING UTILITIES SHALL BE DONE BY HAND.
5. THE CONTRACTOR SHALL VERIFY ALL EXISTING PAVEMENT ELEVATIONS AND PAVEMENT SECTION FOR TIE-INS PRIOR TO CONSTRUCTION. ANY DEVIATIONS FROM EXISTING GRADES OR PAVEMENT SECTION AS SHOWN ON THE PLANS SHALL BE REPORTED TO THE ENGINEER A MINIMUM OF 72 HOURS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE THE ENGINEER THEIR EXISTING GROUND SURVEY PRIOR TO PANEL REMOVAL AND REPLACEMENT.
6. THE ENGINEER RESERVES THE RIGHT TO MAKE REVISIONS TO THE FINISHED ELEVATIONS AND GRADIENTS BASED ON CONTRACTOR SURVEYS. IF CHANGES ARE NECESSARY, THE ENGINEER WILL FURNISH A REVISED GRADING OR PAVING PLAN.
7. THE CONTRACTOR SHALL KEEP THE SITE CLEAN OF TRASH AND DEBRIS AND SHALL APPLY WATER TO PREVENT THE OCCURRENCE OF DUST WHICH IS OBJECTIONABLE TO THE OPERATIONS OR USERS OF THE AREA. ALL COST FOR CONTROLLING TRASH, DUST OR POLLUTANT DISCHARGE TO THE AIR OF ANY KIND SHALL BE INCIDENTAL TO THE CONTRACT.
8. EXPANSION JOINTS SHALL BE INCLUDED ADJACENT TO ALL STRUCTURES. SEE DETAILS F-1 AND F-2 ON SHEET C106A.
9. ALL PROPOSED JOINTS SHALL MATCH EXISTING JOINT LINES. DISTANCES PROVIDED SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO BEGINNING WORK. CONTRACTOR SHALL NOTIFY OWNER/ENGINEER IF EXISTING CONDITIONS ARE IN CONFLICT WITH PLANS.
10. LOCATION OF PROPOSED BOLLARDS SHALL BE COORDINATED WITH OWNER AND OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION.
11. ALL PROPOSED PAVEMENT SHALL BE REINFORCED WITH W.W.F. REFERENCE SHEET C106A FOR DETAILS.
12. CONTRACTOR SHALL INSTALL AN EXPANSION JOINT AT ALL STRUCTURES. REFERENCE PLAN SHEET C106A FOR DETAILS.
13. PROPOSED SUMP PUMP WILL BE REQUIRED FOR ESCALATOR PIT. SEE S-SERIES SHEETS FOR DETAILS.
14. SPOT ELEVATIONS SHOWN ARE FOR INFORMATIONAL PURPOSES ONLY AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO INSTALLATION. CONTRACTOR SHALL TIE IN TO EXISTING PAVEMENT ELEVATIONS. IF FIELD CONDITIONS VARY FROM THE ELEVATIONS SHOWN ON THESE PLANS, CONTRACTOR SHALL ADVISE OWNER AND OWNER'S REPRESENTATIVE IMMEDIATELY.

PAVING PLAN 1 / C105

0 10' 20' 40'
SCALE IN FEET

NORTH

LEGEND

	PROPOSED CONCRETE PAVEMENT
	SCOPE OF WORK LIMITS
	PROPOSED SIDEWALK
	TEMPORARY CONCRETE JERSEY BARRICADES
C	LONGITUDINAL OR TRANSVERSE CONTRACTION JOINT AT EXISTING PAVEMENT
D	TRANSVERSE CONTRACTION JOINT
F	EXPANSION JOINT AT EXISTING PAVEMENT AND SIDEWALK
F1	BUILDING EXPANSION JOINT
F2	BUILDING EXPANSION JOINT WITH SIDEWALK
× 991.XX	SPOT ELEVATION
× 991.XX TOS	TOP OF SIDEWALK SPOT ELEVATION

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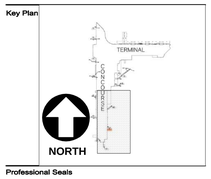

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Drawn by: JG Reviewed by: DLS

Project No: 14.01002.00

Sheet Title

PAVING PLAN

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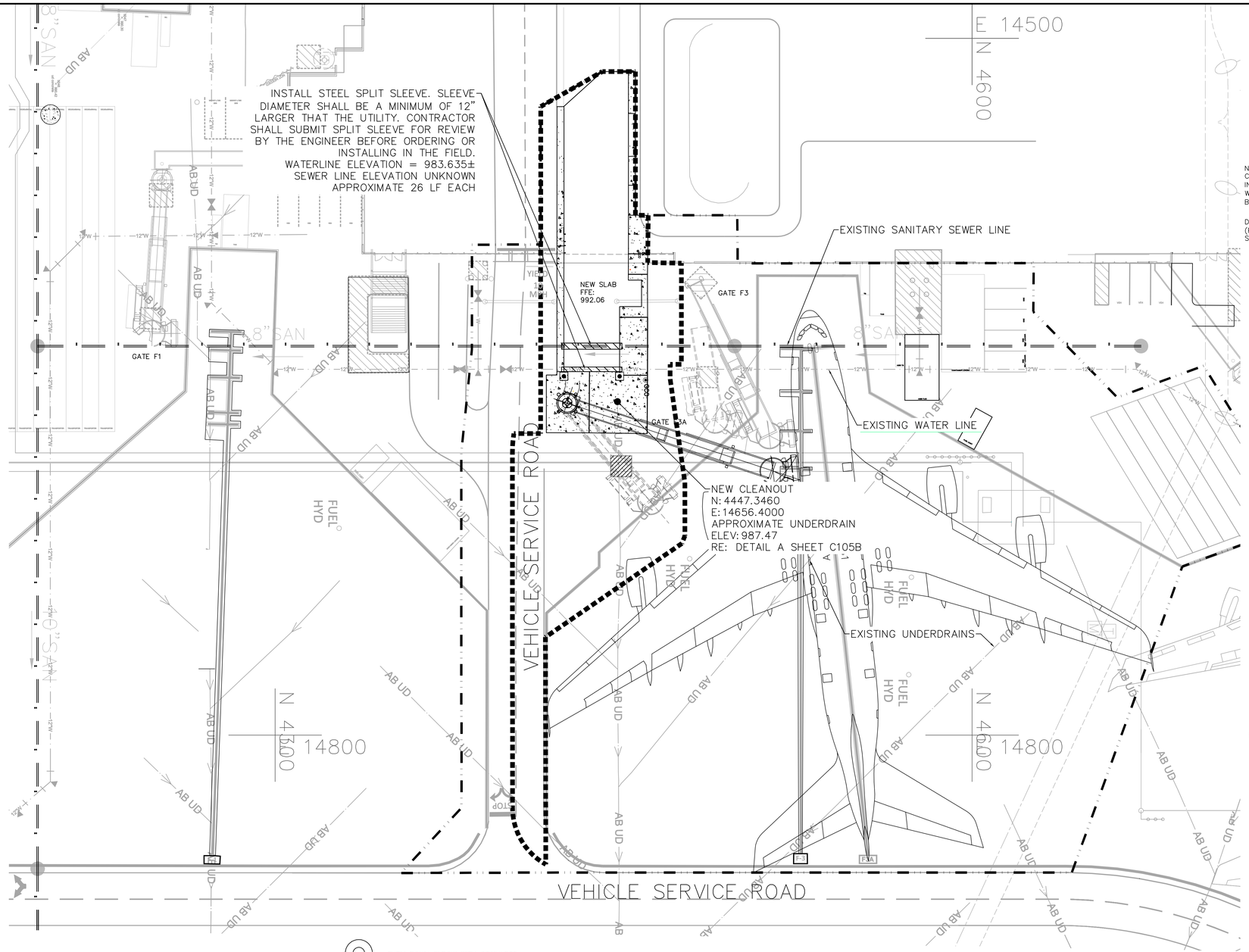
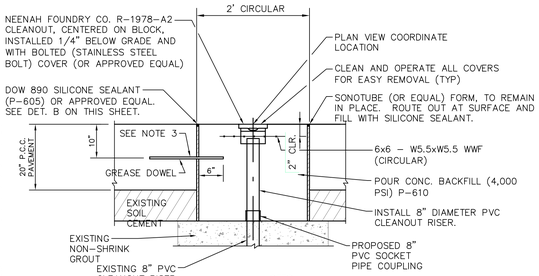
Sheet Number

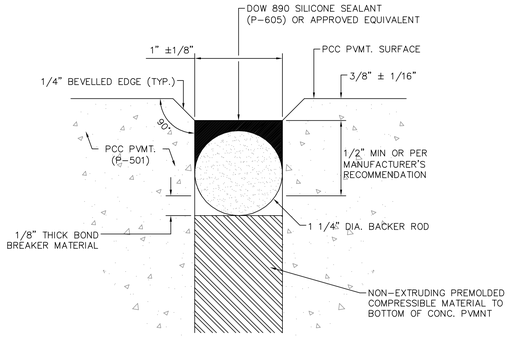
C105A



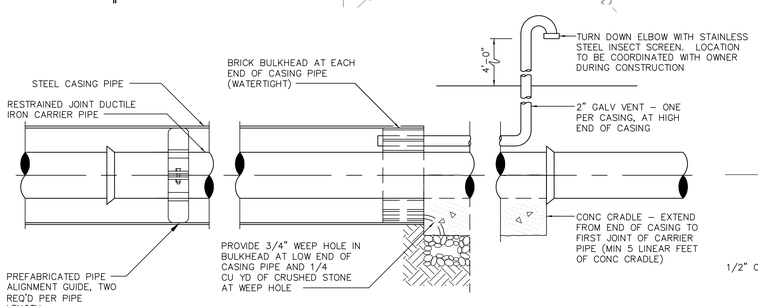


NOTES:
1. SEE DOWEL BAR NOTES ON SHEET C106A.
2. 2'-0" MINIMUM OFFSET FROM SONOTUBE JOINT TO NEAREST PROP. PAVEMENT JOINT.
3. PLACE 3, 1-1/4" ø x 20" LONG SMOOTH SOLID DOWELS EPOXY COATED AT 120° SPACING, TYP. AT EACH CLEANOUT LOCATION.

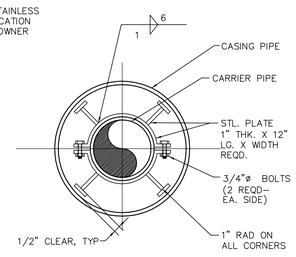
A / C105B — CLEANOUT WITHIN PCC PAVEMENT — N.T.S.



B / C105B — FORMED EXPANSION JOINT SEAL TYPE 1 — N.T.S.



TYPICAL CASING



PIPE ALIGNMENT GUIDE

NOTES:
1. CONTRACTOR SHALL SUBMIT STEEL CASING SLEEVE FOR REVIEW BEFORE ORDERING AND INSTALLATION.
2. STEEL SLEEVE SHALL BE PROVIDED TO THE PROJECT SITE CUT INTO HALF SO IT CAN BE INSTALLED AROUND EXISTING PIPES. HALF SECTIONS OF THE STEEL SLEEVE SHALL BE WELDED TOGETHER.

C / C105B — STEEL SPLIT SLEEVE — N.T.S.

NOTES:
1. PROPOSED SUMP PUMP WILL BE REQUIRED FOR THE ESCALATOR PIT. SEE S-SERIES SHEETS FOR DETAILS.

LEGEND

- PROPOSED CONCRETE PAVEMENT
- SCOPE OF WORK LIMITS
- TEMPORARY CONCRETE JERSEY BARRICADES

EXISTING APRON UTILITIES MODIFICATION PLAN — 1 / C105

0 10' 20' 40'
SCALE IN FEET

NORTH

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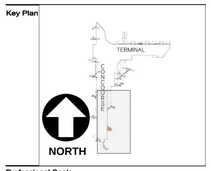

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Drawn by: JG Reviewed by: DLS

Project No: 14.01002.00

Sheet Title
EXISTING APRON UTILITIES MODIFICATION PLAN

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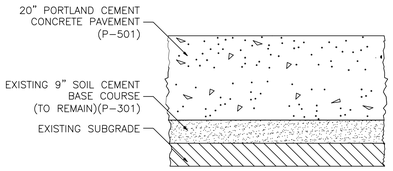
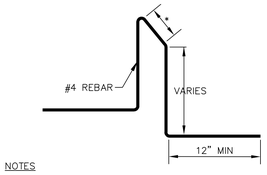
Sheet Number
C105B



A C106A EXISTING TYPICAL SECTION (RAMP 9) FROM AS-BUILTS N.T.S.

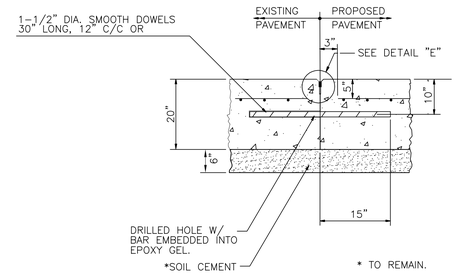


NOTES

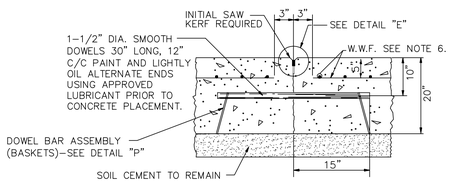
1. CHAIR SHALL BE FIRMLY ANCHORED TO GRADE.
2. THE NUMBER OF CHAIRS USED SHALL BE SUFFICIENT TO FULLY SUPPORT REINFORCEMENT MAT AT THE PROPER HEIGHT DURING PLACEMENT OF CONCRETE.

* AS REQUIRED TO FULLY SUPPORT REINFORCEMENT MAT.

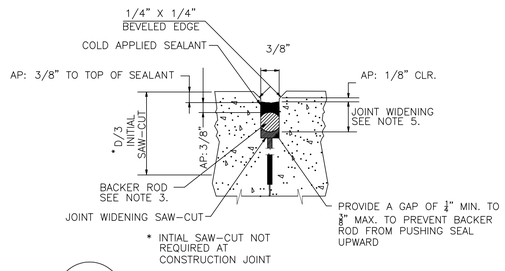
B C106A MAT SUPPORT CHAIR N.T.S.



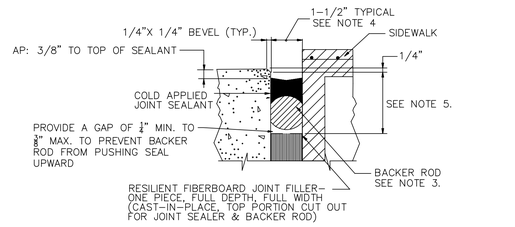
C C106A LONGITUDINAL OR TRANSVERSE JOINT AT EXISTING PAVEMENT N.T.S.



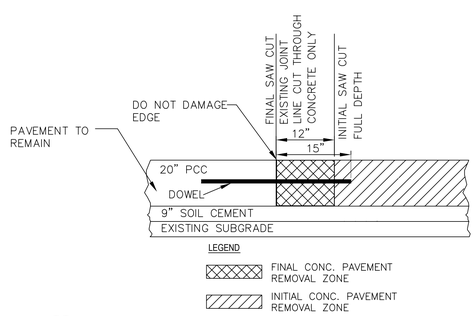
D C106A TRANSVERSE CONTRACTION JOINT N.T.S.



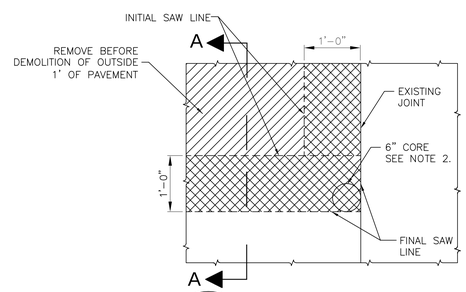
E C106A LONGITUDINAL AND TRANSVERSE JOINT SEAL DETAIL "E" N.T.S.



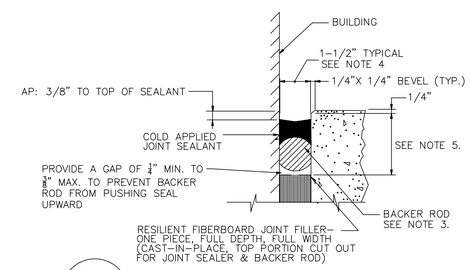
F C106A EXPANSION JOINT AT EXISTING PAVEMENT AND SIDEWALK N.T.S.



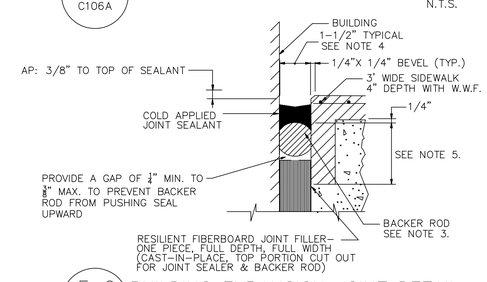
G C106A TYPICAL SAWCUT ADJACENT TO EXISTING PAVEMENT TO REMAIN N.T.S.



H C106A PAVEMENT REMOVAL TYPICAL PLAN N.T.S.



F-1 C106A BUILDING EXPANSION JOINT DETAIL N.T.S.



F-2 C106A BUILDING EXPANSION JOINT DETAIL WITH SIDEWALK N.T.S.

NOTES FOR DOWEL AND TIE BAR HOLE DRILLING AND INSTALLATION:

A. DRILLING AND INSTALLATION METHOD SHALL BE CAPABLE OF MAINTAINING DRILL HOLES AND EMBEDDED BARS: (A) PARALLEL TO THE CONCRETE SURFACE, AND (B) NORMAL TO THE JOINT LINE, WITHIN 1/4" AT THE END OF THE DOWEL OR TIE BAR EXCEPT WHERE SPECIFIED OTHERWISE. DRILL HOLES SHALL BE ACCURATELY LAID OUT SO THAT THE MAXIMUM DEVIATION DOES NOT EXCEED 1". DRILL HOLE DIAMETER TO BE APPROXIMATELY 1/8" CLEAR OF BAR ALL AROUND.

B. AFTER THE DRILLING IS COMPLETE AND PRIOR TO INSTALLATION OF THE DOWEL OR TIE BARS, THE HOLES SHALL BE THOROUGHLY CLEANED TO REMOVE DRILLING DUST, CONCRETE CHIPS, AND ANY MATERIAL DETRIMENTAL TO BONDING.

C. EPOXY GEL SHALL BE APPLIED TO THE DOWEL AND SUFFICIENT GEL INJECTED IN THE BACK OF THE TIE BAR HOLE BY A MECHANICAL MIXING/PUMP DEVICE, SO THAT A SLIGHT AMOUNT OF GEL WILL BE FORCED OUT WHEN THE DOWEL OR TIE BAR IS INSERTED AND TAPPED TO THE CORRECT POSITION. IT WILL BE NECESSARY TO TWIST THE BAR BACK AND FORTH SEVERAL TIMES TO ELIMINATE THE AIR ENTRAPPED IN THE HOLE. SMALL WEDGES MAY BE USED TO SUPPORT THE DOWEL OR TIE BAR IN CORRECT ALIGNMENT UNTIL THE GEL HARDENS.

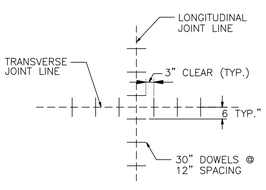
D. EPOXY SHALL MEET THE GEORGIA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATION, SECTION 886 FOR TYPE VIII EPOXY GEL.

NOTES:

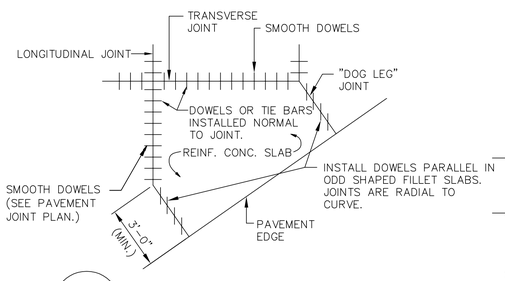
1. LONGITUDINAL AND TRANSVERSE JOINTS SHALL BE SAWED AS INDICATED.
2. TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED ONLY WHEN APPROVED BY THE ENGINEER.
3. FOR ALL JOINTS THE BACKER ROD MATERIAL SHALL BE COMPATIBLE WITH THE COLD POURED SEALANT AND SLIGHTLY OVERSIZED TO PREVENT MOVEMENT DURING THE JOINT SEALANT OPERATION.
4. THE WIDTH OF THE JOINTS SHALL BE CORRECTED FOR 68° F.
5. JOINT CONFIGURATION SHALL MEET JOINT SEAL MANUFACTURER'S SPECIFICATIONS, EXCEPT AS NOTED ON PLANS AND IN SPECIFICATIONS.
6. WELDED WIRE REINFORCING SHALL BE 6X6 D7/D7. ALL REINFORCING STEEL SHALL BE DELIVERED IN FLAT SHEETS. NO ROLL STOCK WILL BE ACCEPTABLE.

DEMOLITION NOTES:

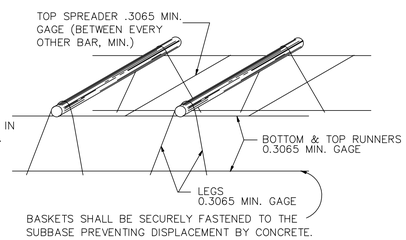
7. ALL PAVEMENT REMOVAL EXCEPT FOR 1'-0" PERIMETER AREA SHALL BE COMPLETED PRIOR TO FINAL CUT.
8. NO SAW CUTS WILL BE PERMITTED TO EXTEND BEYOND THE FINAL SAWCUT LINE. PRIOR TO THE FINAL SAW CUT, THE CONTRACTOR SHALL CORE THE CORNERS OF THE PAVEMENT AREA TO BE DEMOLISHED. THE DIAMETER OF THE CORES SHALL BE 6 INCHES.
9. ADDITIONAL SAW CUTS WILL BE PERMITTED WITHIN THE FINAL SAW CUT PERIMETER AT THE CONTRACTOR'S DISCRETION.
10. WHEN SAW CUTTING CONCRETE, CONTRACTOR SHALL MAKE TWO SAW CUTS AS PER DETAIL THIS SHEET. THE INITIAL SAW CUT SHALL BE CUT THROUGH CONCRETE AND ALL STABILIZED BASE COURSES. THE SECOND CUT SHALL BE THROUGH CONCRETE ONLY. FOLLOWING FINAL SAW CUT, CONCRETE SHALL CAREFULLY BE REMOVED TO AVOID DAMAGING THE REMAINING EDGE.
11. ALL EXISTING CEMENT TREATED BASE OR SOIL CEMENT BASE THAT IS DAMAGED DURING PORTLAND CEMENT CONCRETE PAVEMENT REMOVAL SHALL BE REPAIRED OR REPLACED WITH LOW SLUMP, LOW STRENGTH CONCRETE OR AS DEEMED BY THE ENGINEER OR OUTLINED IN THE SPECIFICATIONS AT NO ADDITIONAL COST TO THE OWNER.



M C106A DOWEL SPACING DETAIL AT JOINT CORNERS N.T.S.



N C106A SKEWED DOWEL INSTALLATION N.T.S.



P C106A TYPICAL DOWEL BAR BASKET N.T.S.

NOTES:

1. WIRE USED IN BASKETS SHALL CONFORM TO ASTM-A82 COLD DRAWN WIRE.
2. DOWEL BAR ATTACHMENT MAY BE FABRICATED BY ARC OR RESISTANCE TYPE WELDING.
3. WIRE FRAME MEMBERS SHALL BE RESISTANCE WELDED EXCEPT FOR SPREADER WIRES WHICH MAY BE ARC WELDED.

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A380 GATE F3 RECONFIGURATION
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TASK ORDER No.: 001

h-j+p
Hartsfield Jackson + Partnership
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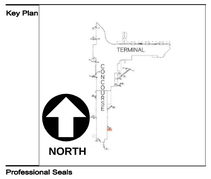

Professional Seals

No.	Description	Date
1	ISSUE FOR 35% CONSTRUCTION DOCUMENTS	06-23-2014
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3	ISSUE FOR 95% CONSTRUCTION DOCUMENTS	01-23-2015
4	ISSUE FOR 100% CONSTRUCTION DOCUMENTS	03-23-2015
5	ISSUE FOR BID DOCUMENTS	04-17-2015

Drawn by: JG Reviewed by: DLS

Project No: 14.01002.00

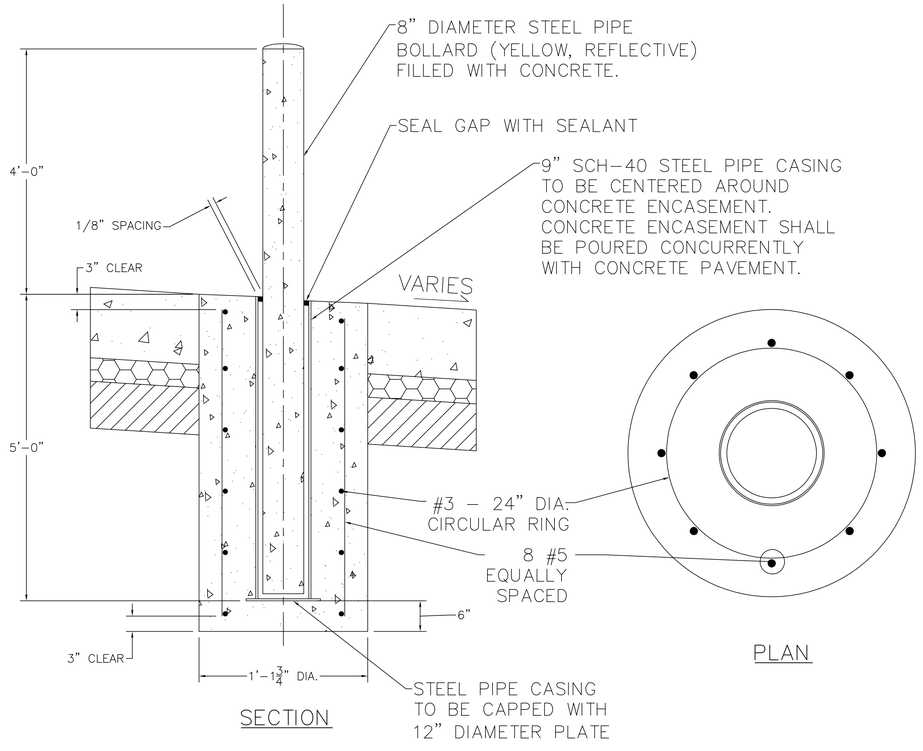
Sheet Title

CIVIL DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

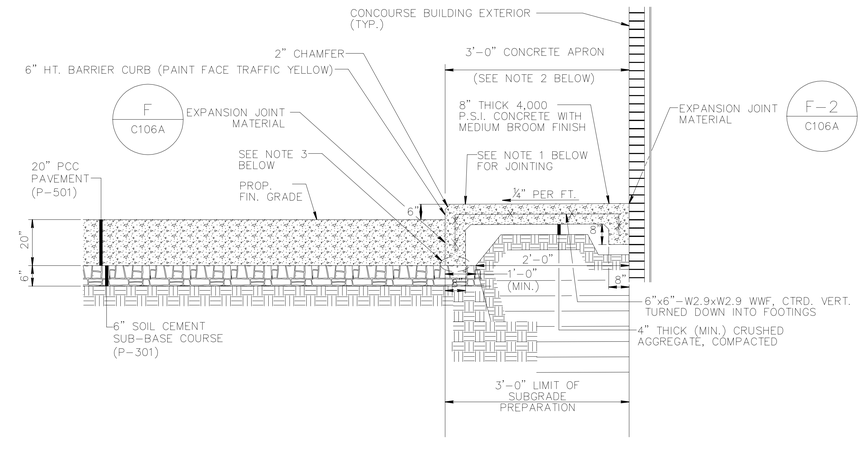
Sheet Number

C106A



1 / C106B REMOVABLE CONCRETE FILLED STEEL BOLLARD

N.T.S.



NOTES:

1. PROVIDE 2" DEPTH SAWN TRANSVERSE CONTRACTION JOINT AT 6'-0" O.C. AND FILL WITH P-605 SILICONE SEALANT.
2. THE 3'-0" WIDTH IS TYPICAL – THE OWNER MAY DIRECT THAT IT BE MODIFIED AT PENETRATIONS SUCH AS PASSENGER BOARDING BRIDGE FOUNDATION SUPPORTS, UTILITY PENETRATIONS, ETC. WHENEVER THE WIDTH IS MODIFIED ENSURE THAT POSITIVE DRAINAGE IS PROVIDED.
3. CONSTRUCT SUPPORT FOOTING TO TOP OF PAVEMENT LAYER UNDERNEATH THE P-501.

CONCOURSE BUILDING – SIDEWALK DETAIL

N.T.S.

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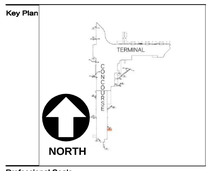

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5	ISSUE FOR BID DOCUMENTS	04-17-2015

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Project No: 14.01002.00

Sheet Title

CIVIL DETAILS

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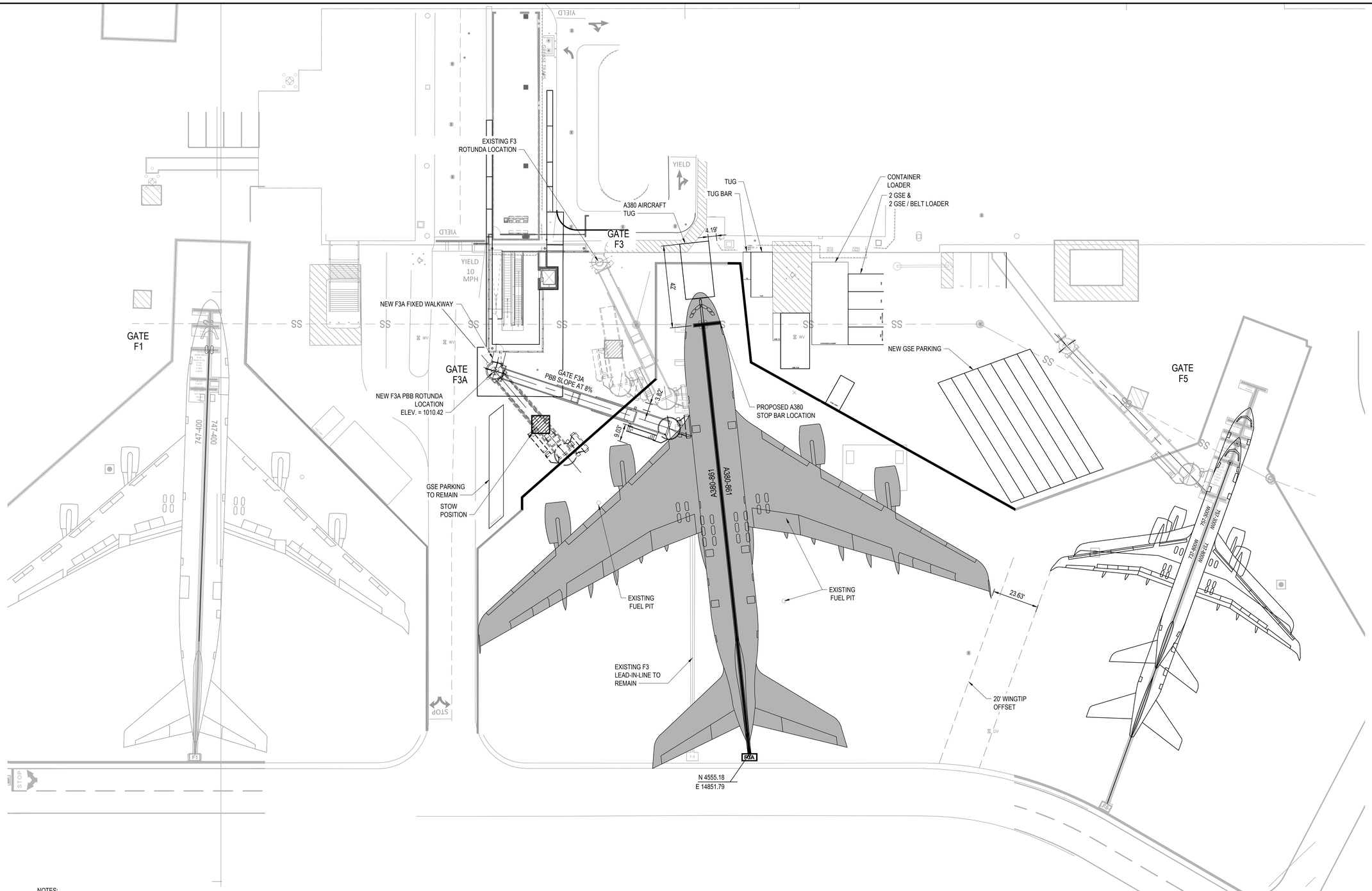
Sheet Number

C106B



NOTES:

1. DIMENSIONS ARE TAKEN TO CENTER OF STRIPE UNLESS OTHERWISE NOTED.
2. ITEMS SHOWN ARE BASED ON INFORMATION RECEIVED AND NOT YET VERIFIED.
3. REFER TO STRUCTURAL DRAWINGS FOR PBB FOUNDATION DETAILS.

1 AIRCRAFT LAYOUT PLAN
1" = 20'

0 5 10 20 40 FT.

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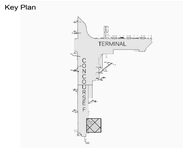

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JTS Reviewed by: SPD

Project No:

Sheet Title

AIRCRAFT LAYOUT PLAN

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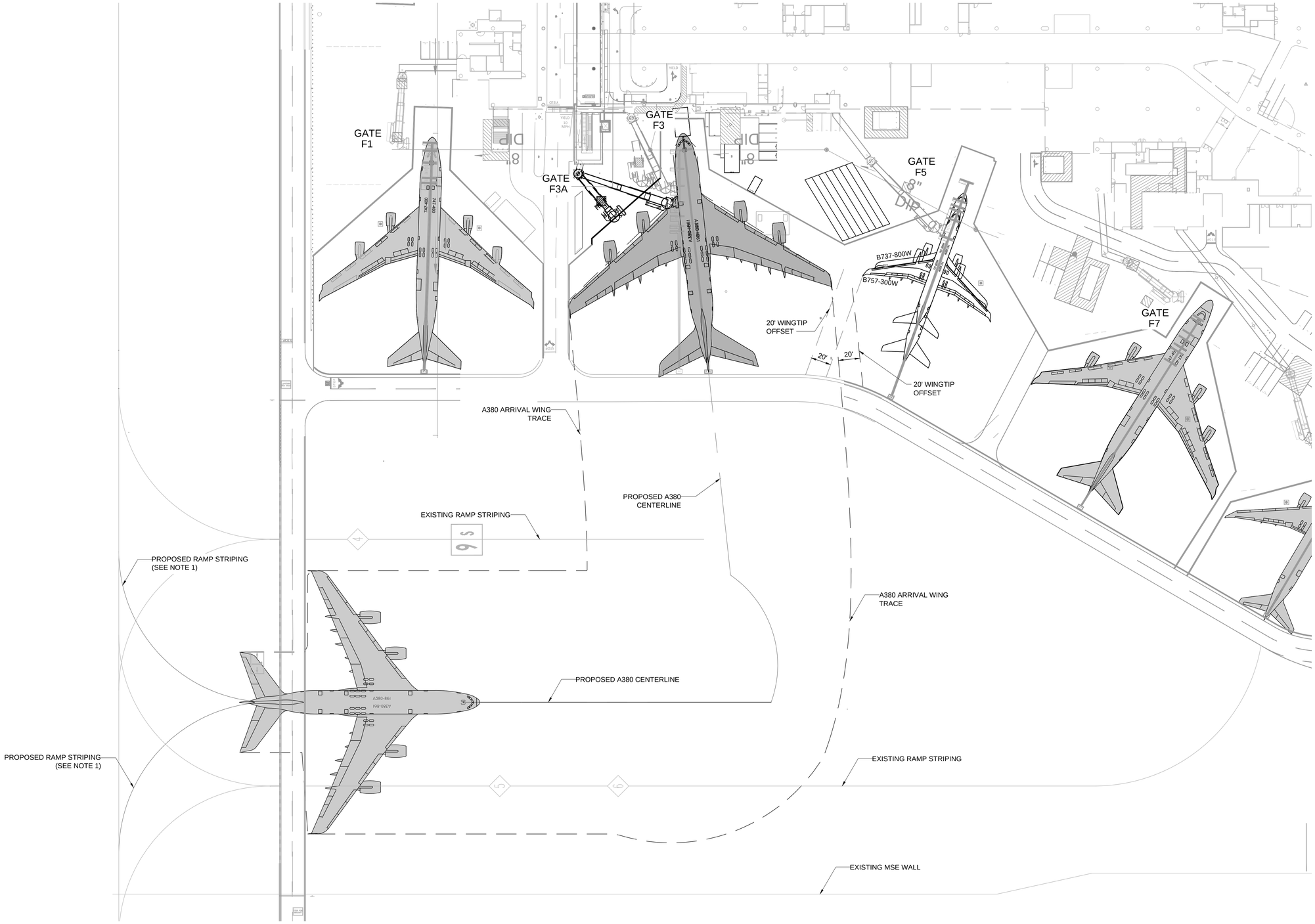
Sheet Number

C201



1 ARRIVAL MANEUVER PLAN
1" = 40'

0 10 20 40 50 FT.

NOTE:

1. SHEET PROVIDED FOR REFERENCE ONLY. REFER PAVEMENT MARKING SHEETS FOR STRIPING DETAILS.

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Sheet Title

ARRIVAL
MANEUVER PLAN

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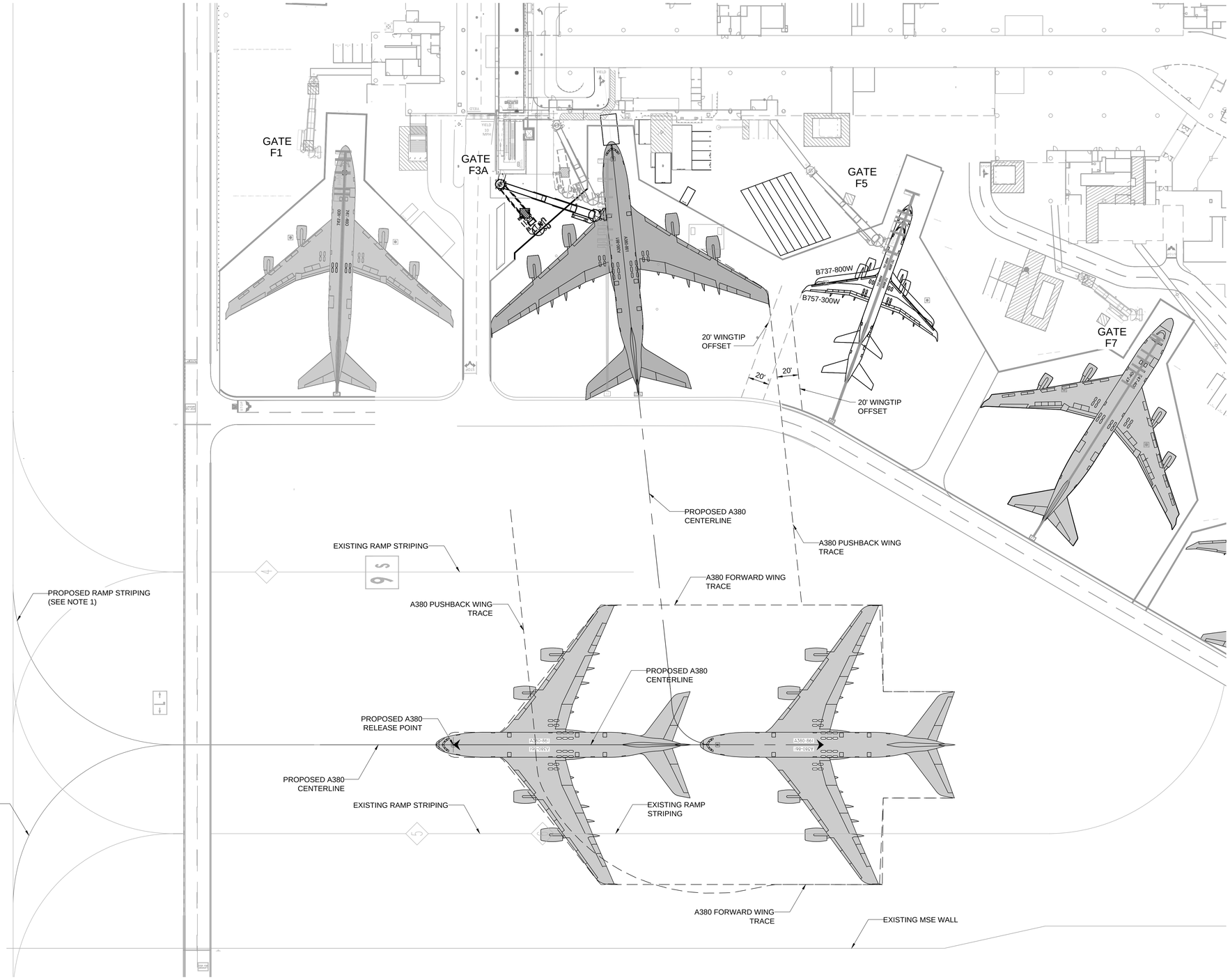
C202



1 DEPARTURE MANEUVER PLAN
1" = 40'

0 10 20 40 80 FT.

NOTE:

1. SHEET PROVIDED FOR REFERENCE ONLY. REFER PAVEMENT MARKING SHEETS FOR STRIPING DETAILS.

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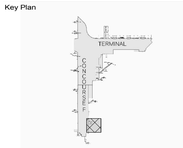

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
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Drawn by: JTS Reviewed by: SPD

Project No:

Sheet Title

DEPARTURE MANEUVER PLAN

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Sheet Number

C203

AIRCRAFT SYSTEMS EQUIPMENT SCHEDULE

			PASSENGER BOARDING BRIDGE SCHEDULE												FIXED WALKWAY SCHEDULE			
LINE	GATE	PBB NAME	NUMBER OF TUNNELS	PBB HORIZONTAL OPERATIONAL RANGE (FEET) RETRACTED	PBB HORIZONTAL OPERATIONAL RANGE (FEET) EXTENDED	CAB HEIGHT RANGE (FEET) LOW	CAB HEIGHT RANGE (FEET) HIGH	REGIONAL JET CAB FLOOR REQUIRED	NUMBER OF GPU CABLE HOISTS	PCA UNIT NOMINAL CAPACITY (TONS)	MOUNT POINT-OF-USE PCA ON PBB	NUMBER OF PCA HOSE REELS TO MOUNT	LIFT COLUMN STABILIZERS	MOUNT EXTRA MD-81 HOSE REEL	MOUNT 400-HZ POINT-OF-USE GPU ON PBB	FIXED WALKWAY OR EXTENDED CORRIDOR REQUIRED	STANDARD OR WIDE FIXED WALKWAY REQUIRED	LEVEL OR SLOPED FIXED WALKWAY REQUIRED	TERMINAL BUILDING STEEL WALKWAY SUPPORT REQUIRED
1	F3A	F3A	3	61	127	8.83	29.41		2	100	X	2	X		X	X	STANDARD	SLOPED	X

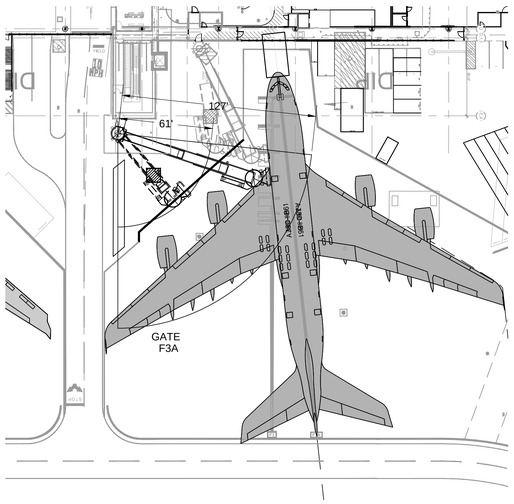
	AIRCRAFT GATE USAGE SCHEDULE																																															
PBB NAME	A380-800	A340-600	A330-300-ST6	A330-200	A320-200	A319	787-800	777-300ER	777-300	777-200LR	777-200	767-400ER	767-300W	767-300ER	767-300	767-200	757-300	757-200W	757-200	747-400	737-900W	737-900	737-800W	737-800	737-700W	737-700	737-600W	737-600	737-500	737-400	737-300W	737-300	737-200	CRJ-701	CRJ-200	EMBRAER 175	EMBRAER 170	MD-90-30	MD-81	PBB NAME
F3A	U1		L2				L2			L2	L2	L2	L2	L2	L2		L2	L2	L2	L2																				F3A

NOTE:

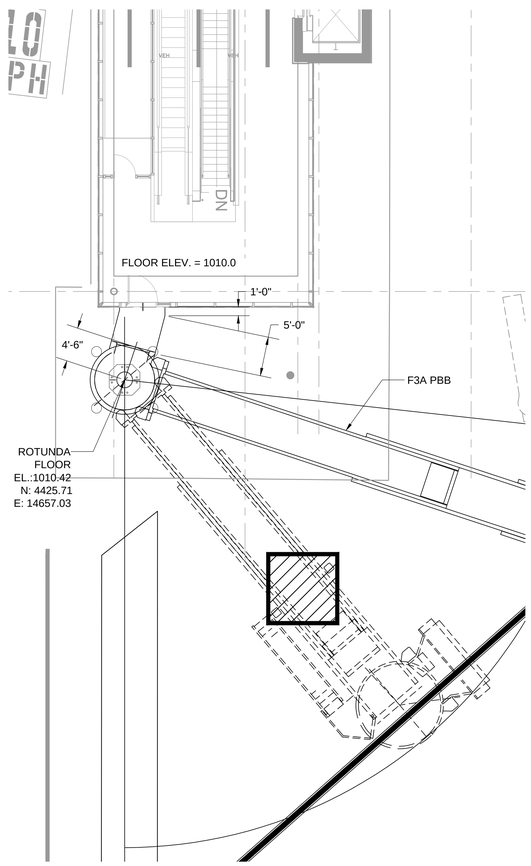
1. AN 'X' DESIGNATION INDICATES THIS FEATURE REQUIRED FOR THAT PARTICULAR GATE EQUIPMENT. TYPICAL ALL COLUMNS.
2. PBB HORIZONTAL OPERATIONAL RANGE IS DEFINED AS THE DISTANCE BETWEEN THE CENTER POINT OF ROTATION OF THE PBB ROTUNDA AND THE CENTER POINT OF ROTATION OF THE PBB CAB. MINIMUM AND MAXIMUM VALUES DENOTE THE DOCKED LENGTH OF THE PBB NEEDED TO SERVICE EACH GATE'S SMALLEST AND LARGEST AIRCRAFT, RESPECTIVELY. CLEARANCE BETWEEN AIRCRAFT AND PBB WILL BE NECESSARY TO FACILITATE THE MOVEMENT OF AIRCRAFT.
3. PBB CAB HEIGHT RANGE IS DEFINED AS THE DISTANCE BETWEEN THE APRON AND THE LEVEL CAB FLOOR AT THE AIRCRAFT DOOR WITH THE CAB ROTATED FULLY COUNTERCLOCKWISE 90 DEGREES FROM THE PBB CENTERLINE, WITH THE PBB CENTERLINE PERPENDICULAR TO THE TERMINAL WALL, AND WITH THE PBB FULLY EXTENDED.
4. AIRCRAFT GATE USAGE SCHEDULE INDICATES THE AIRCRAFT DOORS THAT THE F3A PBB SHALL SERVE AS FOLLOWS:

DESIGNATION	DESCRIPTION
L2	PBB SHALL SERVE THE SECOND FORWARD DOOR OF THE INDICATED AIRCRAFT
U1	PBB SHALL SERVE THE UPPER FIRST FORWARD DOOR OF THE INDICATED AIRCRAFT

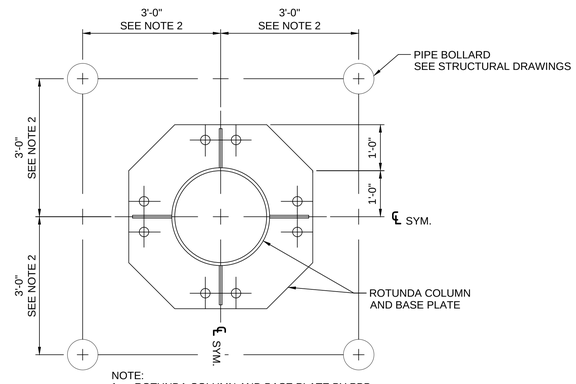
ABBREVIATIONS:
PBB: PASSENGER BOARDING BRIDGE (APRON-DRIVE)
GPU: GROUND POWER UNIT (POINT-OF-USE 400-HZ OR 28.5 VDC CONVERTER FOR AIRCRAFT GROUND POWER)
PCA: PRECONDITIONED AIR
400-HZ: 400-HERTZ (POINT-OF-USE 400-HZ FREQUENCY CONVERTER FOR AIRCRAFT GROUND POWER)



1 PASSENGER BOARDING BRIDGE PLAN
1" = 40'



2 PASSENGER BOARDING BRIDGE ENLARGED PLAN - GATE F3A
1" = 8'



NOTE:
1. ROTUNDA COLUMN AND BASE PLATE BY PBB VENDOR.
2. CONTRACTOR SHALL COORDINATE AND FIELD ADJUST BOLLARD LOCATIONS WITH PBB VENDOR.

3 PASSENGER BOARDING BRIDGE ROTUNDA COLUMN
NOT TO SCALE

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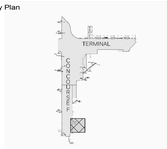

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No.	Description	Date
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2	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	3-23-15
3	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JTS Reviewed by: SPD

Project No:

Sheet Title

PASSENGER BOARDING BRIDGE PLAN AND SCHEDULE

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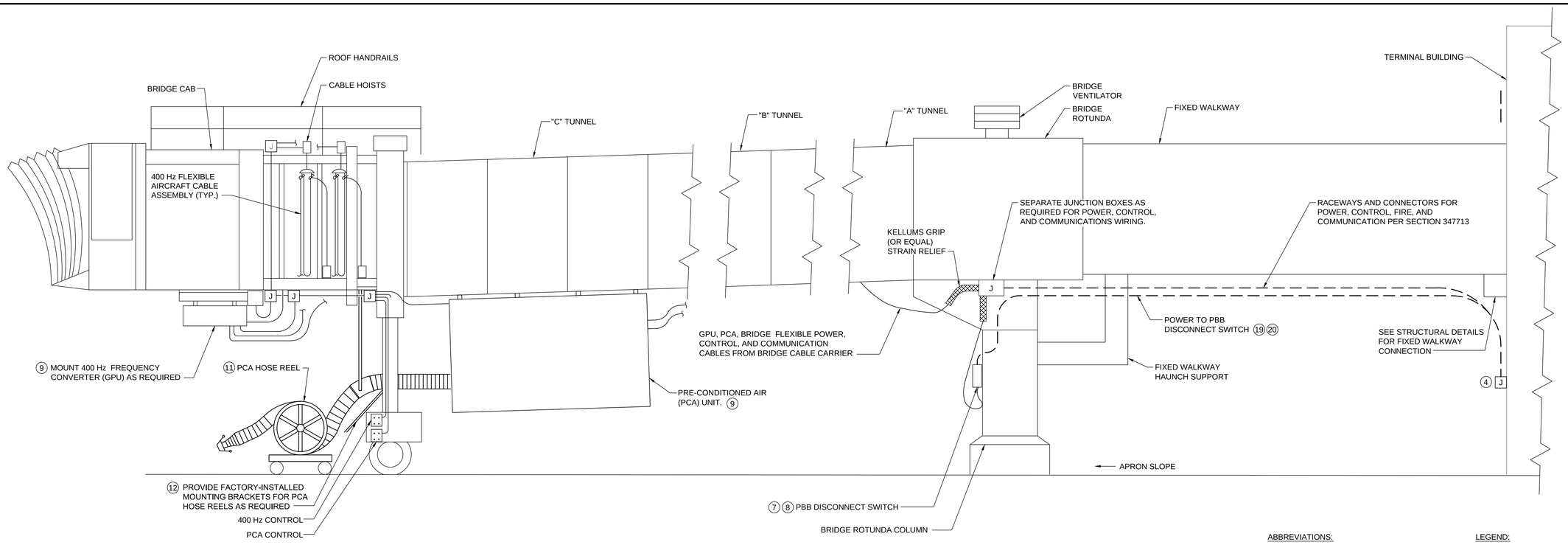
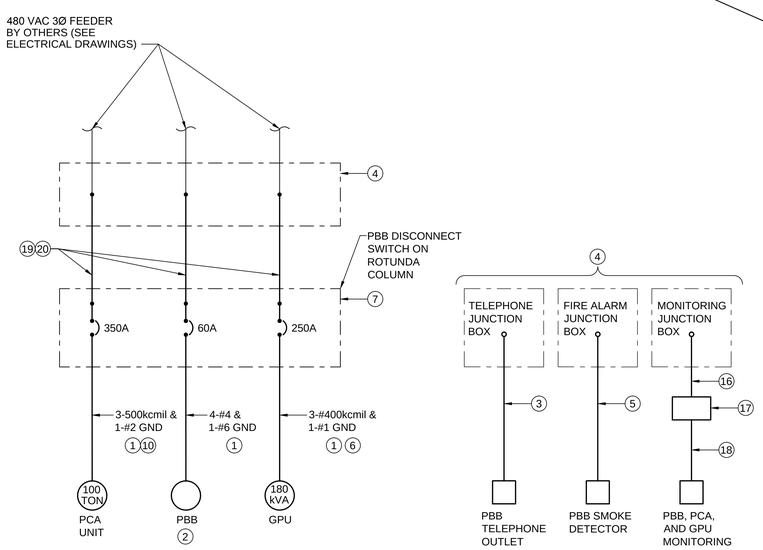
Sheet Number

C204

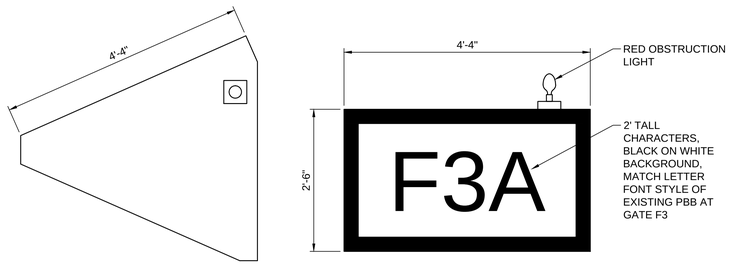


PASSENGER BOARDING BRIDGE SCHEMATIC - GATE F3A

NOT TO SCALE



TYPICAL PBB SINGLE LINE DIAGRAM DETAIL



TOP VIEW **3-SIDED GATE SIGN DETAIL** **SIDE VIEW**

NOT TO SCALE

NOTES:

1. MOUNT GATE SIGN ON TOP RIGHT OF PBB CAB..
2. PBB CONTRACTOR SHALL PROVIDE ALL MOUNTING PROVISIONS FOR MOUNTING ON THE LOADING BRIDGES.
3. PBB CONTRACTOR IS RESPONSIBLE FOR ALL ELECTRICAL SERVICES ASSOCIATED WITH THE INSTALLATION OF THIS SIGN TYPE.
4. SCHEMATIC DETAILS ILLUSTRATING DESIGN INTENT ARE INCLUDED. FINAL DETAILING SHALL BE FULLY ILLUSTRATED IN THE SHOP DRAWING SUBMITTALS.

ABBREVIATIONS:

GND	GROUND
GPU	GROUND POWER UNIT
Hz	Hertz
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
PBB	PASSENGER BOARDING BRIDGE
PCA	PRECONDITIONED AIR
PPE	PORTABLE POWER ELASTOMER
V	VOLT
VAC	VOLTS ALTERNATING CURRENT
VDC	VOLTS DIRECT CURRENT

LEGEND:

	ENCLOSURE
60 AT 60 AF	FUSED DISCONNECT SWITCH "AT" TRIP RATING "AF" FRAME SIZE
	ELECTRICAL LOAD
J	JUNCTION BOX

KEYED NOTES:

1. FLEXIBLE POWER CABLE, NEC PPE RATED 90°C OR BETTER. CABLES WITH TWO CONDUCTORS PER PHASE WITH EQUIVALENT AMPACITY OF THAT SHOWN MAY BE USED.
2. PROVIDE TRANSFORMER AND CIRCUIT BREAKERS AS REQUIRED FOR 120/208V LOADS.
3. PROVIDE TELEPHONE CABLE TO BRIDGE CAB. SEE PBB SPECIFICATION FOR CABLE TYPE.
4. JUNCTION BOXES MOUNTED ON TERMINAL WALL BY TERMINAL BUILDING ELECTRICAL CONTRACTOR. QUANTITY AND SIZE AS REQUIRED.
5. PROVIDE CABLE TO PBB SMOKE DETECTOR. SEE PBB SPECIFICATION FOR CABLE TYPE.
6. VERIFY CABLE SIZE WITH GPU MANUFACTURER.
7. PBB DISCONNECT SWITCH, NEMA 4 STAINLESS STEEL. MOUNT TO ROTUNDA COLUMN.
8. COORDINATE INSTALLATION LOCATION OF PBB DISCONNECT SWITCH ON ROTUNDA COLUMN WITH INSTALLATION OF EMERGENCY FUEL SHUTOFF STATION.
9. PROVIDE FACTORY INSTALLED MOUNTING BRACKETS FOR GPU AND PCA UNIT. COORDINATE BRACKET REQUIREMENTS WITH GPU MANUFACTURER AND PCA UNIT MANUFACTURER. PCA UNIT SHALL BE MOUNTED BELOW THE "C" TUNNEL AT A LOCATION TO PROVIDE MINIMUM 3 FOOT CLEARANCE BETWEEN BOTTOM OF PCA UNIT AND APRON CONCRETE WHEN BRIDGE IS OPERATING AT ITS LOWEST POSITION.
10. VERIFY CABLE SIZE WITH PCA UNIT MANUFACTURER.
11. IF REQUIRED, DUCT STORAGE REELS SHALL BE MOUNTED TO THE BRIDGE SUPPORT MECHANISM, ACCESSIBLE ON THE AIRSIDE. REEL SHALL BE SIDE-MOUNTED TO ALLOW PBB TO FULLY LOWER WITHOUT DAMAGING REEL OR HOSE.
12. PROVIDE 36"W x 24"H STEEL PLATE. MOUNT 400 Hz / 28.5 VDC CONTROL STATION, PCA CONTROL STATION, CABLES AND CONDUIT AS REQUIRED.
13. NOT USED.
14. NOT USED.
15. NOT USED.
16. CAT 6 CABLE FROM PBB ROTUNDA ETHERNET SWITCH TO JUNCTION BOX AT TERMINAL WALL. COIL 25' OF CABLE IN JUNCTION BOX. CABLE SHALL BE ROUTED TO MEDIA CONVERTER IN BUILDING BY OTHERS.
17. ETHERNET SWITCH AT PBB ROTUNDA.
18. CAT 6 CABLE TO PBB CAB.
19. EACH POWER CIRCUIT AND SPECIAL SYSTEMS CABLING SHALL BE IN A DEDICATED RGS CONDUIT, SIZED PER NEC, ATTACHED TO UNDERSIDE OF FIXED WALKWAY.
20. PROVIDE 480VAC, 3-PHASE CIRCUITS FROM JUNCTION BOX AT TERMINAL WALL TO PBB DISCONNECT SWITCH. CONDUCTOR QUANTITY, SIZE AND TYPE SHALL MATCH CIRCUITS FROM THE TERMINAL BUILDING.

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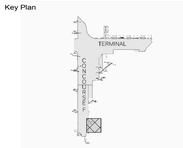

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Drawn by: RA Reviewed by: CHK

Project No:

Sheet Title

AIRCRAFT SYSTEM DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

C205

GENERAL NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH THE CIVIL DRAWINGS AND SPECIFICATIONS FOR RELATED EQUIPMENT, STRIPING PLANS, SAFETY PLANS, CONTRACTOR LAY-DOWN AREAS, CONSTRUCTION FENCE LOCATIONS, TAXIWAY CLOSURE BARRICADES AND PAVING DETAILS.
2. THE CONTRACTOR SHALL COMPLY WITH THE LATEST EDITION OF NFPA 70 (NATIONAL ELECTRICAL CODE), ALL APPLICABLE FAA ADVISORY CIRCULARS, AND ALL APPLICABLE LOCAL CODES.
3. THE CONTRACTOR SHALL COORDINATE WITH THE ARCHITECTURAL, MECHANICAL, STRUCTURAL DRAWINGS AND SPECIFICATIONS FOR EXACT LOCATION OF EQUIPMENT.
4. ALL WORK SHALL BE COORDINATED WITH THE WORK OF OTHER TRADES TO AVOID INTERFERENCE. REFER TO MECHANICAL DRAWINGS FOR PIPES, DUCTS AND MECHANICAL EQUIPMENT.
5. CONTRACTOR SHALL COORDINATE ALL WORK WITH THE OWNER. THE CONTRACTOR SHALL TAKE INTO ACCOUNT SPECIAL OPERATING REQUIREMENTS WHICH MAY AFFECT NORMAL WORKING AND ACCESS CONDITIONS.
6. SEE APRON EXTERIOR POWER DRAWINGS FOR ELECTRICAL CIRCUITS/ POWER CONNECTIONS.
7. SEE BUILDING STRUCTURAL DRAWINGS FOR MOUNTING BRACKET DETAILS.
8. SEE AIRCRAFT DOCKING SYSTEM DETAILS ON C208.
9. RACEWAYS ON PLAN DRAWINGS ARE SHOWN DIAGRAMMATICALLY. CONTRACTOR SHALL SELECT MOST FEASIBLE ROUTING BASED ON EXISTING CONDITIONS AND COORDINATION WITH OTHER TRADES.
10. ALL WALL AND FLOOR PENETRATIONS SHALL BE SEALED WITH UL LISTED FIRE SEALANT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
11. CONCEAL ALL JUNCTION AND PULL BOXES IN FINISHED SPACES UNLESS NOTED OTHERWISE. PROVIDE PULL BOXES AS INDICATED AND WHEREVER NECESSARY TO FACILITATE PULLING OF WIRE AND COORDINATE LOCATIONS WITH OTHER TRADES. COVERS OF JUNCTION AND PULL BOXES SHALL BE ACCESSIBLE FOR ALL RACEWAY RUNS. COORDINATE LOCATIONS WITH OTHER TRADES.
12. ALL CONDUCTORS SHALL BE IDENTIFIED AT EACH JUNCTION BOX, OUTLET BOX, CABINET, PULL BOX, ETC., WITH VINYL CLOTH SELF-ADHESIVE TAGS SHOWING PANEL AND CIRCUIT NUMBERS, CONTROL WIRE NUMBERS OR OTHER APPROPRIATE INFORMATION SUCH AS "ROOM 101 POWER".
13. SYMBOL SIZE DOES NOT IMPLY EQUIPMENT SIZE.
14. ALL EQUIPMENT SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
15. ALL WIRING FROM ADS TO FIXED WALKWAY SHALL BE PROVIDED BY ADS CONTRACTOR.
16. WIRING IN PASSENGER BOARDING BRIDGE (PBB) SHALL BE FLEX WIRE PREINSTALLED IN PBB BY PBB MANUFACTURER/ CONTRACTOR.
17. ALL EXPOSED EXTERIOR DISCONNECTS AND JUNCTION BOXES SHALL BE NEMA 4X RATED, STAINLESS STEEL.

ABBREVIATIONS:

ADS	AIRCRAFT DOCKING SYSTEM
AWG	AMERICAN WIRE GAUGE
C	CONDUIT
GND	GROUND
TYP	TYPICAL
PBB	PASSENGER BOARDING BRIDGE
UNO	UNLESS NOTED OTHERWISE

LEGEND:

	DISPLAY PANEL, SIGNAL HEAD, AND AZIMUTH GUIDANCE DEVICE – NOT TO SCALE
	HAND HELD FORWARD MOTION CONTROL SWITCH AND SOOW CONTROL CABLE – NOT TO SCALE
	SELECTOR SWITCH/EMERGENCY STOP MOUNTED ABOVE APRON ON PASSENGER BOARDING BRIDGE LIFT COLUMN – NOT TO SCALE
JB	JUNCTION BOX
	MODIFIED ADS SIGNAL HEAD WHERE PRIMARY DISPLAY IS NOT CLEARLY VISIBLE TO TUG DRIVER.
	ROUTED CONDUIT OR CABLE; CONCEALED
	ROUTED CONDUIT OR CABLE; EXPOSED
	EFSO STATION
B	INCANDESCENT LIGHT (BLUE GLOBE)
	NORMALLY OPEN CONTACT
	NORMALLY CLOSED CONTACT

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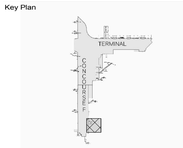

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Drawn by: QMS Reviewed by: CHK

Project No:

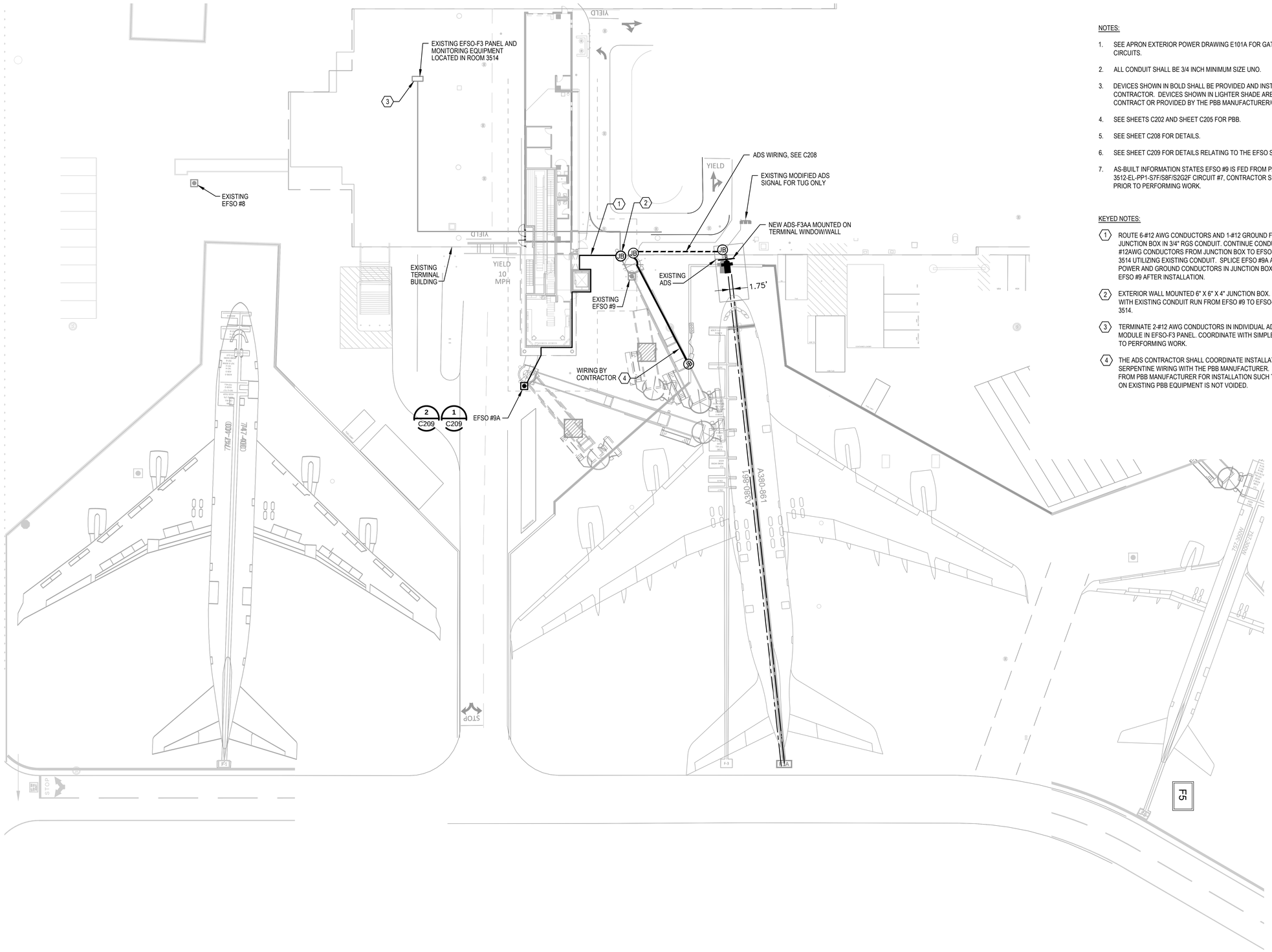
Sheet Title

AIRCRAFT DOCKING SYSTEM NOTES, LEGEND, & ABBREVIATIONS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

C206



NOTES:

1. SEE APRON EXTERIOR POWER DRAWING E101A FOR GATE F3A ELECTRICAL CIRCUITS.
2. ALL CONDUIT SHALL BE 3/4 INCH MINIMUM SIZE UNO.
3. DEVICES SHOWN IN BOLD SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR. DEVICES SHOWN IN LIGHTER SHADE ARE EXISTING, NOT IN CONTRACT OR PROVIDED BY THE PBB MANUFACTURER/CONTRACTOR.
4. SEE SHEETS C202 AND SHEET C205 FOR PBB.
5. SEE SHEET C208 FOR DETAILS.
6. SEE SHEET C209 FOR DETAILS RELATING TO THE EFSO SYSTEM.
7. AS-BUILT INFORMATION STATES EFSO #9 IS FED FROM PANEL 3512-EL-PP1-S7F/S8F/S2G2F CIRCUIT #7, CONTRACTOR SHALL FIELD VERIFY PRIOR TO PERFORMING WORK.

KEYED NOTES:

1. ROUTE 6-#12 AWG CONDUCTORS AND 1-#12 GROUND FROM EFSO #9A TO JUNCTION BOX IN 3/4" RGS CONDUIT. CONTINUE CONDUCTOR PULL OF 4 #12AWG CONDUCTORS FROM JUNCTION BOX TO EFSO-F3 PANEL IN ROOM 3514 UTILIZING EXISTING CONDUIT. SPLICE EFSO #9A AND EFSO #9 120V POWER AND GROUND CONDUCTORS IN JUNCTION BOX. RECOMMISSION EFSO #9 AFTER INSTALLATION.
2. EXTERIOR WALL MOUNTED 6" X 6" X 4" JUNCTION BOX. INSTALL INLINE WITH EXISTING CONDUIT RUN FROM EFSO #9 TO EFSO-F3 PANEL IN ROOM 3514.
3. TERMINATE 2-#12 AWG CONDUCTORS IN INDIVIDUAL ADDRESSABLE MODULE IN EFSO-F3 PANEL. COORDINATE WITH SIMPLEXGRINNELL PRIOR TO PERFORMING WORK.
4. THE ADS CONTRACTOR SHALL COORDINATE INSTALLATION OF SERPENTINE WIRING WITH THE PBB MANUFACTURER. OBTAIN APPROVAL FROM PBB MANUFACTURER FOR INSTALLATION SUCH THAT WARRANTY ON EXISTING PBB EQUIPMENT IS NOT VOIDED.

1 GATE F3/F3A - A380 AIRCRAFT DOCKING SYSTEM
1" = 20'

0 5 15 25 40 FT.

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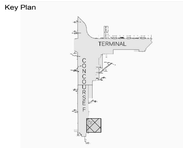

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Drawn by: QMS Reviewed by: CHK

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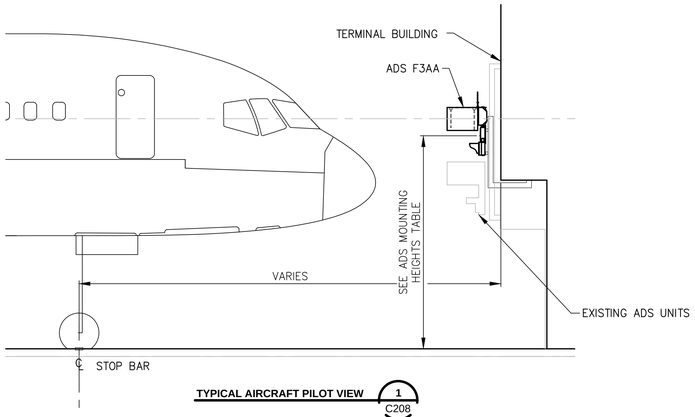
Sheet Title

AIRCRAFT DOCKING SYSTEM AND EFSO ELECTRICAL PLAN

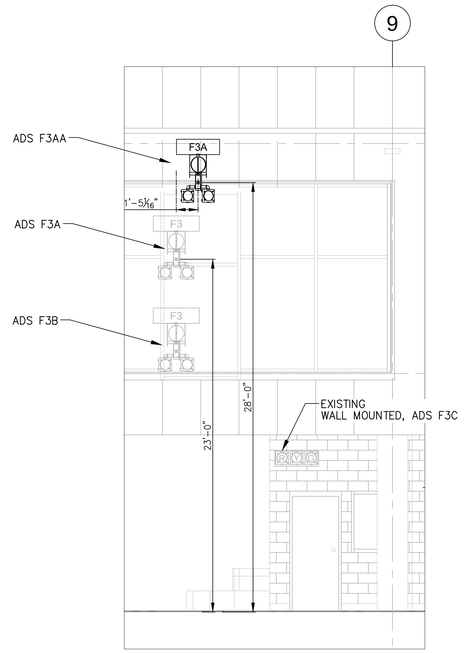
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

C207



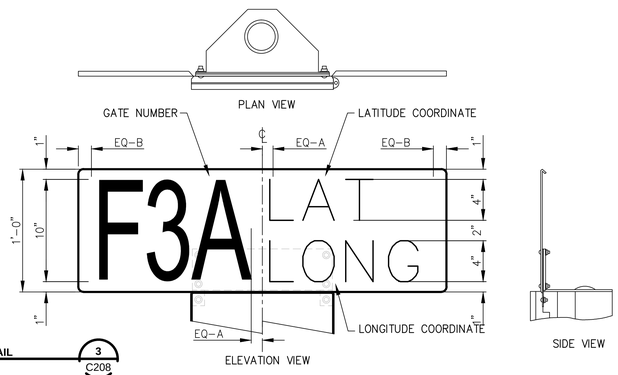
TYPICAL AIRCRAFT PILOT VIEW 1 / C208



GATE F3A ELEVATION & TUG ADS MOUNTING 2 / C208

ADS SIGNAGE NOTES:

1. ADS BACKBOARD SHALL BE BLACK ⅛" THICK ALUMINUM.
2. ALL LETTERING SHALL BE WHITE VINYL TO MATCH 3M BRAND OPAQUE "MATTE WHITE".
3. ALL FONT SHALL BE "FRUTIGER 65 BOLD" BASE SUBMISSION AND "HELVETICA MEDIUM" AS ALTERNATE 1.
4. LATITUDE AND LONGITUDE COORDINATES SHALL BE PROVIDED BY D.O.A. DURING SHOP DRAWING SUBMISSION
5. BACKBOARD SHALL BE 36" MINIMUM. SOME SIGNS SHALL BE LONGER AS TEXT LENGTH REQUIRES
6. GATE NUMBER SHALL BE 10" TALL.
7. LATITUDE AND LONGITUDE SHALL BE 4" TALL.
8. BACKBOARD IS SUITABLE TO DISPLAY PAINTED SYMBOLS AND DECAL TYPE LETTERING ONLY.



ADS SIGNAGE DETAIL 3 / C208

NOTES:

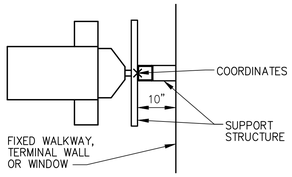
1. THE MOUNTING HEIGHTS LISTED ABOVE ARE RECOMMENDATIONS ONLY. THE FINAL MOUNTING POSITION AND CORRECT ALIGNMENT SHALL BE DETERMINED BY THE CONTRACTOR BASED ON THE MANUFACTURER'S RECOMMENDATIONS.
2. APPROXIMATE MOUNTING HEIGHT INDICATED IS FROM FINISHED GRADE TO ADS REFERENCE MOUNTING HOLE AS NOTED IN THE PRODUCT INSTALLATION MANUAL. THE CONTRACTOR SHALL REVIEW THE MANUFACTURERS INSTALLATION DRAWINGS FOR DIMENSION FROM PILOTS CENTERLINE TO THE MOUNTING HOLE.
3. BASIS OF DESIGN FOR THE AIRCRAFT DOCKING SYSTEM IS INDICATED BELOW:
   MANUFACTURER: PAGE INDUSTRIES
   CATALOG #: P1900 OR APPROVED EQUAL.
   UNIT SHALL INCLUDE THE FOLLOWING AS A MINIMUM:
   - LED ALIGNMENT UNIT
   - RED, YELLOW, AND GREEN SIGNAL UNIT.
   - FULLY RETRACTABLE HANDHELD CONTROLLER, CORD SHALL BE OF LENGTH 50'.
   - EMERGENCY STOP AND SELECTOR SWITCH FOR UP TO 3 UNITS.
   - ALUMINUM BACKING PLATE FOR GATE INFORMATION (COORDINATE GATE INFORMATION WITH AIRPORT)
4. SEE APRON EXTERIOR POWER DRAWINGS FOR ELECTRICAL CIRCUITS.
5. SEE STRUCTURAL DRAWINGS FOR BUILDING MOUNTING BRACKETS.
6. REMOVE EXISTING TWO STATION SELECTOR SWITCH AND REPLACE WITH NEW THREE POSITION SELECTOR SWITCH AND EMERGENCY STOP BUTTON. MANUFACTURER: PAGE INDUSTRIES; CATALOG#: P1900-047; PULL BACK EXISTING CONTROL CONDUCTORS FROM EXISTING ADS UNITS F3A AND F3B AND REUSE FOR CONNECTION TO NEW THREE POSITION SELECTOR SWITCH. PROVIDE NEW CONDUCTORS AND CONDUIT AS REQUIRED TO ROUTE NEW CONTROL CONDUCTORS FROM NEW ADS UNIT F3AA.
7. THE ADS CONTRACTOR SHALL COORDINATE INSTALLATION OF SERPENTINE WIRING WITH THE PBB MANUFACTURER. OBTAIN APPROVAL FROM PBB MANUFACTURER FOR INSTALLATION SUCH THAT WARRANTY ON EXISTING PBB EQUIPMENT IS NOT VOIDED.

ADS MOUNTING HEIGHTS TABLE					
GATE	MARK	APPROXIMATE MOUNTING HEIGHT	COORDINATES		COMMENTS
F3	ADS-F3A	23.00'	E14597.59	N4524.16	FOR B747
	ADS-F3B	17.00'	E14597.59	N4524.16	FOR ALL OTHER PLANES AT THIS GATE
	ADS-F3C	–			MODIFIED ADS FOR TUG
F3A	ADS-F3AA	28.00'	E14596.76	N4525.834.16	FOR A380

ADS MOUNTING HEIGHTS TABLE 5 / C208

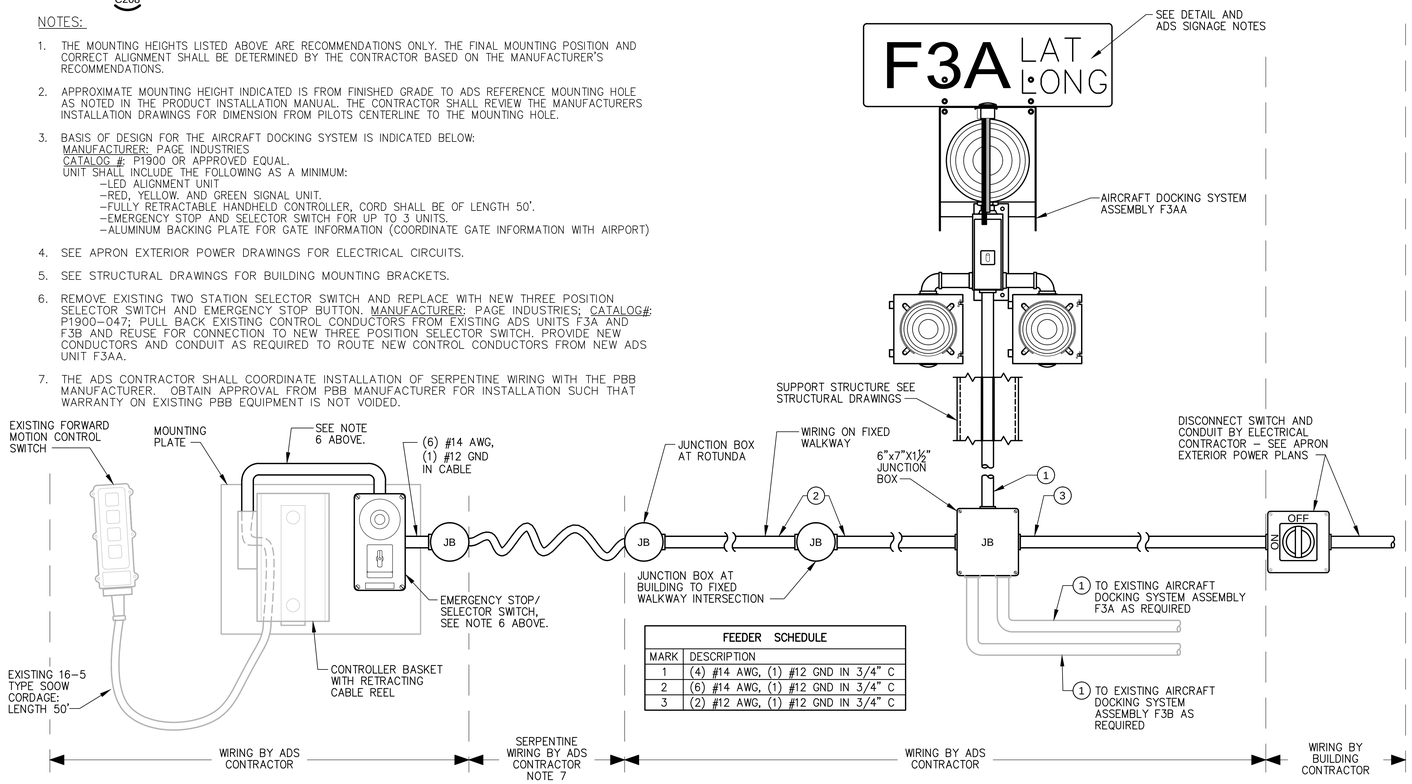
NOTE:

1. MOUNTING HEIGHT AND COORDINATES SHOWN FOR ADS'S AT GATE F3 ARE FOR REFERENCE ONLY. NO NEW WORK REQUIRED FOR F3 ADS'S.



NOTE:

TO BE USED IN CONJUNCTION WITH ADS MOUNTING HEIGHTS TABLE



FEEDER SCHEDULE	
MARK	DESCRIPTION
1	(4) #14 AWG, (1) #12 GND IN 3/4" C
2	(6) #14 AWG, (1) #12 GND IN 3/4" C
3	(2) #12 AWG, (1) #12 GND IN 3/4" C

WIRING DETAIL 6 / C208

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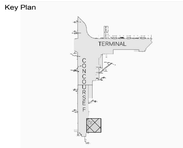

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Drawn by: QMS Reviewed by: CHK

Project No:

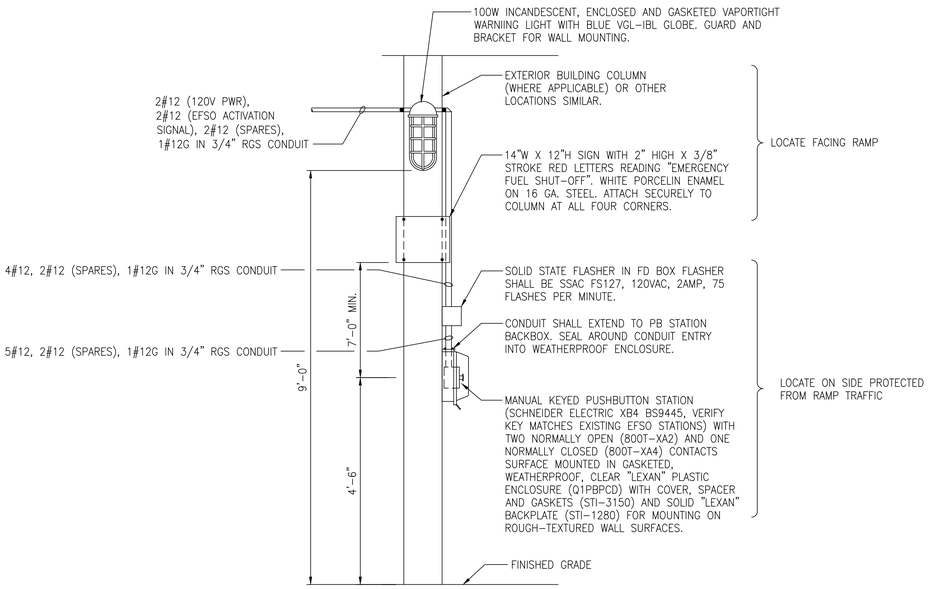
Sheet Title

AIRCRAFT DOCKING SYSTEM DETAILS & SCHEDULES

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

C208



1 C209 DETAIL – MOUNTING FOR EFSO CONTROL STATION

SCALE: NTS

EFSO F-3 ROOM #3514 POINT SCHEDULE			
DESIGNATION	DESCRIPTION	SIGNAL TYPE	SIGNAL TYPE
EFSO#6	SHUT OFF STATION #6 GATE F4	8:M1-4-0	INPUT IAM
EFSO#7	SHUT OFF STATION #7 GATE F2	8:M1-11-0	INPUT IAM
EFSO#8	SHUT OFF STATION #8 GATE F1	8:M1-10-0	INPUT IAM
EFSO#9	SHUT OFF STATION #9 GATE F3	8:M1-1-0	INPUT IAM
EFSO#10	SHUT OFF STATION #10 GATE F5	8:M1-5-0	INPUT IAM
CVF3A	CONTROL VALVE F3A	AUX5	RELAY
LSCF3A	STATUS CLOSE VALVE F3A	8:M1-6-0	INPUT IAM
LSOF3A	STATUS OPEN VALVE F3A	8:M1-6-0	INPUT IAM
CVF3B	CONTROL VALVE F3B	AUX7	RELAY
LSCF3B	STATUS CLOSE VALVE F3B	8:M1-7-0	
LSOF3B	STATUS OPEN VALVE F3B	8:M1-7-0	INPUT IAM
FS-F2	FLOAT SWITCH PIT F2 HIGH	8:M1-8-0	INPUT IAM
FS-F3	FLOAT SWITCH PIT F3 HIGH	8:M1-9-0	INPUT IAM
(2) **EFSO#9A**	**SHUT OFF STATION #9A GATE F3**	**TBD**	**INPUT IAM**

NOTES:

1. ALL EXPOSED EFSO SYSTEM CONDUIT SHALL BE PAINTED TO MATCH TO SURROUNDINGS TO WHICH IT IS ATTACHED TO.
2. ALL EFSO SYSTEM CONDUIT LOCATED INSIDE THE ROOF LINE LIMITS SHALL BE MARKED WITH ALTERNATING COLORED BANDING. EACH BAND SECTION SHALL CONSIST OF FOUR 1" WIDE STRIPES; YELLOW, RED, YELLOW, RED. BANDING SHALL BE EVERY 30' MINIMUM AND MAY BE ADHESIVE BACKED VINYL LABELS, PAINT, OR HALF-LAPPED VINYL TAPE
3. SEE SHEET C207 FOR PLAN VIEW OF EFSO INSTALLATION.

KEYED NOTES:

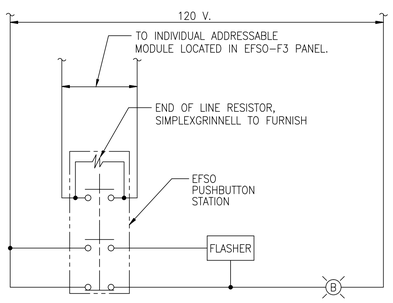
(1) EFSO #9A SHALL BE INTEGRATED INTO THE EXISTING EFSO SYSTEM PROGRAMMING IN THE SAME MANNER AS EXISTING STATIONS #6, #7, #8, & #9. ACTIVATION SHALL CLOSE THE VALVES AS IDENTIFIED IN TABLE.

(2) CONNECT NEW EFSO #9A ACTIVATION WIRING TO EFSO-F3 PANEL INDIVIDUAL ADDRESSABLE MODULE LOCATED IN ROOM #3514. FINAL LOCATION OF TERMINATION TO BE DETERMINED BY SIMPLEXGRINNELL.

(3) EFSO GRAPHIC SHALL BE UPDATED TO INCLUDE EFSO #9A.

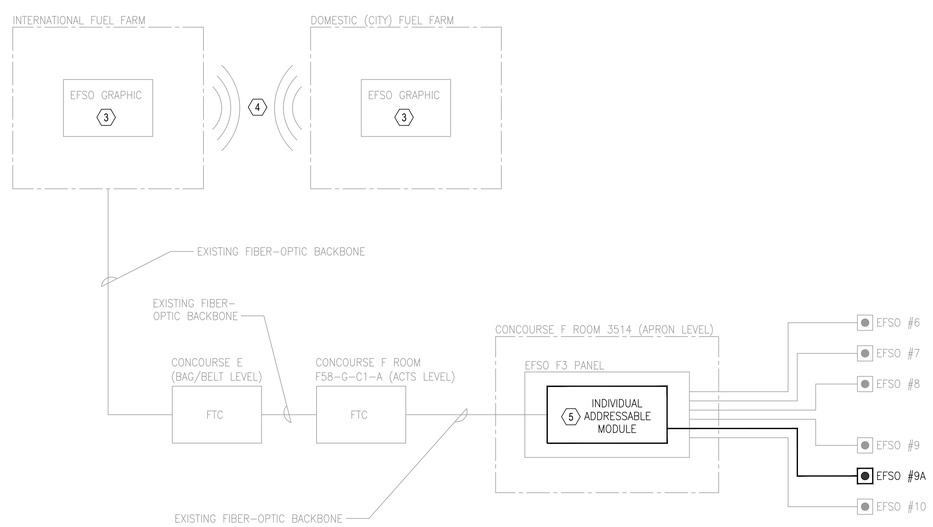
(4) EXISTING WIRELESS TCP/IP CONNECTION BETWEEN THE INTERNATIONAL FUEL FARM AND THE DOMESTIC FUEL FARM.

(5) INDIVIDUAL ADDRESSABLE MODULE SHALL BE FURNISHED BY SIMPLEXGRINNELL.



2 C209 CONTROL DIAGRAM – EFSO PUSHBUTTON STATION

SCALE: NTS



3 C209 EFSO CONTROL AND BLOCK DIAGRAM

SCALE: NTS

EFSO VALVE CLOSURE SCHEDULE (MHJIT)				
ACTIVATED EFSO STATION	PRIMARY RESPONSE		SECONDARY RESPONSE *	
	RESPONSE	EFFECTED GATES	RESPONSE	EFFECTED GATES
1, 2, 3, 4	CLOSE CONTROL VALVE 'F1A' IN FUELING VAULT 'F1'	F8, F10, F12, F14	CLOSE VALVES 'EF1A' AND 'EF1B' IN FUELING VAULT 'EF1'	ALL F TERMINAL GATES
5	CLOSE CONTROL VALVES 'F1A' AND 'F1B' IN FUELING VAULT 'F1' AND CLOSE CONTROL VALVE 'F3B' IN FUELING VAULT 'F3'	F1, F2, F3, F4, F6, F8, F10, F12, F14		
(1) 6, 7, 8, 9 **9A**	CLOSE CONTROL VALVE 'F1B' IN FUELING VAULT 'F1' AND CONTROL VALVE 'F3B' IN FUELING VAULT 'F3'	F1, F2, F3, F4, F6		
10	CLOSE CONTROL VALVES 'F3A' AND 'F3B' IN FUELING VAULT 'F3' AND CONTROL VALVE 'F1B' IN FUELING VAULT 'F1'	F1, F2, F3, F4, F5, F6, F7, F9		
11, 12, 13	CLOSE CONTROL VALVE 'F3A' IN FUELING VAULT 'F3'	F5, F7, F9		

* IF VALVES LISTED IN PRIMARY RESPONSE FAIL TO CLOSE, SECONDARY RESPONSE SHALL OCCUR.

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

Hartsfield Jackson + Partnership
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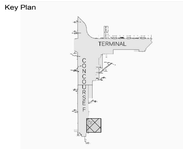
Key Plan



Professional Seals

No.	Description	Date
1	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
2	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	3-23-15
3	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: DSD Reviewed by: DAB

Project No:

Sheet Title

EFSO SYSTEM DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

C209

1.00 GENERAL STRUCTURAL NOTES

1.01 DUTIES AND RESPONSIBILITIES

NO PROVISION OF ANY REFERENCED STANDARD SPECIFICATION, MANUAL OR CODE (WHETHER OR NOT SPECIFICALLY INCORPORATED BY REFERENCE IN THE CONTRACT DOCUMENTS) SHALL BE EFFECTIVE TO CHANGE THE DUTIES AND RESPONSIBILITIES OF OWNER, CONTRACTOR, ENGINEER, SUPPLIER, OR ANY OF THEIR CONSULTANTS, AGENTS, OR EMPLOYEES FROM THOSE SET FORTH IN THE CONTRACT DOCUMENTS, NOR SHALL IT BE EFFECTIVE TO ASSIGN TO THE STRUCTURAL ENGINEER OF RECORD OR ANY OF THE STRUCTURAL ENGINEER OF RECORD'S CONSULTANTS, AGENTS,OR EMPLOYEES ANY DUTY OF AUTHORITY TO SUPERVISE OR DIRECT THE FURNISHING OR PERFORMANCE OF THE WORK OR ANY DUTY OR AUTHORITY TO UNDERTAKE RESPONSIBILITIES CONTRARY TO THE PROVISIONS OF THE CONTRACT DOCUMENTS.

1.02 CODE AND STANDARDS REFERENCES

REFERENCE TO STANDARD SPECIFICATIONS OF ANY TECHNICAL SOCIETY, ORGANIZATION, OR ASSOCIATION OR TO CODES OF LOCAL OR STATE AUTHORITIES, SHALL MEAN THE LATEST STANDARD, CODE, SPECIFICATION OR TENTATIVE SPECIFICATION ADOPTED AT THE DATE OF TAKING BIDS, UNLESS SPECIFICALLY STATED OTHERWISE.

1.03 CONTRACT DOCUMENT CONFLICTS

1. CONTRACT DOCUMENTS SHALL GOVERN IN THE EVENT OF A CONFLICT WITH THE CODE OR PRACTICE OR SPECIFICATION OF ACI, PCI, AISC, SJI OR OTHER STANDARDS. WHERE A CONFLICT OCCURS WITH IN THE CONTRACT DOCUMENTS, THE STRICTEST REQUIREMENTS SHALL GOVERN.
2. IN THE EVENT OF CONFLICTS AMONG THE VARIOUS PARTS OF THE STRUCTURAL CONTRACT DOCUMENTS, STRUCTURAL DRAWINGS, GENERAL NOTES, AND SPECIFICATIONS, THE STRICTEST REQUIREMENTS SHALL GOVERN.

1.04 CONTRACT DOCUMENT CONTENT

CONTRACT DOCUMENTS DO NOT INCLUDE SHOP DRAWINGS, VENDOR DRAWINGS, OR MATERIAL PREPARED AND SUBMITTED BY THE CONTRACTOR.

1.05 CONTRACTOR COORDINATION

1. CONTRACTOR SHALL COORDINATE THE STRUCTURAL DOCUMENTS WITH THE ARCHITECTURAL, MECHANICAL, ELECTRICAL, PLUMBING AND CIVIL DOCUMENTS. ARCHITECT/STRUCTURAL ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCY OR OMISSION. COORDINATION SHALL INCLUDE, BUT NOT LIMITED TO, EDGE OF SLAB DIMENSIONS, OPENING LOCATIONS AND DIMENSIONS, DEPRESSED SLAB LOCATIONS AND EXTENTS, SLAB SLOPES, CURB LOCATIONS, CMU WALL LOCATIONS, EXISTING DIMENSIONS, AND ELEVATIONS. FOR DIMENSIONS NOT SHOWN ON THE STRUCTURAL DRAWINGS, SEE ARCHITECTURAL DRAWINGS.
2. THE CONTRACTOR SHALL VERIFY THE REQUIREMENTS OF OTHER TRADES AS TO SLEEVES, CHASES, HANGERS, INSERTS, ANCHORS, HOLES AND OTHER ITEMS TO BE PLACED OR SET IN THE STRUCTURAL WORK.
3. CONTRACTOR SHALL VERIFY THE STRUCTURALLY SUPPORTED MECHANICAL EQUIPMENT WEIGHTS, OPENING SIZES AND LOCATIONS IDENTIFIED ON THE STRUCTURAL DRAWINGS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
4. CONTRACTOR SHALL VERIFY EXISTING DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS BEFORE STARTING WORK. ARCHITECT/STRUCTURAL ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCY.

1.06 MEANS AND METHODS

THE CONTRACTOR HAS SOLE RESPONSIBILITY FOR MEANS, METHODS, TECHNIQUES, AND SEQUENCES AS WELL AS COMPLIANCE WITH ALL OSHA SAFETY PRECAUTIONS AND REGULATIONS, AND PROCEDURES OF CONSTRUCTION DURING THE WORK. THE ENGINEER WILL NOT ADVISE ON NOR ISSUE DIRECTION AS TO PROCEDURES TO PERFORM THE WORK. THE SUPERVISION OF THE WORK IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

1.07 MATERIALS

ALL MATERIALS, WORKMANSHIP, AND DESIGN SHALL CONFORM TO THE REFERENCED BUILDING CODE AND SPECIFICATIONS.

1.08 TEMPORARY GUYING AND BRACING

THE STRUCTURAL DRAWINGS HEREIN REPRESENT THE FINISHED STRUCTURE. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY GUYING AND BRACING REQUIRED TO ERECT AND HOLD THE STRUCTURE IN PROPER ALIGNMENT UNTIL ALL STRUCTURAL WORK AND CONNECTIONS HAVE BEEN COMPLETED. THE INVESTIGATION, DESIGN, SAFETY, ADEQUACY AND INSPECTION OF ERECTION BRACING, SHORING, SUPPORTS, ETC. IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

1.09 CONSTRUCTION LOADS

LOADING APPLIED TO THE STRUCTURE DURING THE PROCESS OF CONSTRUCTION SHALL NOT EXCEED THE SAFE LOAD-CARRYING CAPACITY OF THE STRUCTURAL MEMBERS. THE LIVE LOADINGS USED IN THE DESIGN OF THIS STRUCTURE ARE INDICATED IN THE "DESIGN CRITERIA NOTES". DO NOT APPLY ANY CONSTRUCTION LOADS UNTIL STRUCTURAL FRAMING IS PROPERLY CONNECTED TOGETHER AND UNTIL ALL TEMPORARY BRACING IS IN PLACE.

1.10 TYPICAL DETAILS

DRAWINGS INDICATE TYPICAL DETAILS OF CONSTRUCTION. THESE DETAILS SHALL APPLY TO ALL SITUATIONS OCCURRING ON THE PROJECT THAT ARE SIMILAR TO THOSE SPECIFICALLY DETAILED. THE APPLICABILITY OF THE DETAIL TO ITS LOCATION ON THE PLANS CAN BE DETERMINED BY THE TITLE OF THE DETAIL. SUCH DETAILS APPLY WHETHER OR NOT THEY ARE KEYED IN AT EACH LOCATION. WHERE CONDITIONS ARE NOT SPECIFICALLY SHOWN, SIMILAR DETAILS OF CONSTRUCTION MAY BE USED, SUBJECT TO APPROVAL BY THE ENGINEER. DECISIONS REGARDING THE APPLICABILITY OF TYPICAL DETAILS SHALL BE DETERMINED BY THE ENGINEER. CONTRACTOR SHALL CONSIDER ALL OF THE CONTRACT DOCUMENTS IN DETERMINING SIMILAR AND LIKE CONDITIONS.

1.11 STAIRS AND HANDRAILS

STRUCTURAL ENGINEER OF RECORD IS NOT RESPONSIBLE FOR THE DESIGN OF STEEL STAIRS, HANDRAILS, CURTAIN WALL/WINDOW WALL SYSTEMS, COLD-FORMED METAL FRAMING, OR OTHER SYSTEMS NOT SHOWN IN THE STRUCTURAL DOCUMENTS. SUCH SYSTEMS SHALL BE DESIGNED, FURNISHED, AND INSTALLED BY OTHERS AS REQUIRED BY OTHER PORTIONS OF THE CONTRACT DOCUMENTS.

1.12 STRUCTURAL SYSTEMS ERECTION

ALL STRUCTURAL SYSTEMS WHICH ARE TO BE COMPOSED OF COMPONENTS TO BE FIELD ERECTED SHALL BE SUPERVISED BY THE SUPPLIER DURING MANUFACTURING, DELIVERY, HANDLING, STORAGE AND ERECTION IN ACCORDANCE WITH THE SUPPLIER'S INSTRUCTIONS AND REQUIREMENTS.

1.13 SPECIAL INSPECTIONS

IN THE CASE OF NECESSARY SPECIAL INSPECTIONS, THE CONTRACTOR SHALL NOTIFY THE SPECIAL INSPECTOR AT LEAST 48 HOURS IN ADVANCE FOR WORK THAT WILL REQUIRE INSPECTION OR TESTING.

1.14 DEMOLISHING

UNLESS OTHERWISE INDICATED, ALL ITEMS NOTED TO BE DEMOLISHED SHALL BECOME THE CONTRACTOR'S PROPERTY AND BE REMOVED FROM THE SITE.

1.15 CONTRACTOR SITE VISITS

CONTRACTORS SHALL VISIT THE SITE PRIOR TO BID TO ASCERTAIN CONDITIONS WHICH MAY ADVERSELY AFFECT THE WORK OR COST THERE OF.

2.00 DESIGN CRITERIA

2.01 GENERAL BUILDING CODES

THE CONTRACT DOCUMENTS ARE BASED ON THE REQUIREMENTS OF THE FOLLOWING DESIGN CODE AND STANDARDS AND/OR CRITERIA:

GENERAL	2012 INTERNATIONAL BUILDING CODE W/ GEORGIA AMENDMENTS
CONCRETE	ACI 318
MASONRY	ACI 530
STRUCTURAL STEEL	AISC 360-10 LRFD

2.02 LIVE LOADS

DESIGN GRAVITY LIVE LOADS USED IN THE DESIGN OF THIS STRUCTURE ARE AS FOLLOWS:

CATEGORY	UNIFORM LOAD (PSF)	CONCENTRATED LOAD (LB)
ROOF, TYPICAL	20	300
FLOOR, TYPICAL	100	

2.03 LATERAL FORCE RESISTING SYSTEM

1. THE ABILITY OF THE STRUCTURAL FRAME TO RESIST LATERAL LOADS AND PROVIDE STABILITY UNDER GRAVITY LOADS DERIVES FROM THE COMPLETE INSTALLATION OF THE LATERAL FORCE RESISTING SYSTEMS AND DIAPHRAGMS DESCRIBED BELOW. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL TEMPORARY BRACING REQUIRED TO MAINTAIN THE STABILITY AND SAFETY OF ALL ELEMENTS DURING THE CONSTRUCTION PROCESS UNTIL ALL OF THESE ELEMENTS ARE COMPLETELY INSTALLED AND ALL DESIGNATED CONCRETE ELEMENTS (IF ANY) HAVE REACHED A MINIMUM OF 75% OF THEIR DESIGN STRENGTH. THE REQUIRED STRUCTURAL ELEMENTS ARE:
   A. INTERMEDIATE MOMENT FRAMES OF CONCRETE.
   B. STEEL SYSTEMS NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE
2. WIND LOADS
   A. WIND PRESSURES ARE BASED ON THE AMERICAN SOCIETY OF CIVIL ENGINEERS, MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES, ASCE 7-10. DESIGN WIND LOADS USED IN THE DESIGN OF THIS STRUCTURE ARE AS FOLLOWS:

WIND SPEED	115 MPH
EXPOSURE CATEGORY	B
INTERNAL PRESSURE COEFFICIENT	±0.18

3. SEISMIC DESIGN CRITERIA
   SEISMIC CRITERIA USED IN THE DESIGN OF THIS STRUCTURE ARE AS FOLLOWS:

OCCUPANCY CATEGORY	III
SITE CLASS	D
SDS	0.192 g
SD1	0.141 g
SEISMIC IMPORTANCE FACTOR, I	1.25
R	3.0
SYSTEM OVER-STRENGTH FACTOR	3.0
Cd	3.0
SEISMIC DESIGN CATEGORY	C

3.00 FOUNDATION NOTES

3.01 GEOTECHNICAL REPORT

FOUNDATION DESIGN IS BASED ON THE RECOMMENDATIONS IN THE GEOTECHNICAL REPORT #71.3961 BY WILLMER ENGINEERING INC., DATED OCTOBER 27, 2014. THE ARCHITECT AND STRUCTURAL ENGINEER ARE NOT RESPONSIBLE FOR SUBSURFACE CONDITIONS ENCOUNTERED IN THE FIELD DIFFERENT FROM THOSE ASSUMED FOR DESIGN NOR ACCURACY OR APPLICABILITY OF SUCH DATA HEREIN THE CONTRACT DOCUMENTS.

3.02 FOUNDATION COORDINATION

PRIOR TO COMMENCING ANY FOUNDATION WORK, COORDINATE WORK WITH ANY EXISTING UTILITIES. ARCHITECT/STRUCTURAL ENGINEER SHALL BE NOTIFIED AND APPROVAL OBTAINED BEFORE FOOTINGS ARE TO BE LOWERED WHERE REQUIRED TO AVOID UTILITIES.

3.03 FOUNDATION CONDITION DISCREPANCIES

FOUNDATION CONDITIONS NOTED DURING CONSTRUCTION WHICH DIFFER FROM THOSE DESCRIBED IN THE GEOTECHNICAL REPORT SHALL BE REPORTED TO THE ARCHITECT, STRUCTURAL ENGINEER, AND GEOTECHNICAL ENGINEER BEFORE FURTHER CONSTRUCTION IS ATTEMPTED. STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR DIFFERENTIAL SETTLEMENT, SLAB CRACKING, OR OTHER FUTURE DEFECTS RESULTING FROM UNREPORTED CONDITIONS.

3.04 SUBGRADE PREPARATION

1. THE CONTRACTOR SHALL PERFORM EXCAVATIONS, FOOTING CONSTRUCTION, AND PREPARATION OF THE SUBGRADE UNDER THE SLAB ON GRADE IN ACCORDANCE WITH THE RECOMMENDATIONS CONTAINED IN THE GEOTECHNICAL REPORT AND THE PROJECT SPECIFICATIONS.
2. THE CONTRACTOR SHALL DETERMINE THE EXTENT OF CONSTRUCTION DEWATERING REQUIRED FOR THE EXCAVATION. THE CONTRACTOR SHALL SUBMIT TO THE GEOTECHNICAL ENGINEER FOR REVIEW THE PROPOSED PLAN FOR CONSTRUCTION DEWATERING, PRIOR TO BEGINNING THE EXCAVATION
3. THE CONTRACTOR SHALL REFERENCE SPECIFICATIONS, GEOTECHNICAL REPORT, AND CONSULT GEOTECHNICAL ENGINEER FOR STRUCTURAL FILL COMPACTION AND TESTING REQUIREMENTS.
4. ALL FOUNDATION EXCAVATIONS SHALL BE EVALUATED AND CERTIFIED FOR THE ADEQUACY OF THE BEARING MEDIUM BY A STRUCTURAL TESTING/INSPECTION AGENCY PRIOR TO PLACING FOUNDATION CONCRETE.
5. WITHIN AN AREA A MINIMUM OF 5 FEET BEYOND THE BUILDING LIMITS, EXCAVATE A MINIMUM OF 4" OF EXISTING SOIL. REMOVE ALL ORGANICS, PAVEMENT, ROOTS, DEBRIS AND OTHERWISE UNSUITABLE MATERIAL.
6. NO UNBALANCED BACKFILLING SHALL BE DONE AGAINST FOUNDATION WALLS UNLESS WALLS ARE SECURELY BRACED AGAINST OVERTURNING, EITHER BY TEMPORARY BRACING OR BY PERMANENT CONSTRUCTION.
7. ALL RETAINING WALLS SHALL HAVE AT LEAST 12" OF FREE-DRAINING GRANULAR BACKFILL, FULL HEIGHT OF WALL. PROVIDE CONTROL JOINTS IN RETAINING WALLS AT APPROXIMATELY EQUAL INTERVALS NOT TO EXCEED 25 FEET NOR 3 TIMES THE WALL HEIGHT. PROVIDE EXPANSION JOINTS AT EVERY FOURTH CONTROL JOINT, UNLESS OTHERWISE INDICATED.

3.05 MICROPILES

1. MICROPILES TO BE DESIGNED BY SPECIALTY CONTRACTOR.
2. MICROPILE CONTRACTOR TO SUBMIT CALCULATIONS AND SHOP DRAWINGS BEARING THE SIGNED AND DATED SEAL OF A LICENSED ENGINEER IN THE STATE OF GEORGIA.
3. MICROPILES TO HAVE A MINIMUM AXIAL COMPRESSIVE CAPACITY OF 300 KIPS AND MINIMUM TENSILE CAPACITY OF 45 KIPS.
4. MICROPILE CAPACITIES TO BE VERIFIED BY LOAD TESTING.

3.06 PERMANENT SHORING WALLS

1. PERMANENT SHORING WALLS TO BE DESIGNED BY SPECIALTY CONTRACTOR.
2. PERMANENT SHORING WALL CONTRACTOR TO SUBMIT CALCULATIONS AND SHOP DRAWINGS BEARING THE SIGNED AND DATED SEAL OF A LICENSED ENGINEER IN THE STATE OF GEORGIA.
3. SEE SPECIFICATION SECTION 316000 FOR PERMANENT EXCAVATION SHORING WALLS.

4.00 CAST-IN-PLACE CONCRETE

4.01 CONCRETE SPECIFICATIONS

1. ALL CONCRETE WORK SHALL CONFORM TO THE REQUIREMENTS OF ACI 301, "SPECIFICATION FOR STRUCTURAL CONCRETE BUILDINGS". HOT WEATHER CONCRETING SHALL BE IN ACCORDANCE WITH ACI 305. COLD WEATHER CONCRETING SHALL BE IN ACCORDANCE WITH ACI 306.
2. ALL CONCRETE TO BE PERMANENTLY EXPOSED TO WEATHER SHALL BE AIR ENTRAINED TO 5% (±1%).
3. ALL CONCRETE SHALL BE PROPORTIONED FOR A MAXIMUM ALLOWABLE UNIT SHRINKAGE OF 0.05% MEASURED AT 28 DAYS AFTER CURING IN LIME WATER AS DETERMINED BY ASTM C 157 (USING AIR STORAGE).
4. ALL CONCRETE SHALL CONFORM TO THE REQUIREMENTS AS SPECIFIED IN THE TABLE BELOW U.N.O. ON THE DRAWINGS:

USAGE	28 DAY COMP. STRENGTH, PSI	CONC. TYPE	MAX AGG., IN	REMARKS
1. MICROPILE CAPS	4000	NWT	1	
2. WALL FOOTINGS	4000	NWT	1	
3. FOUNDATION WALLS	4000	NWT	1	
4. SLAB-ON-GRADE	3000	NWT	1	
5. SLAB-ON-COMPOSITE DECK	3500	LWT	3/4	
6. BEAMS, SLABS, AND COLUMNS	5000	NWT	1	

4.02 SLAB-ON-GRADE

1. UNLESS NOTED OTHERWISE, SLAB ON GRADE SHALL BE PLACED ON GRANULAR FILL ON COMPACTED SUBGRADE.
2. SLAB ON GRADE SHALL BE UNDERLAID BY POROUS MATERIAL. PRIOR TO PLACING THE POROUS MATERIAL, THE SUBGRADE SHALL BE PROPERLY COMPACTED, PROOFROLLED, FREE OF STANDING WATER, MUD AND FROZEN SOIL. BEFORE PLACEMENT OF THE CONCRETE, POLYETHYLENE VAPOR RETARDER SHALL BE PLACED ON TOP OF THE POROUS MATERIAL.
   A. ALL POROUS FILL MATERIAL SHALL BE A CLEAN GRANULAR MATERIAL WITH 100% PASSING A 1-1/2" SIEVE AND NO MORE THAN 5% PASSING A NO. 4 SLEEVE. POROUS FILL SHALL BE COMPACTED TO =95% MAX. DRY DENSITY PER ASTM D-689.
3. PLACE CONTROL JOINTS AT COLUMN LINES AND INTERMEDIATE LINES IN EACH DIRECTION. ADDITIONAL JOINTS SHALL BE PROVIDED AS REQUIRED SUCH THAT THE AREA OF EACH PANEL DOES NOT EXCEED 400 SQUARE FEET. CONTROL JOINT SHALL NOT BE SPACES FURTHER THAN 20'-0" LOCATE CONSTRUCTION JOINTS AT CONTROL JOINTS. HORIZONTAL CONSTRUCTION JOINTS ARE NOT PERMITTED EXCEPT THOSE SHOWN ON THE STRUCTURAL DRAWINGS. THE ARCHITECT/ENGINEER SHALL APPROVE ALL DEVIATIONS OR ADDITIONAL JOINTS IN WRITING.
4. SLAB JOINTS SHALL BE FILLED WITH APPROVED MATERIAL. THIS SHOULD TAKE PLACE AS LATE AS POSSIBLE, PREFERABLY 4 TO 6 WEEKS AFTER THE SLAB HAS BEEN CAST. PRIOR TO FILLING, REMOVE ALL DEBRIS FROM THE SLAB JOINTS, THEN FILL IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AS FOLLOWS:
   6" SLAB - FILL WITH EPOXY RESIN
   OTHER SLABS - FILL WITH FIELD MOLDED OR ELASTOMERIC SEALANT
5. WHERE THE SLAB IS TO RECEIVE SENSITIVE ARCHITECTURAL FLOOR FINISHES, SUCH AS CERAMIC TILE, ALL JOINTS IN SLAB CONSTRUCTION SHALL BE PLACED TO ALIGN WITH THE JOINTS IN THE FINISHED MATERIAL.
6. THE CONTRACTOR IS CAUTIONED AGAINST LOADING THE SLAB ON GRADE WITH CRANE LOADS. THE SLAB HAS NOT BEEN DESIGNED FOR CRANE LOADS AND WILL REQUIRE AN INCREASE IN SLAB THICKNESS AND/OR REINFORCEMENT. THE CONTRACTOR IS REQUIRED TO SUBMIT CALCULATIONS SIGNED AND SEALED BY A REGISTERED STRUCTURAL ENGINEER IN THE STATE WHERE THE PROJECT IS LOCATED VERIFYING THE ADEQUACY OF THE SLAB.
7. SEE ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS OF DEPRESSED SLAB AREAS AND DRAINS. SLOPE SLAB TO DRAINS WHERE SHOWN.

4.03 FORMWORK

FORMWORK SHALL REMAIN IN PLACE UNTIL CONCRETE HAS OBTAINED AT LEAST 90% OF ITS 28 DAY STRENGTH. THE CONTRACTOR SHALL PROVIDE ALL SHORING AND RESHORING.

5.00 REINFORCING STEEL

5.01 REINFORCING STEEL SPECIFICATION

1. METHODS OF ESTIMATING, DETAILING, FABRICATING, PLACING AND CONTRACTING FOR REINFORCING MATERIALS SHALL FOLLOW THE MANUAL OF STANDARD PRACTICE AS PUBLISHED BY THE CONCRETE REINFORCING STEEL INSTITUTE.
2. DETAILING OF BAR SUPPORTS, INCLUDING HOOKS AND BENDS, FOR REINFORCING STEEL SHALL BE IN ACCORDANCE WITH THE ACI STANDARD DETAILS AND DETAILING OF CONCRETE REINFORCEMENT AS REPORTED BY ACI COMMITTEE 315.
3. ALL REINFORCING STEEL SHALL BE ASTM A615 GRADE 60 U.N.O.
4. WELDED WIRE FABRIC (FLAT SHEET ONLY)SHALL CONFORM TO ASTM A706 AND HAVE A MINIMUM SIDE AND END LAPS OF 8"
5. DEFORMED BAR ANCHORS SHALL BE ASTM A496 MINIMUM YIELD STRENGTH 70,000 PSI AS NOTED ON THE DRAWINGS. REINFORCING BARS SHALL NOT BE SUBSTITUTED FOR DEFORMED BAR ANCHORS.

5.02 CONCRETE REINFORCEMENT

1. CONCRETE REINFORCEMENT BARS SHALL NOT BE TACK WELDED, WELDED, HEATED OR CUT UNLESS INDICATED ON THE CONTRACT DOCUMENTS OR REVIEWED BY THE STRUCTURAL ENGINEER.
2. ALL REINFORCING STEEL SHALL BE SET AND TIED IN PLACE PRIOR TO POURING OF CONCRETE, EXCEPT THE VERTICAL DOWELS FOR MASONRY WALL REINFORCING THAT MAY BE "FLOATED" IN PLACE. DO NOT FIELD BEND BARS PARTIALLY EMBEDDED IN HARDENED CONCRETE UNLESS SPECIFICALLY INDICATED OR APPROVED BY THE ENGINEER.

5.03 HORIZONTAL REINFORCEMENT

HORIZONTAL FOOTING AND WALL REINFORCEMENT SHALL BE CONTINUOUS AND SHALL HAVE 90 DEGREE BENDS AND EXTENSIONS, OR CORNER BARS OF EQUIVALENT SIZE LAPPED 36 BAR DIAMETERS AT CORNERS AND INTERSECTIONS.

5.04 REINFORCEMENT STEEL COVERAGE

UNLESS OTHERWISE NOTED, THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR THE REINFORCEMENT LAYER NEAREST TO THE SURFACE:

1. CONCRETE SURFACES CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH - 3"
2. CONCRETE EXPOSED TO EARTH OR WEATHER:
   A. #6 THROUGH #l8 BARS - 2"
   B. #5 BAR, W31 OR D31 WIRE & SMALLER - 1 1/2"
3. CONCRETE SURFACES NOT EXPOSED TO WEATHER OR IN CONTACT WITH THE GROUND:
   A. #3 TO #11 BARS IN ELEVATED SLABS, WALLS, JOISTS - 3/4"
   B. #3 TO #18 BARS IN BEAMS, COLUMNS - 1 1/2"
   C. FOUNDATION CONCRETE - 3"
4. PROVIDE STANDARD BAR CHAIRS AND SPACERS AS REQUIRED TO MAINTAIN CONCRETE PROTECTION SPECIFIED

5.05 REINFORCEMENT SPLICES

ALL REINFORCING DESIGNATED AS CONTINUOUS (CONT.) ON THE PLANS AND DETAILS SHALL BE LAPPED 36xBAR DIAMETERS AT SPLICES U.N.O. REINFORCEMENT BAR SPLICES IN GRADE BEAMS SHALL BE LOCATED AT THE CENTERLINE OF SUPPORTS FOR BOTTOM BARS AND AT MIDSPAN FOR TOP BARS. PROVIDE STANDARD ACI HOOKS FOR TOP AND BOTTOM BARS AT DISCONTINUOUS ENDS OF ALL GRADE BEAMS.

1. THE FOLLOWING NOTATIONS ARE USED ON THE DRAWINGS TO DENOTE REINFORCING STEEL EMBEDMENT LENGTHS AND SPLICE TYPES:
   CD - COMPRESSION DEVELOPMENT LENGTH, 22 BAR DIAMETERS
   TD - TENSION DEVELOPMENT LENGTH
   CS - COMPRESSION SPLICE, 30 BAR DIAMETER
   EB - END BEARING COMPRESSION SPLICE
   M - M MECHANICAL ANCHORAGE SPLICE OR OTHER TENSION SPLICE TYPE DEVELOPING 125% FY IN TENSION
   A - CLASS A TENSION SPLICE
   B - CLASS B TENSION SPLICE
2. UNSCHEDULED BEAMS, GRADE BEAMS, AND SLABS SHALL HAVE CONTINUOUS TOP BARS LAPPED AT MIDSPAN BETWEEN SUPPORTS WITH A CLASS A TENSION SPLICE. BOTTOM BARS SHALL BE LAPPED AT THE SUPPORTS WITH A CLASS A TENSION SPLICE.

5.06 TOPPING SLABS AND HOUSEKEEPING PADS

AS A MINIMUM PROVIDE WELDED SMOOTH WIRE REINFORCEMENT W/6x6 W2.9x2.9 IN ALL TOPPING SLABS AND HOUSEKEEPING PADS SUPPORTING MECHANICAL EQUIPMENT WHETHER SHOWN ON THE DRAWINGS OR NOT UNLESS HEAVIER REINFORCEMENT IS CALLED FOR ON THE DRAWINGS.

5.07 PLACEMENT OF WELDED WIRE REINFORCEMENT

WELDED WIRE REINFORCEMENT SHALL BE CONTINUOUS ACROSS THE FILLING OF JOINT CONCRETE SURFACE AND NOT INTERRUPTED BY BEAMS OR GIRDERS. PRECAST CONCRETE BLOCKS USED FOR THE POSITIONING OF THE WELD WIRE REINFORCEMENT SHALL HAVE A COMPRESSIVE STRENGTH EQUAL TO THAT OF THE SLAB. THE USE OF POLYPROPYLENE FIBERS (IN LIEU OF WELDED WIRE FABRIC) IS PROHIBITED WITHOUT THE PRIOR WRITTEN AUTHORIZATION OF THE STRUCTURAL ENGINEER.

5.08 REINFORCING STEEL OVERAGE ALLOWANCE

1. REBAR SUB-CONTRACTOR TO PROVIDE, IN THEIR BIDS, AN ALLOWANCE (FOR COST OF MATERIAL, FABRICATION, AND INSTALLATION) OF 6% OF TOTAL REBAR FOR ADDITIONAL MISCELLANEOUS ITEMS NOT SHOWN, IN ADDITION TO THE MAIN REBAR SHOWN.

6.00 STRUCTURAL STEEL

6.01 STRUCTURAL STEEL SPECIFICATIONS

1. STEEL FABRICATORS SHALL BE AN AISC CERTIFIED SHOP FOR AND MAINTAIN DETAILED QUALITY CONTROL PROCEDURES AS REQUIRED TO SATISFY THE SPECIAL INSPECTION REQUIREMENTS.
2. ALL STRUCTURAL STEEL SHALL BE FABRICATED AND ERECTED ACCORDING TO THE LOAD AND RESISTANCE FACTOR DESIGN (L.R.F.D) "MANUAL OF STEEL CONSTRUCTION" OF THE AISC.
3. THE OWNER SHALL HIRE AN INDEPENDENT TESTING AGENCY TO PROVIDE SPECIAL INSPECTIONS OF BOLTING, WELDING AND OTHER ITEMS IN ACCORDANCE WITH SPECIFIED CODE. CONTRACTOR TO CLEARLY MARK THE GRADE OF STEEL ON EACH PIECE WITH A DISTINGUISHING MARK VISIBLE FROM THE FLOOR LEVEL FOR THE PURPOSE OF FIELD INSPECTIONS.
4. ALL STRUCTURAL STEEL PERMANENTLY EXPOSED TO THE WEATHER, INCLUDING BRICK SHELF ANGLES, SHALL BE HOT-DIPPED GALVANIZED
5. ALL STRUCTURAL STEEL TO BE SHOP PRIMED. ALL STRUCTURAL STEEL EXPOSED TO VIEW SHALL BE SHOP PAINTED.
6. ALL MATERIALS SHALL BE IN ACCORDANCE WITH THE FOLLOWING ASTM SPECIFICATIONS U.N.O:

DESCRIPTION	ASTM	GRADE
A. WIDE-FLANGE BEAMS AND COLUMNS AND WT SHAPE BEAMS	A992	50
SUBSTITUTE FOR A992	A572	50
B. CHANNELS USED AS BEAMS, AND WIND GIRTS S SHAPE ELEVATOR DIVIDER BEAMS, EDGE ANGLES, BENT PLATES, ANGLE HANGERS, BRACES/KICKERS, BASEPLATES, PLATES IN BUILT-UP COLUMNS, AND ANGLE OR CHANNEL WEB MEMBERS OF BRACED FRAMES	A36	36
C. PIPE COLUMNS	A53	B(FYI=36KSI)
D. ROUND HOLLOW SHAPES USED AS COLUMNS OR WIND GIRTS	A500	B(FY=42KSI)
SQUARE HOLLOW SHAPES USED AS COLUMNS OR WIND GIRTS	A500	B(FY=46KSI)
E. BEAM COLUMN STIFFENER PLATES DOUBLE PLATES.	A572	50
F. ALL OTHER STEEL NOT INDICATED EXCEPT PLATES AND ANGLES	A992	50
SUBSTITUTE FOR A992	A572	50

6.02 STRUCTURAL DESIGN

1. COLUMNS, ANCHOR BOLTS, BASE PLATES, ETC. HAVE BEEN DESIGNED FOR THE FINAL COMPLETED CONDITION AND HAVE NOT BEEN INVESTIGATED FOR POTENTIAL LOADINGS ENCOUNTERED DURING STEEL ERECTION AND CONSTRUCTION. ANY INVESTIGATION OF THE COLUMNS, ANCHOR BOLTS, BASE PLATES, ETC. FOR ADEQUACY DURING THE STEEL ERECTION AND CONSTRUCTION PROCESS IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

6.03 CONNECTIONS

1. CONNECTION DETAILS NOT COMPLETELY DETAILED ON THE DRAWINGS INCLUDING MATERIAL GRADE AND SIZES, WELD SIZES, AND NUMBER OF BOLTS SHALL BE DESIGNED BY THE CONTRACTOR PER THE SPECIFICATIONS. THE DEPICTING ARRANGEMENT CONCEPT OF THE CONNECTION WITHOUT COMPLETE DETAILS SHALL BE DESIGNED WITH THAT ARRANGEMENT CONCEPT. THIS DESIGN SERVICE SHALL BE INCLUDED IN THE CONTRACTORS SCOPE OF SERVICES. SHOP DRAWINGS AND CALCULATIONS OF SUCH CONNECTIONS SHALL BE SUBMITTED BEARING THE SIGNED AND DATED SEAL OF A LICENSED PROFESSIONAL ENGINEER IN THE PROJECT STATE. REVIEW DOES NOT RELIEVE THE CONTRACTOR OF THE FULL RESPONSIBILITY FOR THE DESIGN AND ADEQUACY OF SUCH CONNECTIONS.
2. ALL CONNECTION MATERIAL, INCLUDING STIFFENERS, BEARING AND GUSSET PLATES, ANGLES, ETC. U.N.O. HEREIN OR ON THE DRAWINGS SHALL CONFORM TO ASTM A36 UNLESS A HIGHER GRADE OF STEEL IS REQUIRED BY STRENGTH AND PROVIDED THE RESULTING SIZES ARE COMPATIBLE WITH THE CONNECTED MEMBERS.
3. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
4. ALL CONNECTIONS SHALL BE SHEAR TYPE CONNECTIONS AND DESIGNED BY THE FABRICATOR IN ACCORDANCE WITH THE AISC SPECIFICATIONS FOR LOAD AND RESISTANCE FACTOR DESIGN FOR THE FACTORED REACTION FORCES INDICATED ON PLAN. MINIMUM REACTION FORCE TO BE 10 KIP U.N.O.
5. SPECIAL OR COMPLEX CONNECTIONS THAT ARE TO BE DESIGNED BY THE FABRICATOR ARE DENOTED AS SUCH ON PLAN. THE FABRICATOR SHALL DESIGN THESE CONNECTIONS FOR THE FORCES SHOWN AND SUBMIT CALCULATIONS AND SHOP DRAWINGS BEARING THE SIGNED AND DATED SEAL OF A LICENSED PROFESSIONAL ENGINEER REGISTERED IN THE PROJECT STATE.
6. WHERE STEEL BEAMS BEAR ACROSS BUILDING EXPANSION JOINTS OR AT WALL CONTROL JOINTS, PROVIDE A "SLIP" CONNECTION.

6.04 STRUCTURAL BOLTS, FASTENERS, ANCHOR RODS, AND HEADED STUDS

1. ALL BOLTS IN STRUCTURAL CONNECTIONS SHALL CONFORM TO ASTM A325, HAVE A MINIMUM DIAMETER OF 3/4", AND BE A SHEAR BEARING TYPE BOLT "SNUG-TIGHT" U.N.O.
2. USE ASTM A490 TYPE I BOLTS FOR BEARING TYPE CONNECTIONS WITH A BOLT DIAMETER GREATER THAN 1" ONLY.
3. THREADED RODS SHALL CONFORM TO A36, ASTM A572-GRADE 50 FOR UP TO 2 INCHES IN DIAMETER, ASTM A572-GRADE 42 FOR DIAMETERS GREATER THAN 2 INCHES AND UP TO 6 INCHES. ASTM A588 FOR CORROSION RESISTANCE.
4. ALL PINS IN PIN CONNECTED MEMBERS SHALL CONFORM TO ASTM A36 AND ASTM A108 FOR PINS 4 INCHES IN DIAMETER AND SMALLER, AND ASTM A668-CLASS D (FY=37,500 PSI) FOR PINS GREATER THAN 4 INCHES IN DIAMETER.
5. ANCHOR RODS SHALL CONFORM TO ASTM F1554 GRADE 55 AND BE 3/4" INCHES IN DIAMETER EMBEDDED INTO THE CONCRETE FOUNDATION A DISTANCE OF 9" WITH A HEAVY HEX NUT AT THE EMBEDDED END. STRIKE BOLT THREADS AT THE EMBEDDED END AT TWO PLACES BELOW THE NUT.
6. HEADED STUDS SHALL HAVE A MINIMUM DIAMETER OF 3/4", 4-1/2" LONG AND CONFORM TO AWS D1.1
7. REFER TO AISC TABLE J3.3 FOR HOLES SIZES.

6.05 WELDING

1. ALL WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1 MANUAL 7OXX (SMAW), F7XX-EXXX (SAW), ER70S-X (GMAW), OR E7XT-X (FCAW) ELECTRODES. WEATHERING STEEL ELECTRODES SHALL CONFORM TO TABLE 3.3 OF THE ANSI/AWS D1.1 MANUAL U.N.O.
2. ELECTRODES FOR GRADE 60 OR GRADE 65 MATERIAL SHALL CONFORM TO E80XX (SMAW), F8XX-XX (SAW), ER80S-S (GMAW), OR E8XT-X (FCAW)
3. ALL FILLER MATERIAL SHALL HAVE A MINIMUM YIELD STRENGTH OF 50 KSI.
4. WHERE "CONTINUOUS CHORD" ANGLES ARE INDICATED, PROVIDE A CONTINUOUS BUTT WELD OR FULL PENETRATION WELD AT THE SPLICE POINTS. THE STEEL FABRICATOR MAY SUBMIT AN ALTERNATE BOLTED CONNECTION DETAIL FOR APPROVAL.

6.06 GROUT

1. GROUT BELOW STRUCTURAL STEEL PLATES SHALL BE A NON-METALLIC, NON-SHRINK GROUT WITH A MINIMUM STRENGTH OF 6000 PSI WHEN BEARING ON 3000 PSI CONCRETE OR LESS, A STRENGTH OF 8000 PSI WHEN BEARING ON CONCRETE BETWEEN 3000 AND 4000 PSI, AND U.N.O. ON THE DRAWINGS. A STRENGTH OF 8000 PSI WHEN BEARING ON CONCRETE GREATER THAN 4000 PSI.
2. GROUT AT STEEL ENCASEMENT OF EXISTING DRILLED PIERS TO HAVE A STRENGTH OF 6000 PSI.

6.07 ERECTION

1. ALL HOLES IN STEEL SHALL BE DRILLED OR PUNCHED WITH SLOTTED HOLES HAVING SMOOTH EDGES. BURNING OF HOLES AND TORCH CUTTING AT THE SITE IS NOT PERMITTED.
2. ALL PROTECTIVE COATINGS DAMAGED DURING THE TRANSPORTING, ERECTION AND FIELD WELDING PROCESSES SHALL BE REPAIRED IN THE FIELD TO MATCH THE SHOP APPLIED COATING.
3. THE STRUCTURAL STEEL ERECTOR SHALL PROVIDE ALL TEMPORARY GUYING AND BRACING.

6.08 STRUCTURAL STEEL OVERAGE ALLOWANCE

1. STEEL SUB-CONTRACTOR TO PROVIDE, IN THEIR BIDS, AN ALLOWANCE (FOR COST OF MATERIAL, FABRICATION, AND ERECTION) OF 7.5% OF TOTAL STRUCTURAL STEEL FOR ADDITIONAL MISCELLANEOUS ITEMS NOT SHOWN; IN ADDITION TO THE MAIN STRUCTURAL STEEL AND MISCELLANEOUS STEEL SHOWN IN THESE DRAWINGS.

6.09 GENERAL PRICING NOTES:

1. GLAZING SUPPORT
   ASSUME THAT ALL GLAZING WIDER THAN 10'-0" TO BE BRACED AT TOP AN BOTTOM (IF NOT EXTENDING TO THE FLOOR) WITH HSS4X4X3/8 VERTICALS AT 4'-0" O.C. (MAX.) AND AT HEADER AND JAMBS. U.N.O.
   GLAZING LESS THAN 10'-0" SHALL BE BRACED WITH LIGHT GAGE METAL STUD FRAMING. METAL STUDS SHALL BE DESIGNED ACCORDINGLY.
2. CLOSURE ANGLES
   ALL METAL DECK AND COMPOSITE DECK EDGES HAVE CONTINUOUS CLOSURE. ASSUME CONTINUOUS 1/4" BENT PLATE WITH HEIGHT TO MATCH CONCRETE AT COMPOSITE DECK AND 4" AT METAL ROOF DECK. U.N.O.
3. EXPOSED STEEL
   ALL STRUCTURAL STEEL EXPOSED TO WEATHER AND/OR CORROSION SHALL BE HOT-DIPPED GALVANIZED (INCLUDING SHELF ANGLES). ANCHOR RODS EXPOSED TO WEATHER AND/OR CORROSION SHALL BE STAINLESS STEEL.
4. EMBED PLATES
   ALL BEAMS FRAMING INTO CONCRETE SHALL HAVE EMBED PLATES.

7.00 STEEL DECKS

7.01 DESIGN

1. DESIGN OF STEEL DECK SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND SHALL CONFORM TO THE REQUIREMENTS OF THE STEEL DECK INSTITUTE (SDI) AND THE CONTRACT DOCUMENTS. MANUFACTURER SHALL BE A MEMBER OF THE STEEL DECK INSTITUTE. SUBMIT SHOP DRAWINGS WITH PRODUCT DATA, SPAN TABLES AND LOAD DATA BEARING THE SIGNED AND DATED SEAL BY A LICENSED ENGINEER IN THE PROJECT STATE. REVIEW OF SHOP DRAWINGS SHALL BE FOR CONFORMANCE WITH THE CONTRACTOR'S INTERPRETATION OF DESIGN LOADS AND CONTRACT DOCUMENTS DETAILS. SUCH REVIEW SHALL NOT RELIEVE THE CONTRACTOR OF THE FULL RESPONSIBILITY FOR THE DESIGN OF THE STEEL DECK.
2. DECKING SHALL BE CONTINUOUS A MINIMUM OF 3 SPANS WHERE THE STRUCTURE PERMITS AND ERECTED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.
3. DAMAGED DECK IN THE HANDLING AND ERECTION PROCESS SHALL BE REPAIRED WITH GALVANIZING REPAIR PAINT.

7.02 STEEL ROOF DECK

STEEL ROOF DECK SHALL BE A MINIMUM OF 20 GAGE, GALVANIZED (G90).

7.03 METAL DECK FASTENING

METAL DECK SHALL BE FASTENED TO STEEL FRAMING WITH 5/8" DIAMETER PUDDLE WELD AT THE FOLLOWING SPACINGS:

1. AT PERPENDICULAR TO DECK FLUTES: 12" O.C. MAX. (TYP) AND AT EACH EDGE FLUTE OF EACH DECK UNIT.
2. AT PARALLEL TO DECK FLUTES: 12" O.C. MAX
3. SIDE LAPS SHALL BE FASTENED WITH #10 SELF TAPPING SCREWS AT A MAXIMUM SPACING OF 12" CENTER TO CENTER BETWEEN SUPPORTS.

MINIMUM DECK PROPERTIES

1. 3" - 20 GAGE METAL ROOF DECK
   I = 1.079 in 4/ft
   Sp = 0.501 in 3/ft
   Sn = 0.552 in 3/ft

8.00 MASONRY

8.01 MASONRY SPECIFICATIONS

1. CONCRETE MASONRY DESIGN AND CONSTRUCTION SHALL CONFORM TO THE `BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES' AND THE `SPECIFICATIONS FOR MASONRY STRUCTURES', ACI 530.
2. GROUT FOR REINFORCED MASONRY SHALL BE IN ACCORDANCE WITH ASTM C476 WITH MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI U.N.O.
3. PROVIDE TYPE `S' MORTAR IN ACCORDANCE WITH ASTM C270, U.N.O. MORTAR BED JOINTS SHALL NOT EXCEED 5/8" THICKNESS.
4. PROVIDE HOLLOW, LOAD-BEARING CONCRETE MASONRY UNITS (CMU) CONFORMING TO ASTM C90, WITH A MAXIMUM DENSITY OF 105 PCF.
5. CONCRETE MASONRY SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH, F'm = 1500 PSI, CORRESPONDING TO UNIT STRENGTH OF 2,000 PSI ON NET CROSS-SECTIONAL AREA OF CMU DETERMINED IN ACCORDANCE WITH ASTM C140.
6. TRUSS AND LADDER REINFORCEMENT SHALL BE ZINC COATED AND COMPLY WITH ASTM A82.
7. COORDINATE EMBEDDED ITEMS REQUIRED FOR ARCHITECTURAL, STRUCTURAL, AND MECHANICAL ELEMENTS.

8.02 MASONRY DESIGN

1. MASONRY UNITS SHALL BE PLACED IN RUNNING BOND U.N.O.
2. ANCHOR SIDES AND TOPS OF MASONRY WALL PANELS TO THE STRUCTURE BY DOVETAIL ANCHORS, METAL STRAPS, OR EQUIVALENT U.N.O.
3. SEE ARCHITECTURAL DRAWINGS FOR NON-STRUCTURAL CMU WALL LOCATIONS. PROVIDE REINFORCEMENT IN ACCORDANCE WITH SECTION 9.05.

8.03 CONTROL JOINTS

1. VERTICAL CONTROL JOINTS SHALL BE PROVIDED ACCORDING TO THE FOLLOWING CRITERIA:
   A. 40' O.C. MAXIMUM
   B. 20'-0" MAXIMUM FROM BUILDING CORNERS
   C. NO CLOSER THAN 1'-4" TO OPENING EDGES
   D. NO CLOSER THAN 1'-4" TO MAJOR BEAM OR JOIST BEARINGS
2. BOND BEAMS, CMU LINTELS, MASONRY BENEATH STEEL BEAMS, JOIST BEARINGS, AND OTHER STRUCTURAL ELEMENTS SHALL EXTEND UNINTERRUPTED ACROSS CONTROL JOINTS. PROVIDE RAKED JOINTS IN THESE ELEMENTS TO MATCH THE CONTROL JOINT.

8.04 STABILITY AND BRACING

MASONRY WALLS SHOWN ON THE ARCHITECTURAL AND STRUCTURAL DRAWINGS HAVE BEEN DESIGNED TO RESIST THE REQUIRED CODE VERTICAL AND LATERAL FORCES APPLIED TO THEM IN THE FINAL CONSTRUCTED CONFIGURATION AS SHOWN. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROPERLY AND ADEQUATELY BRACE ALL MASONRY WALLS AT ALL STAGES DURING CONSTRUCTION TO RESIST ERECTION LOADS AND LATERAL LOADS THAT COULD POSSIBLY BE APPLIED PRIOR TO COMPLETION OF CONSTRUCTION.

9.00 EXISTING CONDITIONS

1. THE CONTRACTOR SHALL SURVEY THE EXISTING STRUCTURE TO DETERMINE THAT ALL MODIFICATIONS AS INDICATED IN THE DRAWINGS ARE FEASIBLE AND PRACTICAL AND SHALL REPORT ANY DISCREPANCIES OR UNUSUAL CONDITIONS TO THE ARCHITECT AND ENGINEER OF RECORD. FIELD VERIFY DIMENSIONS OF ALL NEW STRUCTURAL ELEMENTS PRIOR TO THE SUBMISSION OF SHOP DRAWINGS.
2. CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES IN THE AREA OF CONSTRUCTION THAT MIGHT BE AFFECTED BY OR OTHERWISE INTERFERE WITH INSTALLATION OF NEW WORK. THIS INCLUDES THOSE THAT MIGHT BE DAMAGED BY NEW FOUNDATION OR OTHER WORK AND THOSE WHOSE PRESENCE MIGHT LEAD TO DAMAGE TO NEW WORK (SUCH AS SETTLEMENT, ETC.)

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WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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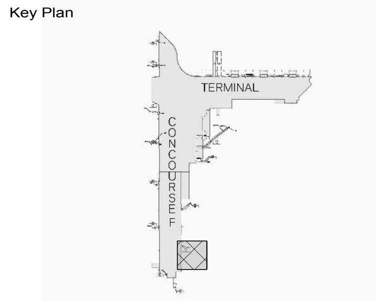
Key Plan



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STRUCTURAL GENERAL NOTES

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Sheet Number

S001

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10.00 DRAWING INTERPRETATION

10.01 STRUCTURAL ABBREVIATIONS

THE FOLLOWING ABBREVIATIONS ARE USED ON THE STRUCTURAL DRAWINGS:

@	- AT
&	- AND
Ø	- ROUND, DIAMETER
AR	- ANCHOR ROD
ADDL.	- ADDITIONAL
AHU	- AIR HANDLING UNIT
ALT.	- ALTERNATE
ANCH.	- ANCHOR
APPROX.	- APPROXIMATE
ARCH.	- ARCHITECTURAL
ARCHL.	- ARCHITECTURAL
BLDG.	- BUILDING
BM.(S)	- BEAM(S)
BO	- BOTTOM OF
BOT.	- BOTTOM
BRDG.	- BRIDGING
BRG.	- BEARING
BTWN.	- BETWEEN
C	- CHANNEL
CANT.	- CANTILEVER
CIP	- CAST IN PLACE CONCRETE
CJ	- CONSTRUCTION JOINT
CJP	- COMPLETE JOINT PENETRATION
CL	- CENTER LINE
CLR.	- CLEAR
CMU	- CONCRETE MASONRY UNIT
COL.	- COLUMN
COMPR.	- COMPRESSIBLE
CONC.	- CONCRETE
CONN.(S)	- CONNECTION(S)
CONST.	- CONSTRUCTION
CONT.	- CONTINUOUS
CORR.	- CORRUGATED
CTRS.	- CENTERS
DB	- BAR DIAMETER
DBA	- DEFORMED BAR ANCHOR
DBL.	- DOUBLE
DET.	- DETAIL
DIA.	- DIAMETER
DWA	- DEFORMED WIRE ANCHOR
DWL.S)	- DOWEL(S)
DWG.S)	- DRAWING(S)
EA.	- EACH
EJ	- EXPANSION JOINT
EL.	- ELEVATION
ELEV.	- ELEVATION
EMBED.	- EMBEDMENT
ENGR.	- ENGINEER
EQ.	- EQUAL
EQUIP.	- EQUIPMENT
EQUIV.	- EQUIVALENT
EW	- EACH WAY
EXIST.	- EXISTING
EXP.	- EXPANSION
EXT.	- EXTERIOR
FA.	- FACE
FAB.	- FABRICATE
F'C=	- 28 DAY CONCRETE STRENGTH =
FD	- FLOOR DRAIN
FDN.	- FOUNDATION
FIN.	- FINISH(ED)
FL.	- FLOOR
FS	- FAR SIDE
FTG.	- FOOTING
FUT.	- FUTURE
FY=	- YIELD STRENGTH =
GALV.	- GALVANIZE
GEN.	- GENERAL
HGR.	- HANGER
HORIZ.	- HORIZONTAL
HSA	- HEAD STUD ANCHOR
HSS	- HOLLOW STRUCTURAL SHAPE
INT.	- INTERIOR
JT.	- JOINT
K	- KIPS (1000 LBS)
KSF	- KIPS PER SQUARE FOOT
KSI	- KIPS PER SQUARE INCH
2L	- DOUBLE ANGLE
L	- ANGLE
LLBB	- LONG LEG BACK TO BACK
LB.(S)	- POUND(S)
LD	- DEVELOPMENT LENGTH
LL(S)H	- LONG LEG (SIDE) HORIZONTAL
LL(S)V	- LONG LEG (SIDE)VERTICAL
LWC	- LIGHTWEIGHT CONCRETE
MAS.	- MASONRY
MAT'L	- MATERIAL
MAX.	- MAXIMUM
MC	- MOMENT CONNECTION
MECH.	- MECHANICAL
MEZZ.	- MEZZANINE
MFR.	- MANUFACTURE(R)
MIN.	- MINIMUM
MTL.	- METAL
MISC.	- MISCELLANEOUS
NIC	- NOT IN CONTRACT
NO. (#)	- NUMBER
NS	- NEAR SIDE
NTS	- NOT TO SCALE
NWC	- NORMAL WEIGHT CONCRETE
NWT	- NORMAL WEIGHT
OC	- ON CENTER
OPNG.(S)	- OPENING(S)
OPP.	- OPPOSITE
OPP. HD.	- OPPOSITE HAND
PC	- PRECAST CONCRETE
PCF	- POUNDS PER CUBIC FOOT
PL	- PLATE
P.L.	- PROPERTY LINE
PLF	- POUNDS PER LINEAR FOOT
PRELIM.	- PRELIMINARY
PROP.	- PROPERTY
PSF	- POUNDS PER SQUARE FOOT
PSI	- POUNDS PER SQUARE INCH
PT	- POST-TENSION(ED)(ING)
QTY.	- QUANTITY
R	- RISER (STAIR),REACTION
RAD.	- RADIUS
REF.	- REFERENCE
REINF.	- REINFORCEMENT OR REINFORCING
REM.	- REMAINDER
REQD.	- REQUIRED
REV.	- REVISION
RTU	- ROOF TOP UNIT
SC	- SLIP CRITICAL, SHEAR CONNECTOR(S)
SCHED.	- SCHEDULE(D)
SECT.	- SECTION
SHT.	- SHEET
SIM.	- SIMILAR
SLBB	- SHORT LEG BACK TO BACK
SP.OR SPA.	- SPACE, SPACING
SPEC.(S)	- SPECIFICATION(S)
SQ.	- SQUARE
STD.	- STANDARD
STL.	- STEEL
STIR.	- STIRRUP
STRUCT.	- STRUCTURE
SYM.	- SYMMETRICAL
T	- PLATE THICKNESS
THRD.	- THREADED
T.O.	- TOP OF
TOC	- TOP OF CONCRETE
TOM	- TOP OF MASONRY
TOS	- TOP OF STEEL
TR.	- TREAD (STAIR)
TYP.	- TYPICAL
U.N.O.	- UNLESS NOTED OTHERWISE
VERT.	- VERTICAL
W	- WIDE FLANGE
W/	- WITH
WGT.	- WEIGHT
WP	- WORK POINT
W.R.T.	- WITH RESPECTS TO
WS	- WATERSTOP
WT	- STEEL TEE SECTION
WWR	- WELDED WIRE REINF.
X-STR	- EXTRA STRONG
XX-STR	- DOUBLE EXTRA STRONG

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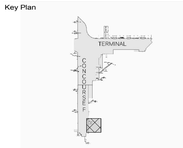

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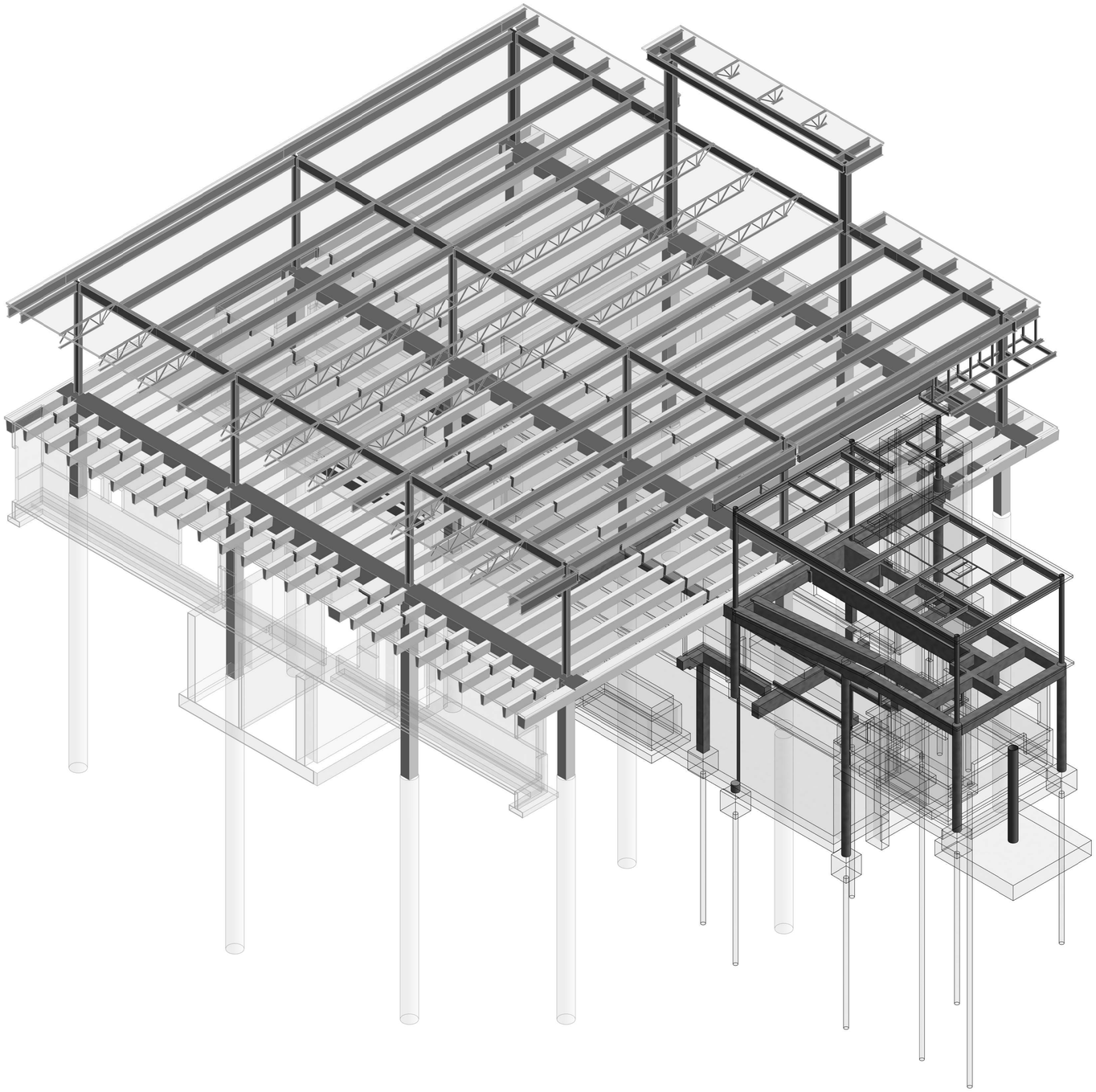
S002



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S010
AXONOMETRIC VIEW
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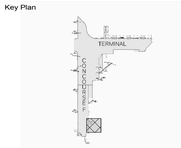

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AXONOMETRIC VIEW

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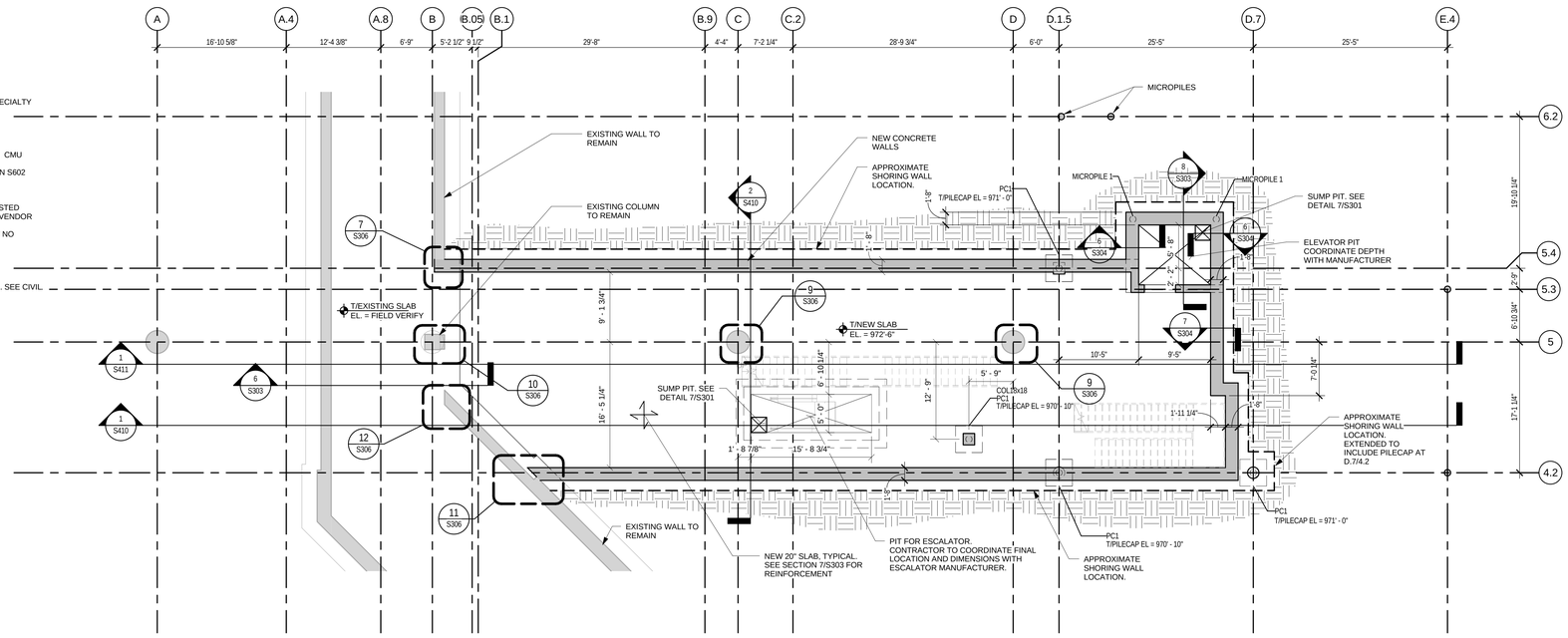
S010

FOUNDATION NOTES:
1. SEE S001 AND S002 FOR GENERAL NOTES.
2. SEE S301 FOR TYPICAL FOUNDATION DETAILS.
3. PC# INDICATES MICROPILE PILECAP. SEE S302 FOR PILECAP SIZES AND REINFORCEMENT.
4. MICROPILE 1 INDICATES SINGLE MICROPILE. MICROPILE TO BE DESIGNED BY SPECIALTY CONTRACTOR FOR CAPACITIES INDICATED IN GENERAL NOTES.
5. GB# INDICATES GRADE BEAM. SEE 6/S302 FOR GRADE BEAM SCHEDULE.
6. ALL FOOTINGS, AND PILECAPS, TO BE CENTERED ON COLUMNS AND WALLS, UNLESS OTHERWISE INDICATED.
7. SEE S501 FOR COLUMN SCHEDULE.
8. COORDINATE ALL SLAB EDGE DIMENSIONS, DEPRESSED SLABS, PENETRATIONS, CMU AND CONCRETE WALL LOCATIONS WITH ARCHITECTURAL DRAWINGS.
9. CB# INDICATES NEW CAST-IN-PLACE CONCRETE BEAM. SEE BEAM SCHEDULE ON S602 FOR SIZES AND REINFORCEMENT.
10. DRILL AND EPOXY NEW SLAB AND BEAM TOP AND BOTTOM REINFORCEMENT INTERRUPTED BY EXISTING COLUMN, 6" INTO THE COLUMN.
11. PASSENGER BOARDING BRIDGE (PBB) FOUNDATION IS DESIGNED FOR LOADS LISTED BELOW. GENERAL CONTRACTOR TO VERIFY THAT LOADS FROM THE SELECTED VENDOR DO NOT EXCEED THESE LOADS. IF LOADS EXCEED THOSE LISTED BELOW, THE FOUNDATION WILL NEED TO BE RE-EVALUATED AND POSSIBLY RE-DESIGNED AT NO ADDITIONAL COST TO THE OWNER.

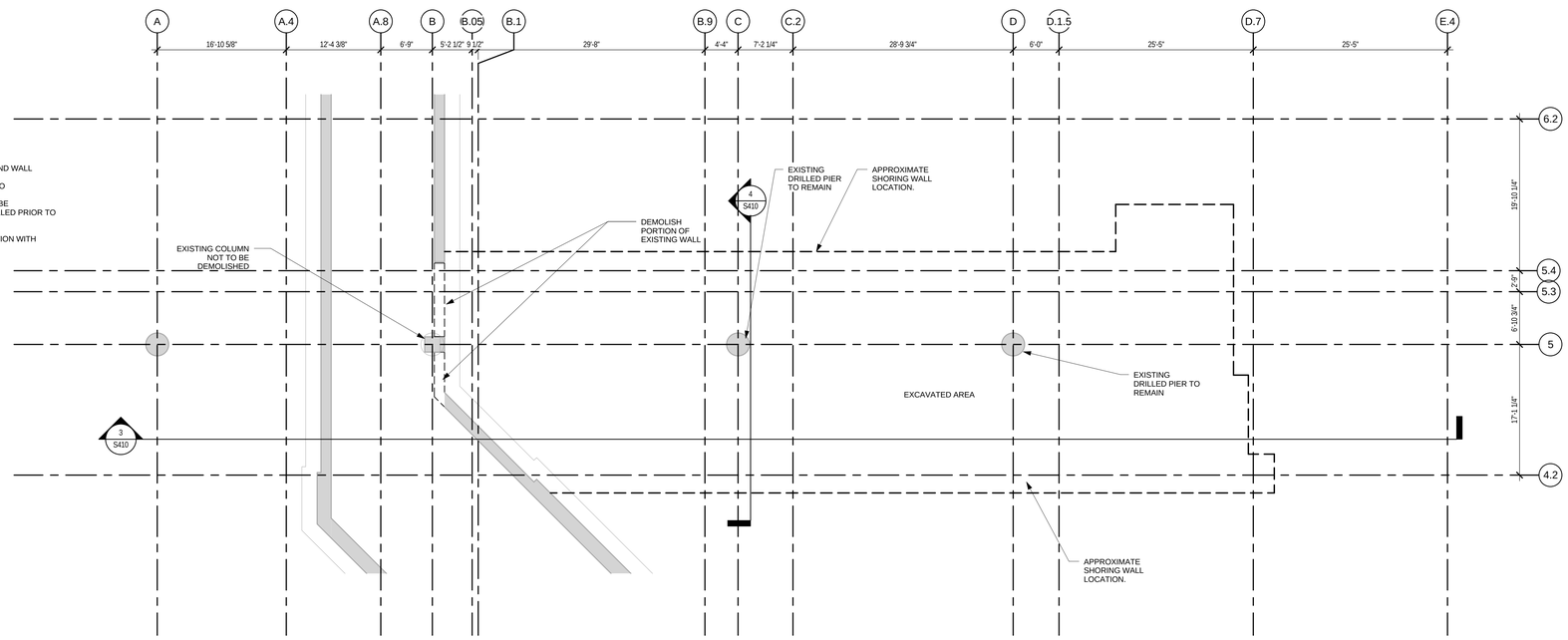
	AXIAL LOAD (KIPS)	MOMENTS (KIP-FT)
- DEAD LOADS	31.4	64.4
- LIVE LOADS	12.9	13.9
- WIND LOADS	0.0	463.4

12. INCREASE PBB FOOTING PLAN DIMENSIONS TO FILL ENTIRE APRON SLAB PANEL. SEE CIVIL DRAWINGS FOR PANEL LAYOUT.
13. SEE GENERAL NOTES FOR PERMANENT EXCAVATION SHORING WALL INFO.



1 ARRIVALS LEVEL (NEW)
1/8" = 1'-0"

FOUNDATION DEMOLITION NOTES:
D1. COORDINATE ALL SLAB EDGE DIMENSIONS, SLOPED SLABS, PENETRATIONS, AND WALL LOCATIONS WITH ARCHITECTURAL DRAWINGS.
D2. COORDINATE ALL EXISTING UTILITY LOCATIONS WITH CIVIL ENGINEER PRIOR TO COMMENCEMENT OF EXCAVATION.
D3. PROVIDE TEMPORARY BRACING FOR EXISTING COLUMN AND DRILLED PIER TO BE EXPOSED. SEE S305 BRACING SECTIONS AND DETAILS. BRACING TO BE INSTALLED PRIOR TO EXCAVATION.
D4. COORDINATE EXTENTS OF APRON SLAB DEMOLITION WITH CIVIL ENGINEER.
D5. GENERAL CONTRACTOR TO CONFIRM SEQUENCING OF NEW OPENING DEMOLITION WITH SECURITY REQUIREMENTS AT EXISTING TUNNEL.



2 ARRIVALS LEVEL (DEMO)
1/8" = 1'-0"

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CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p
Hartsfield Jackson + Partnership
191 Peachtree Street, NE
Suite 2250
Atlanta, GA 30303
Phone: 404-439-9000

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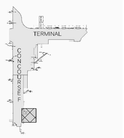
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: RQ Reviewed by: MK

Project No:

Sheet Title

PLANS -- DEMO & PROPOSED - ARRIVALS LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

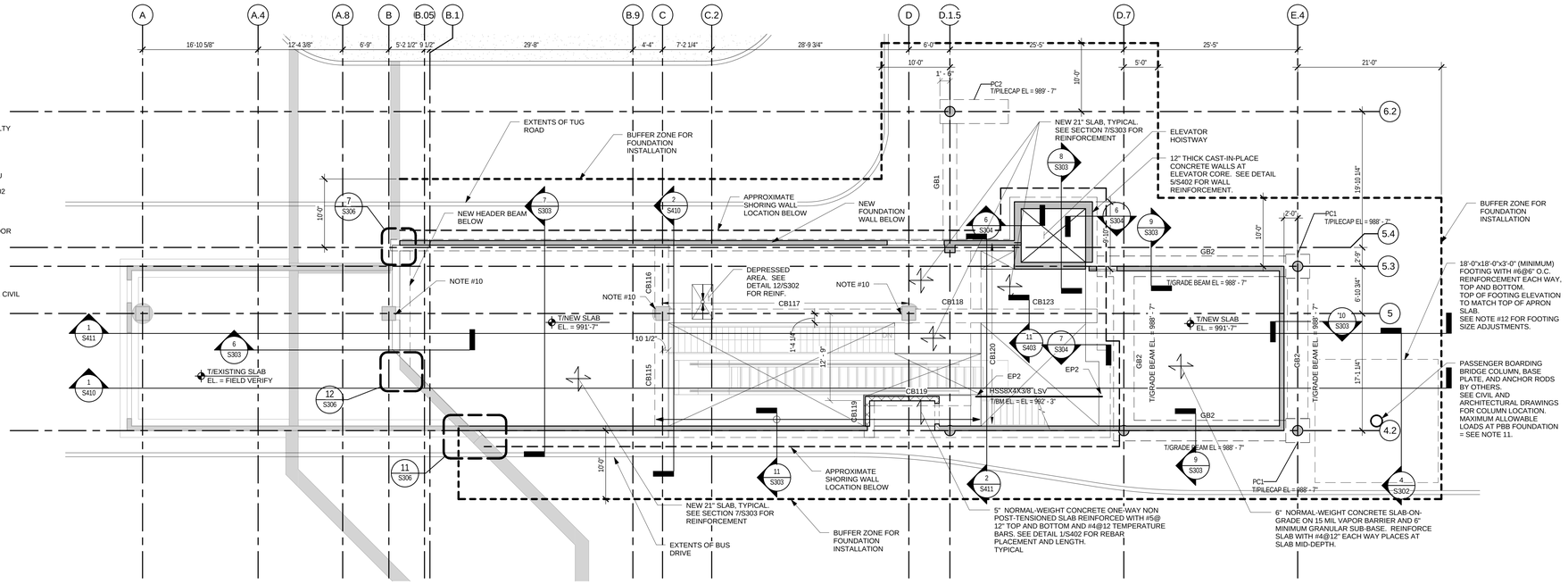
Sheet Number

S101

FOUNDATION NOTES:
1. SEE S001 AND S002 FOR GENERAL NOTES.
2. SEE S301 FOR TYPICAL FOUNDATION DETAILS.
3. PC# INDICATES MICROPILE PILECAP. SEE S302 FOR PILECAP SIZES AND REINFORCEMENT.
4. MICROPILE 1 INDICATES SINGLE MICROPILE. MICROPILE TO BE DESIGNED BY SPECIALTY CONTRACTOR FOR CAPACITIES INDICATED IN GENERAL NOTES.
5. GB# INDICATES GRADE BEAM. SEE 6/S302 FOR GRADE BEAM SCHEDULE.
6. ALL FOOTINGS, AND PILECAPS, TO BE CENTERED ON COLUMNS AND WALLS, UNLESS OTHERWISE INDICATED.
7. SEE S501 FOR COLUMN SCHEDULE.
8. COORDINATE ALL SLAB EDGE DIMENSIONS, DEPRESSED SLABS, PENETRATIONS, CMU AND CONCRETE WALL LOCATIONS WITH ARCHITECTURAL DRAWINGS.
9. CB## INDICATES NEW CAST-IN-PLACE CONCRETE BEAM. SEE BEAM SCHEDULE ON S602 FOR SIZES AND REINFORCEMENT.
10. DRILL AND EPOXY NEW SLAB AND BEAM TOP AND BOTTOM REINFORCEMENT INTERRUPTED BY EXISTING COLUMN, 6" INTO THE COLUMN.
11. PASSENGER BOARDING BRIDGE (PBB) FOUNDATION IS DESIGNED FOR LOADS LISTED BELOW. GENERAL CONTRACTOR TO VERIFY THAT LOADS FROM THE SELECTED VENDOR DO NOT EXCEED THESE LOADS. IF LOADS EXCEED THOSE LISTED BELOW, THE FOUNDATION WILL NEED TO BE RE-EVALUATED AND POSSIBLY RE-DESIGNED AT NO ADDITIONAL COST TO THE OWNER.

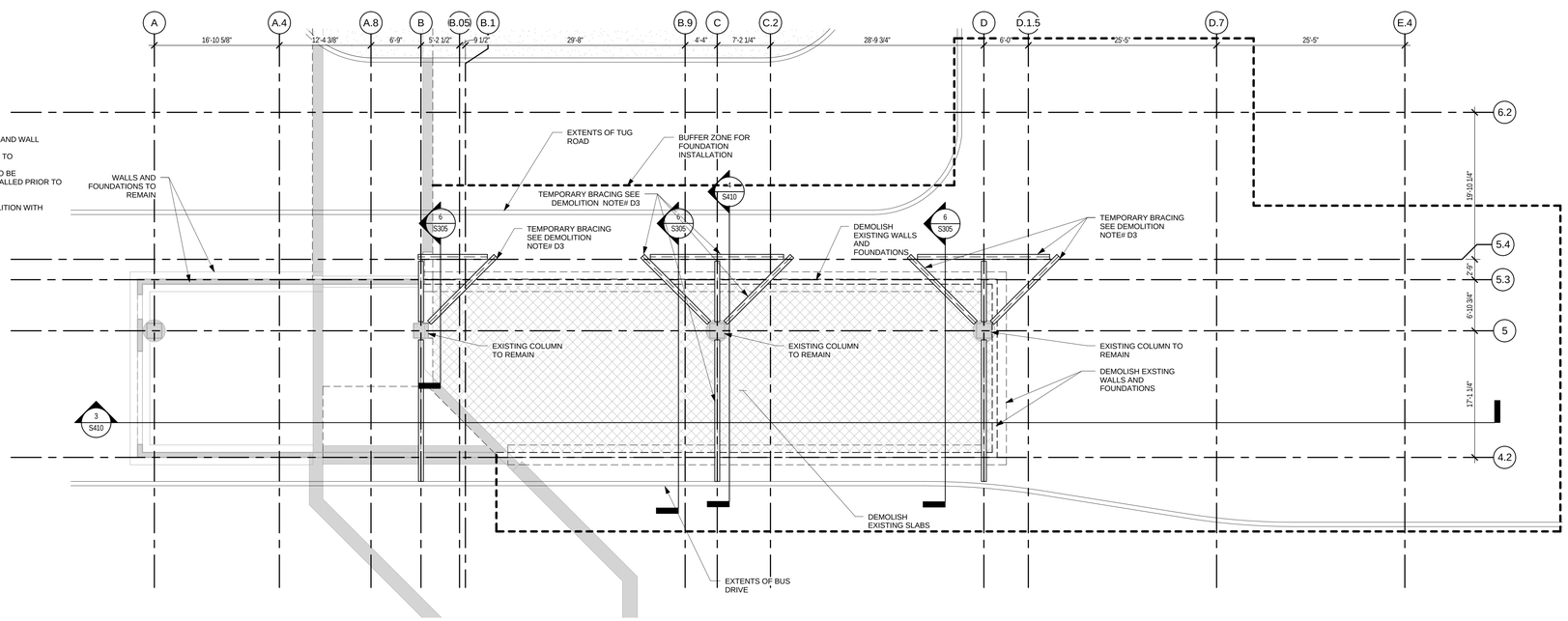
	AXIAL LOAD (KIPS)	MOMENTS (KIP-FT)
- DEAD LOADS	31.4	64.4
- LIVE LOADS	12.9	13.9
- WIND LOADS	0.0	463.4

12. INCREASE PBB FOOTING PLAN DIMENSIONS TO FILL ENTIRE APRON SLAB PANEL. SEE CIVIL DRAWINGS FOR PANEL LAYOUT.
13. SEE GENERAL NOTES FOR PERMANENT EXCAVATION SHORING WALL INFO.



1 APRON LEVEL (NEW)
1/8" = 1'-0"

FOUNDATION DEMOLITION NOTES:
D1. COORDINATE ALL SLAB EDGE DIMENSIONS, SLOPED SLABS, PENETRATIONS, AND WALL LOCATIONS WITH ARCHITECTURAL DRAWINGS.
D2. COORDINATE ALL EXISTING UTILITY LOCATIONS WITH CIVIL ENGINEER PRIOR TO COMMENCEMENT OF EXCAVATION.
D3. PROVIDE TEMPORARY BRACING FOR EXISTING COLUMN AND DRILLED PIER TO BE EXPOSED. SEE S305 BRACING SECTIONS AND DETAILS. BRACING TO BE INSTALLED PRIOR TO EXCAVATION.
D4. COORDINATE EXTENTS OF APRON SLAB DEMOLITION WITH CIVIL ENGINEER.
D5. GENERAL CONTRACTOR TO CONFIRM SEQUENCING OF NEW OPENING DEMOLITION WITH SECURITY REQUIREMENTS AT EXISTING TUNNEL.



2 APRON LEVEL (DEMO)
1/8" = 1'-0"

4/14/2015 6:28:31 PM

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Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
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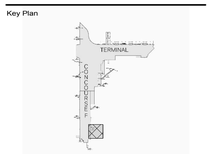
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: RQ Reviewed by: MK

Project No:

Sheet Title

PLANS -- DEMO & PROPOSED - APRON LEVEL

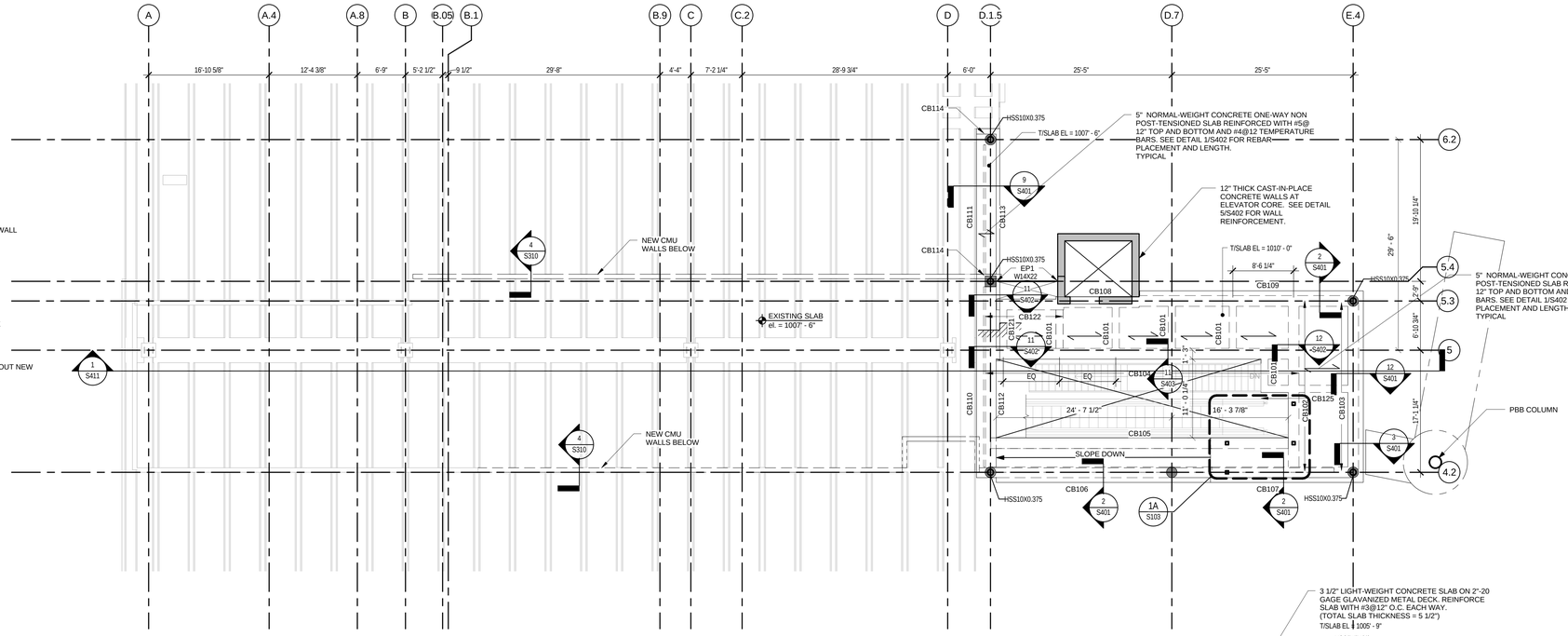
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

S102

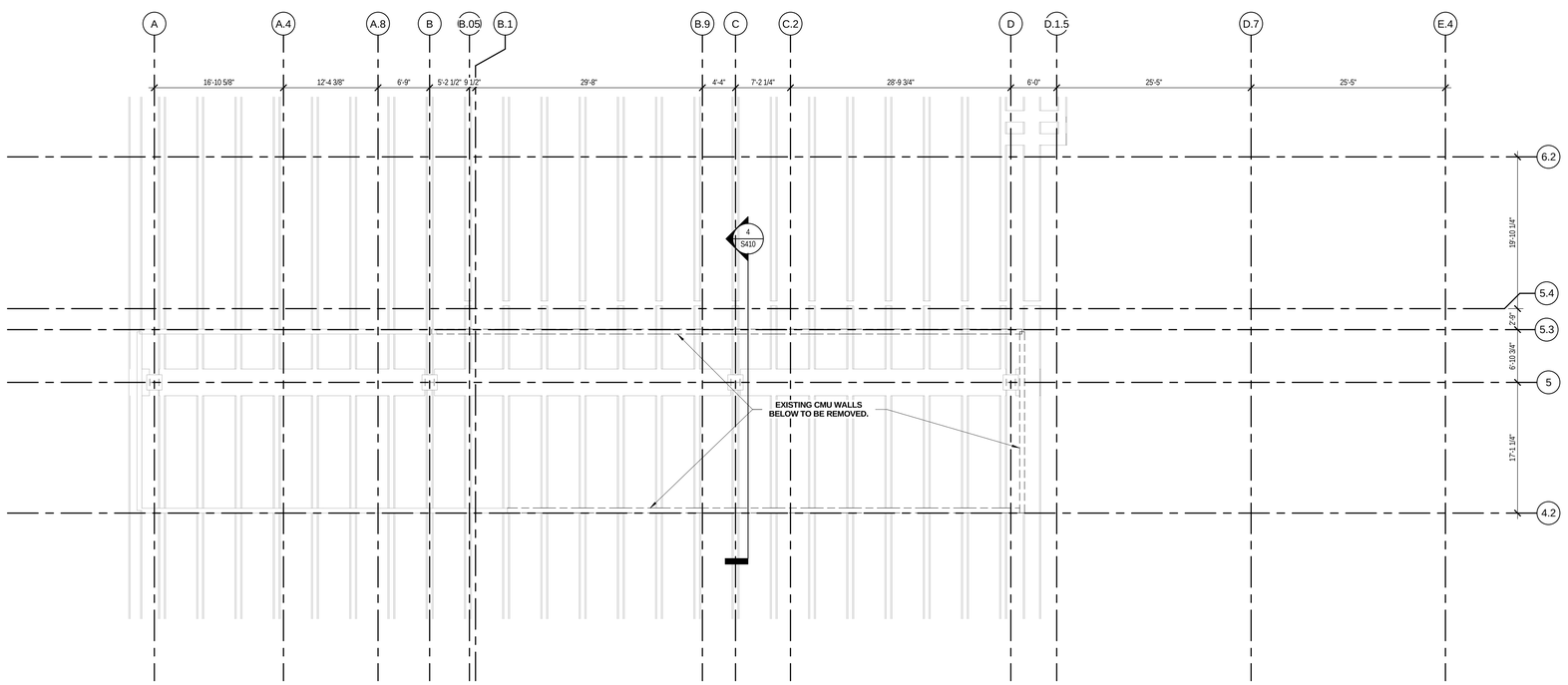
CONCRETE FRAMING NOTES:
1. SEE S001 AND S002 FOR GENERAL NOTES.
2. CB## INDICATES NEW CAST-IN-PLACE CONCRETE BEAM. SEE BEAM SCHEDULE ON S602 FOR SIZES AND REINFORCEMENT.
3. COORDINATE ALL SLAB EDGE DIMENSIONS, SLOPED SLABS, PENETRATIONS, AND WALL LOCATIONS WITH ARCHITECTURAL DRAWINGS.
4. SEE DETAIL 10/S301 FOR STEEL COLUMN BASE PLATE SCHEDULE.
5. SEE S501 FOR COLUMN SCHEDULE.

STEEL FRAMING NOTES:
1. SEE S001 AND S002 FOR GENERAL NOTES.
2. COORDINATE ALL SLAB EDGE DIMENSIONS, SLOPED SLABS, OPENINGS, PENETRATIONS, AND WALL LOCATIONS WITH M.E.P AND ARCHITECTURAL DRAWINGS.
3. ATTACH ROOF DECK PER DETAIL 1/S401.
4. STEEL BEAM LEGEND: W##x## (##) R=##\# kips
   A. R=# kips INDICATES FACTORED BEAM REACTION. IF NO REACTION IS SHOWN ON PLAN:
      i. FOR W8 BEAMS, PROVIDE CONNECTION FOR 10 kips.
      ii. FOR W12 BEAMS, PROVIDE CONNECTION FOR 25 kips.
      iii. FOR W14 AND LARGER BEAMS, PROVIDE CONNECTIONS BASED ON 1/2 OF THE MAXIMUM FACTORED UNIFORM LOADS TABULATED IN THE MANUAL OF STEEL CONSTRUCTION..
   B. (##) INDICATES THE NUMBER OF 3/4" DIAMETER X 4.75" LONG SHEAR STUDS. WHERE NONE ARE SHOWN ON PLAN, PROVIDE 1 STUD PER FOOT ALONG THE LENGTH OF THE COMPOSITE BEAM.
   C. M= ## K-FT INDICATES MOMENT END REACTION AT END OF BEAM.
5. ROOF BEAMS ARE EQUALLY SPACED WITHIN FRAMING BAYS, U.N.O.
6. CONTRACTOR TO FIELD VERIFY DIMENSIONS TO ALL EXISTING STRUCTURES BEFORE LAYING OUT NEW STRUCTURAL COMPONENTS.
7. ▶ INDICATES MOMENT CONNECTION SEE 6/S401.
8. EP# INDICATES EMBED PLATE. SEE DETAIL 4/S402 FOR SIZES.



1 DEPARTURES LEVEL (NEW)
1/8" = 1'-0"

1A ESCALATOR PIT PARTIAL PLAN (NEW)
1/8" = 1'-0"



2 DEPARTURES LEVEL (DEMO)
1/8" = 1'-0"

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Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p

Hartsfield Jackson + Partnership
191 Peachtree Street, NE
Suite 2250
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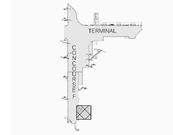
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	08-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: RQ Reviewed by: MK

Project No:

Sheet Title

PLANS -- DEMO & PROPOSED - DEPARTURES LEVEL

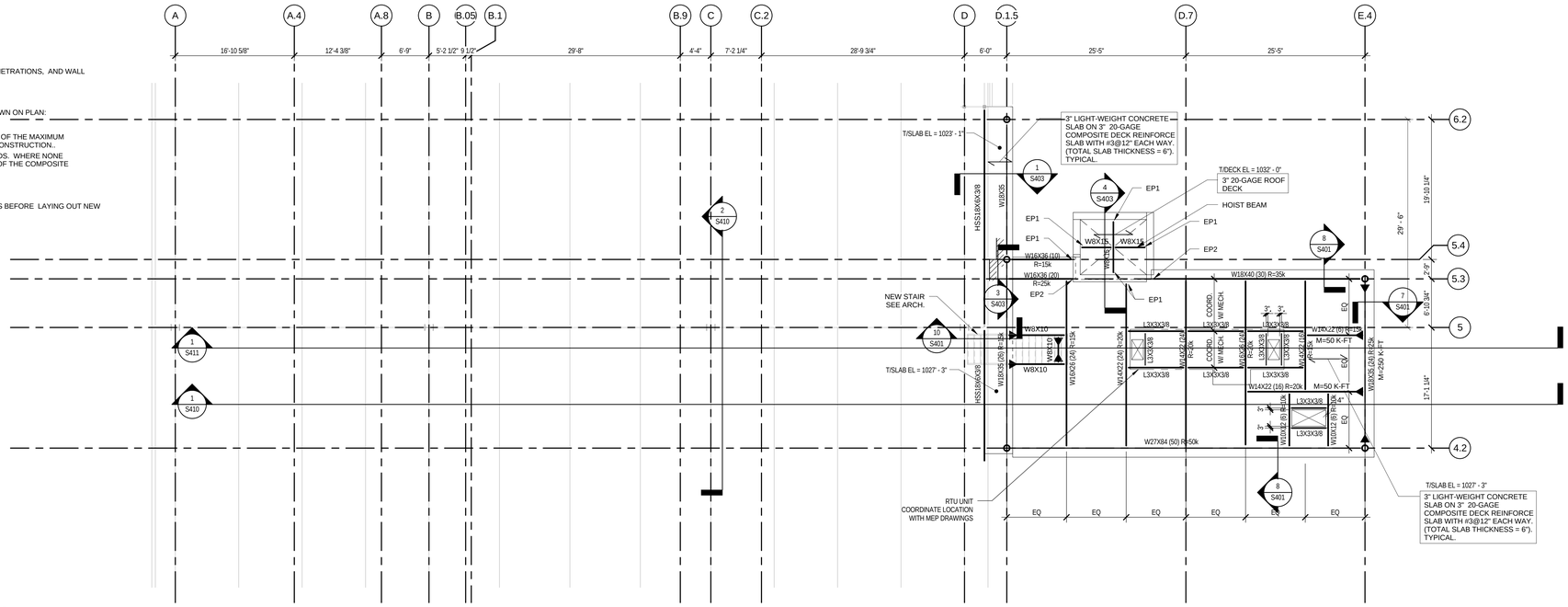
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

S103

STEEL FRAMING NOTES:

1. SEE S001 AND S002 FOR GENERAL NOTES.
2. COORDINATE ALL SLAB EDGE DIMENSIONS, SLOPED SLABS, OPENINGS, PENETRATIONS, AND WALL LOCATIONS WITH M.E.P AND ARCHITECTURAL DRAWINGS.
3. ATTACH ROOF DECK PER DETAIL 1/S401.
4. STEEL BEAM LEGEND: W##x## (##) R=## kips
   A. R=# kips INDICATES FACTORED BEAM REACTION, IF NO REACTION IS SHOWN ON PLAN:
      i. FOR W8 BEAMS, PROVIDE CONNECTION FOR 10 kips.
      ii. FOR W12 BEAMS, PROVIDE CONNECTION FOR 25 kips.
      iii. FOR W14 AND LARGER BEAMS, PROVIDE CONNECTIONS BASED ON 1/2 OF THE MAXIMUM FACTORED UNIFORM LOADS TABULATED IN THE MANUAL OF STEEL CONSTRUCTION.
   B. (##) INDICATES THE NUMBER OF 3/4" DIAMETER X 4.75" LONG SHEAR STUDS. WHERE NONE ARE SHOWN ON PLAN, PROVIDE 1 STUD PER FOOT ALONG THE LENGTH OF THE COMPOSITE BEAM.
   C. M= ## K-FT INDICATES MOMENT END REACTION AT END OF BEAM.
5. ROOF BEAMS ARE EQUALLY SPACED WITHIN FRAMING BAYS, U.N.O.
6. CONTRACTOR TO FIELD VERIFY DIMENSIONS TO ALL EXISTING STRUCTURES BEFORE LAYING OUT NEW STRUCTURAL COMPONENTS.
7. ▶——— INDICATES MOMENT CONNECTION SEE 6/S401.
8. EP# INDICATES EMBED PLATE. SEE DETAIL 4/S402 FOR SIZES.



1 ROOF LOW (NEW)
1/8" = 1'-0"

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
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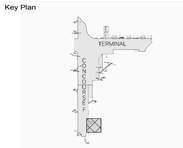
Key Plan



Professional Seals

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2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: RQ Reviewed by: MK

Project No:

Sheet Title

PLANS -- DEMO & PROPOSED - LOW ROOF

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

S104

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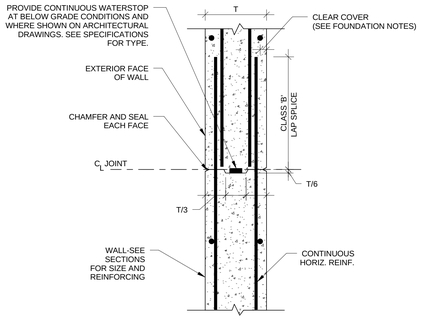
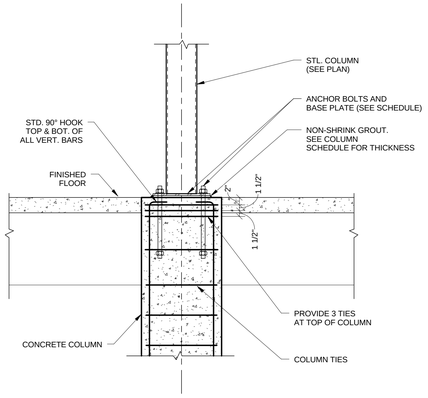


NOTES:

1. SUBMIT PROPOSED WALL JOINT LOCATIONS FOR APPROVAL PRIOR TO POURING WALL. JOINTS SHALL BE SPACED NO CLOSER THAN 5'-0" FROM THE CORNERS AND PILASTERS.
2. WHERE WALL SPANS HORIZONTALLY TO SUPPORT VERTICAL OR LATERAL LOADS, JOINTS SHALL BE LOCATED IN MIDDLE THIRD OF WALL SPANS, UNLESS NOTED OTHERWISE. SEE PLANS FOR LOCATIONS WHERE WALLS ARE SO DESIGNED.

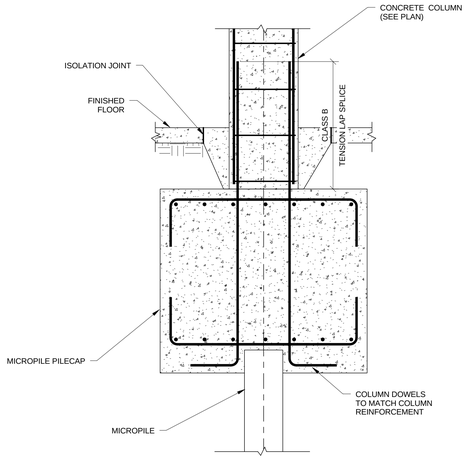
4 TYPICAL CONCRETE WALL CONSTRUCTION JOINT

1" = 1'-0"



3 TYPICAL DETAIL AT TOP OF CONCRETE COLUMN

3/4" = 1'-0"



2 TYPICAL DETAIL AT TOP OF MICROPILE PILECAP

3/4" = 1'-0"

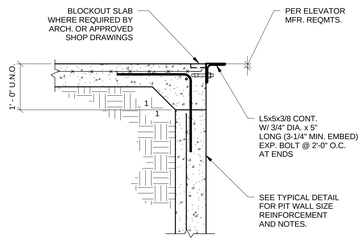
MIN. LAP SPLICE LENGTH SCHEDULE FOR CONCRETE MASONRY UNITS (CMU)							
BAR TYPE	BAR SIZE						
	#3	#4	#5	#6	#7	#8	#9
8" CMU	19"	25"	31"	57"	79"	112"	146"
12" CMU	19"	25"	31"	52"	61"	75"	90"

NOTES:

1. F'm = 1500 psi
2. REBAR IS ASSUMED TO BE UNCOATED (NO EPOXY COATING)
3. REBAR IS LOCATED IN CENTER OF CELL.

1 MASONRY LAP SPLICE LENGTH SCHEDULE

1" = 1'-0"

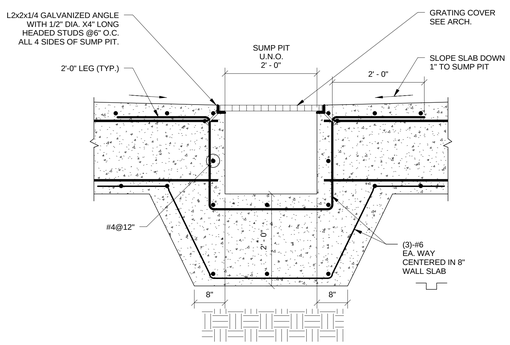


NOTES:

1. PROVIDE CONTINUOUS ELEVATOR SILL ANGLE AT THRESHOLD OF ELEVATOR PIT. SEE ARCHITECTURAL DRAWINGS FOR LOCATION.
2. INSTALL EXPANSION BOLT ACCORDING TO MANUFACTURERS REQUIREMENTS.

8 TYPICAL ELEVATOR SILL ANGLE

3/4" = 1'-0"

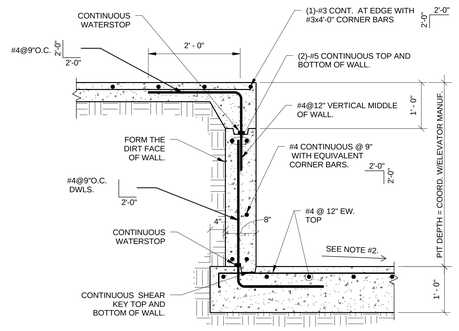


NOTES:

1. POUR PIT MONOLITHIC WITH BASE SLAB.
2. SEE PLAN FOR LOCATION AND SIZE WHERE DIFFERENT FROM DIMENSIONS IN THIS DETAIL.

7 TYPICAL ELEVATOR SUMP PIT

3/4" = 1'-0"

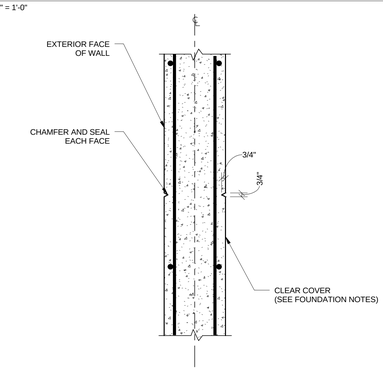


NOTES:

1. BRACE WALL AS REQUIRED UNTIL UPPER SLAB IS POURED AND HAS REACHED 2500 PSI MINIMUM.
2. SLOPE PIT BOTTOM SLAB 1" TO SUMP PIT.
3. GENERAL CONTRACTOR TO COORDINATE ELEVATOR PIT SIZE, DEPTH, SILL DETAIL, AND BLOCKOUT REQUIREMENTS WITH ELEVATOR MANUFACTURER'S APPROVED SHOP DRAWINGS.
4. WHERE ELEVATOR PIT SLAB IS BLOCKED OUT TO ALLOW FOR PLACEMENT OF HYDRAULIC ELEVATOR JACK, FILL BLOCKOUT WITH CONCRETE AFTER JACK IS SET.

6 TYPICAL SECTION AT ELEVATOR PIT

3/4" = 1'-0"



NOTES:

1. SEE SECTIONS FOR WALL SIZE AND REINFORCING
2. MAXIMUM JOINT SPACING 20'-0"
3. STOP 50% OF HORIZONTAL REINFORCING AT EACH SIDE OF JOINT

5 TYPICAL CONCRETE WALL CONTROL JOINT

1" = 1'-0"

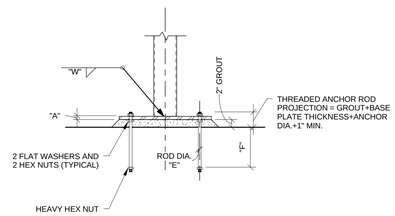
CLASS "B" LAP SPLICE LENGTH SCHEDULE (INCHES)																				
BAR SIZE	f'c = 3000 PSI				f'c = 4000 PSI				f'c = 5000 PSI				f'c = 6000 PSI				f'c = 7000 PSI			
	FOOTINGS	WALLS	SLABS/ BEAMS (BOTTOM)	SLABS/ BEAMS (TOP)	FOOTINGS	WALLS	SLABS/ BEAMS (BOTTOM)	SLABS/ BEAMS (TOP)	FOOTINGS	WALLS	SLABS/ BEAMS (BOTTOM)	SLABS/ BEAMS (TOP)	FOOTINGS	WALLS	SLABS/ BEAMS (BOTTOM)	SLABS/ BEAMS (TOP)	FOOTINGS	WALLS	SLABS/ BEAMS (BOTTOM)	SLABS/ BEAMS (TOP)
#3	17	22	22	28	15	19	19	24	13	17	17	22	12	15	15	20	11	14	14	18
#4	22	29	29	37	19	25	25	32	17	22	22	29	15	20	20	26	14	19	19	24
#5	28	36	36	47	24	31	31	40	22	28	28	36	19	25	25	33	18	23	23	30
#6	33	43	43	56	29	37	37	48	26	33	33	43	23	30	30	39	22	28	28	36
#7	48	63	63	81	42	54	54	70	38	49	49	63	34	44	44	57	31	41	41	53
#8	55	72	72	91	48	62	62	80	43	56	56	72	39	50	50	65	36	47	47	61
#9	62	81	81	105	54	70	70	91	48	62	62	81	44	57	57	74	40	53	53	68
#10	70	91	91	119	61	80	80	103	54	71	71	92	49	64	64	83	46	59	59	77

NOTES:
1. IF LIGHTWEIGHT AGGREGATE CONCRETE IS USED, MULTIPLY TABLE VALUES BY 1.3.
2. REBAR IS ASSUMED TO BE UNCOATED (NO EPOXY COATING).

12 CLASS "B" LAP SPLICE LENGTH SCHEDULE

12" = 1'-0"

BASE PLATE & ANCHOR ROD SCHEDULE										
COLUMN SIZE	BASE PLATE						ANCHOR ROD			WELD
	FIGURE #	A	B	C	D1	D2	E	F	NO. OF RODS	"W"
HSS10X0.375	2	1	16"	16"	6.5"	6.5"	1	15"	4	1/4"



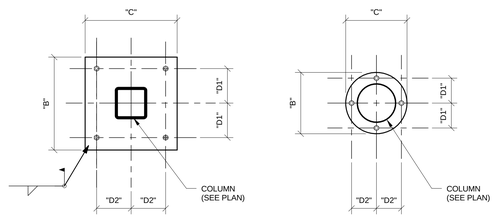


FIGURE 1 FIGURE 2

NOTES:

1. USE OVERSIZED HOLES IN BASE PLATES FOR ANCHOR RODS ACCORDING TO AISC.
2. PLATE WASHERS SHALL BE INSTALLED OVER OVERSIZED HOLES.
3. THE HOLE IN THE PLATE WASHER SHALL BE 1/16" LARGER THAN THE ANCHOR ROD DIAMETER.
4. TACK WELD THE HEAVY HEX NUT AT THE BASE OF THE THREADED ANCHOR ROD TO PREVENT ANCHOR WITHDRAWAL.

10 BASE PLATE AND ANCHOR ROD SCHEDULE FOR HSS COLUMN

3/4" = 1'-0"

4/14/2015 6:29:14 PM

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TASK ORDER No. : 001

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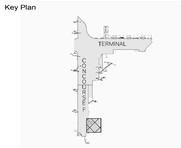

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2. ISSUED FOR 65% CONSTRUCTION DOCUMENTS		10-30-14
3. ISSUED FOR 95% CONSTRUCTION DOCUMENTS		01-23-15
4. ISSUED FOR 100% CONSTRUCTION DOCUMENTS		03-23-15
5. ISSUED FOR BID DOCUMENTS		04-17-15

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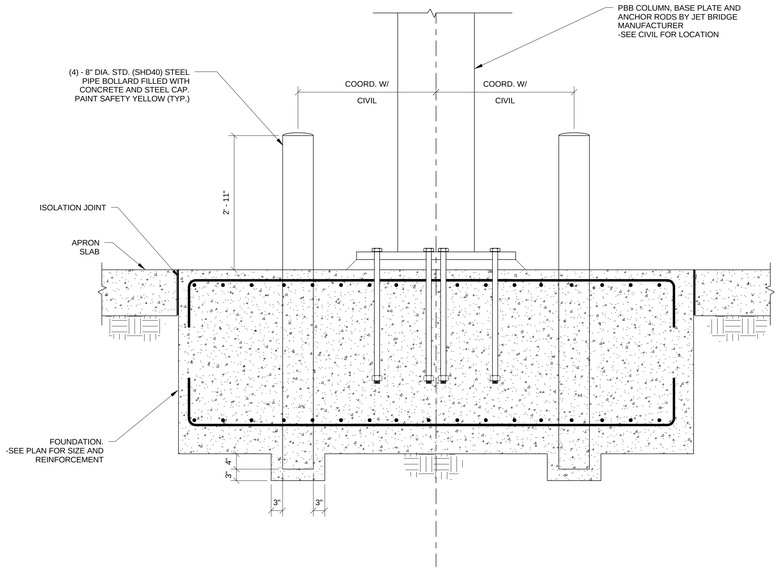
Sheet Title

SUBSTRUCTURE TYPICAL DETAILS

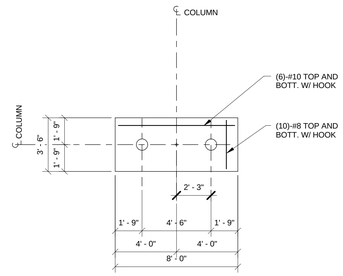
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

S301

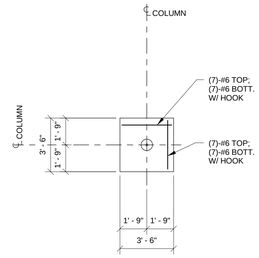


4 DETAIL AT PBB COLUMN
3/4" = 1'-0"



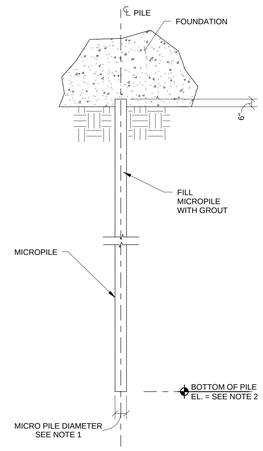
(2 MICROPILES)
PC2
THICKNESS = 48"

3 PILECAP PC2
1/4" = 1'-0"



(1 MICROPILES)
PC1
THICKNESS = 48"

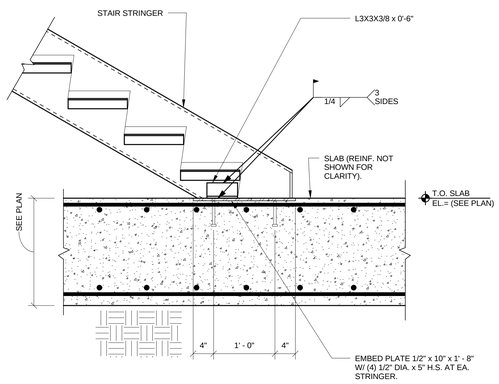
2 PILECAP PC1
1/4" = 1'-0"



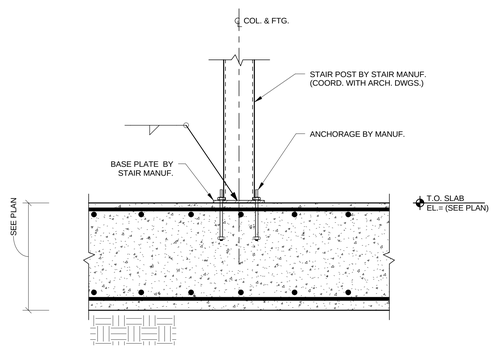
NOTES:

1. MICROPILE SIZE TO BE DESIGNED BY SPECIALTY CONTRACTOR.
2. FOR BOTTOM OF PILE ELEVATION SEE GEOTECHNICAL REPORT AND COORDINATE WITH SPECIALTY CONTRACTOR DESIGNING THE MICROPILES.
3. SEE GENERAL NOTES FOR MICROPILE CAPACITIES.

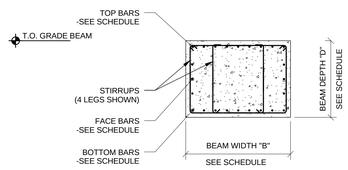
1 TYPICAL MICROPILE ELEVATION
1/4" = 1'-0"



8 TYPICAL EMBED AT STAIR STRINGER
1" = 1'-0"



7 TYPICAL STAIR POST BASE DETAIL
1" = 1'-0"



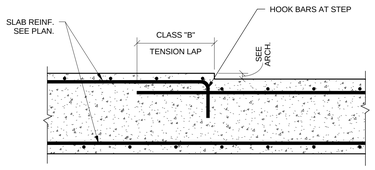
GRADE BEAM SCHEDULE

MARK	BEAM WIDTH "B"	BEAM DEPTH "D"	TOP BARS	BOTTOM BARS	FACE BARS (EACH FACE)	STIRRUPS			REMARKS
						# LEGS	SIZE	SPACING	
GB1	24"	24"	5#9	5#9	3#9	4	4	12"	
GB2	36"	24"	5#10	5#10	3#9	4	4	12"	

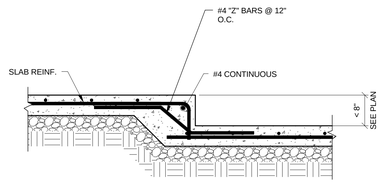
NOTES:

1. ALL GRADE BEAM REINFORCEMENT IS TO BE GRADE 60 (U.N.O.).
2. HOOK TOP BARS, BOTTOM BARS, AND FACE BARS EACH END.

6 GRADE BEAM SCHEDULE
1/4" = 1'-0"



12 TYPICAL DEPRESSED SLAB ON ELEVATED SLAB
3/4" = 1'-0"



11 TYPICAL DEPRESSED SLAB ON GRADE DETAIL
3/4" = 1'-0"

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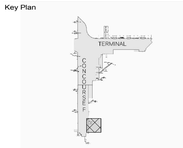

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

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Project No:

Sheet Title

SUBSTRUCTURE
TYPICAL DETAILS

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Sheet Number

S302

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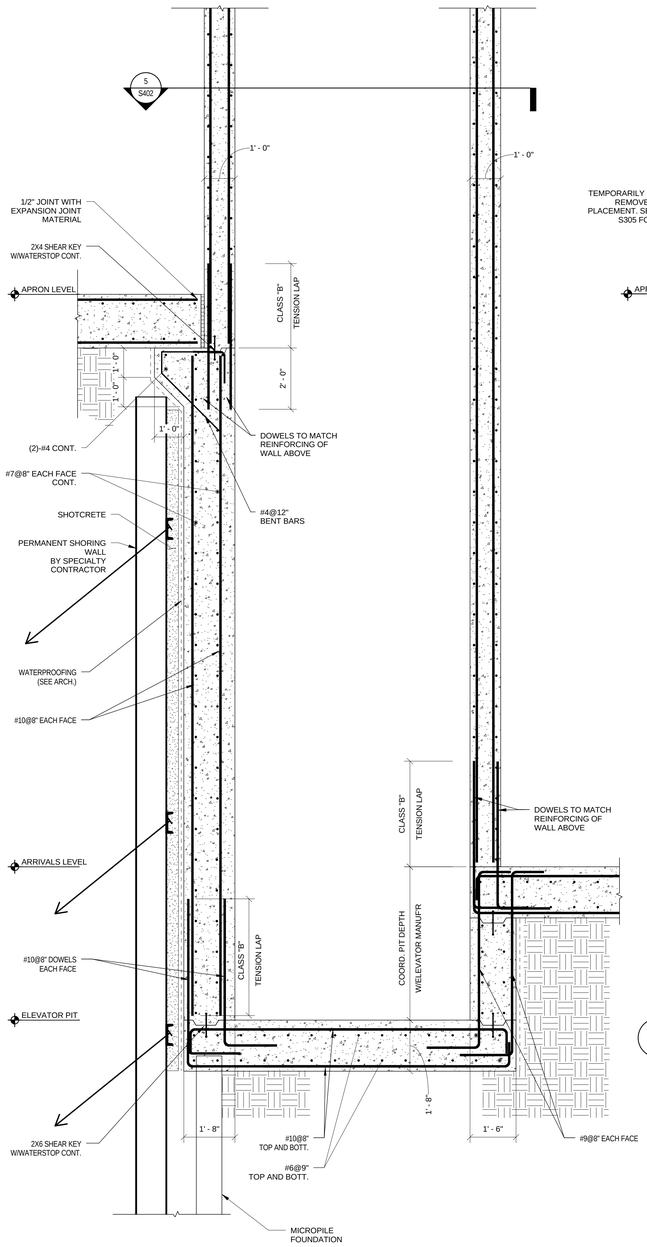
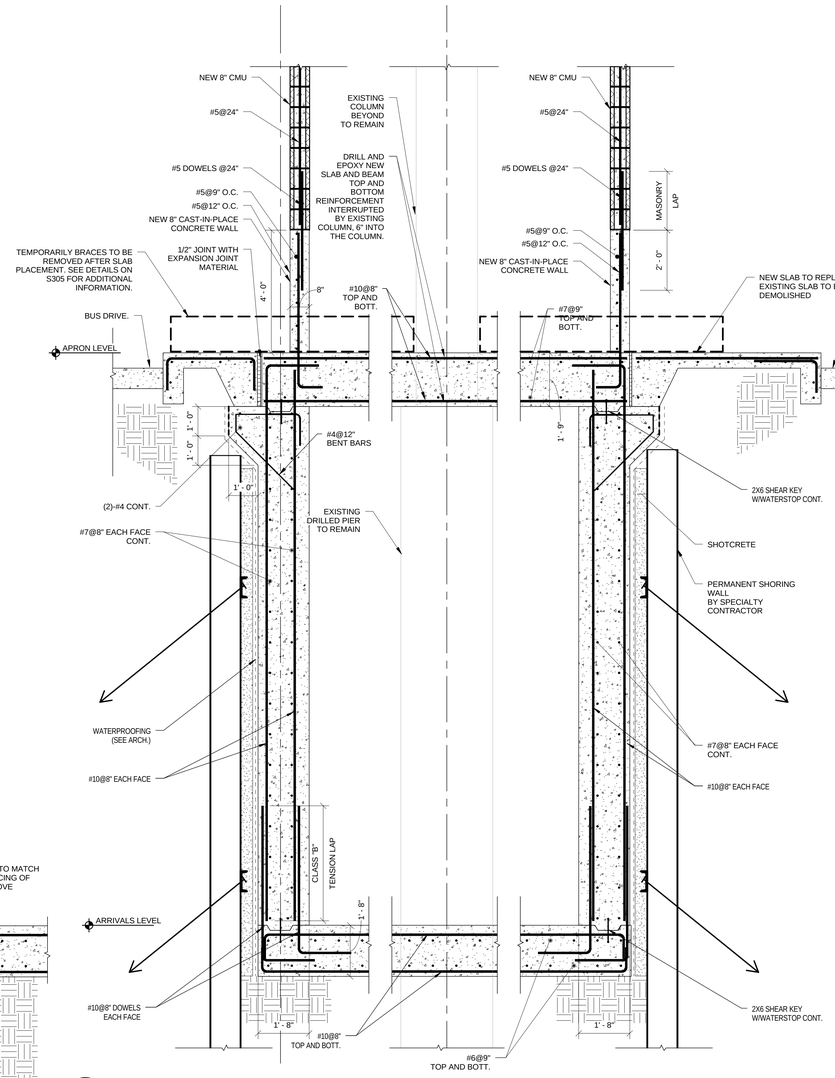
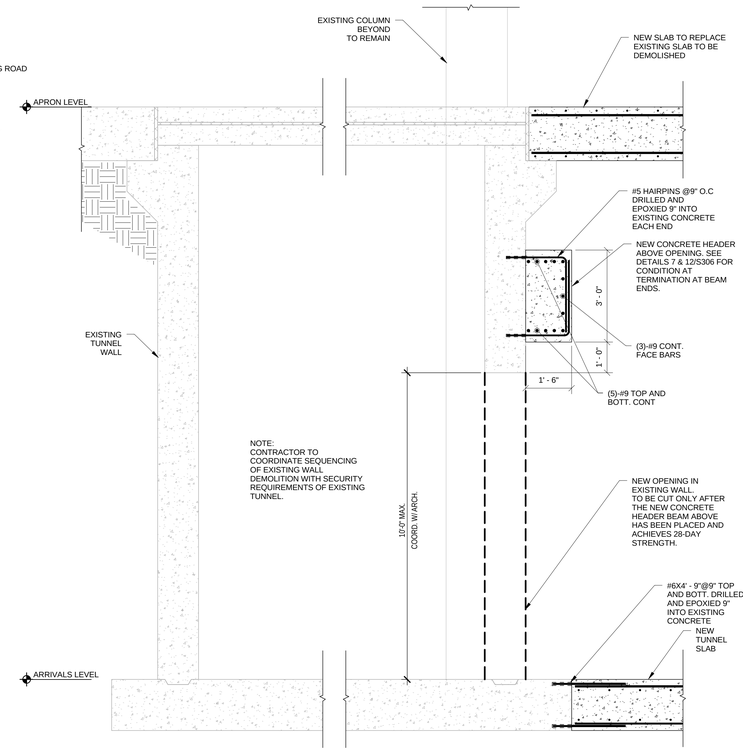


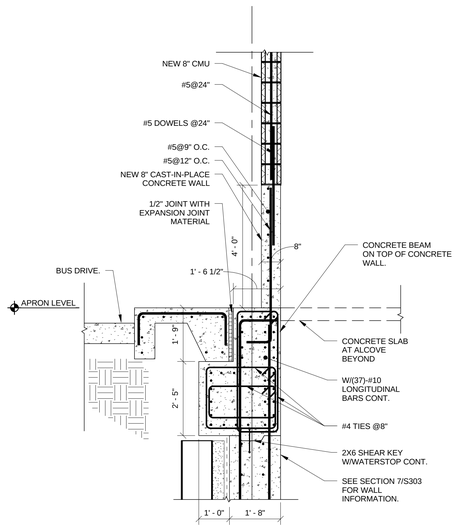
8 SECTION THRU ELEVATOR PIT N-S
1/2" = 1'-0"



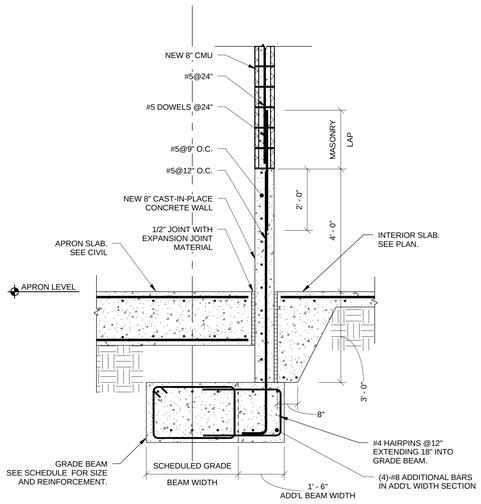
7 SECTION THRU TUNNEL N-S
1/2" = 1'-0"



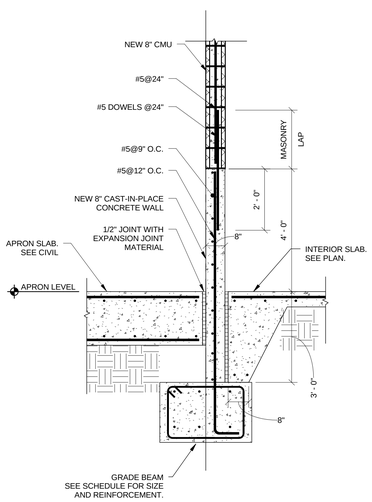
6 DETAIL AT EXISTING TUNNEL OPENING
1/2" = 1'-0"



11 SECTION AT SOUTH WALL
1/2" = 1'-0"



10 SECTION AT NEW EAST WALL
1/2" = 1'-0"



9 SECTION AT NEW WALL
1/2" = 1'-0"

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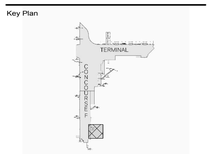

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

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SUBSTRUCTURE DETAILS

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S303

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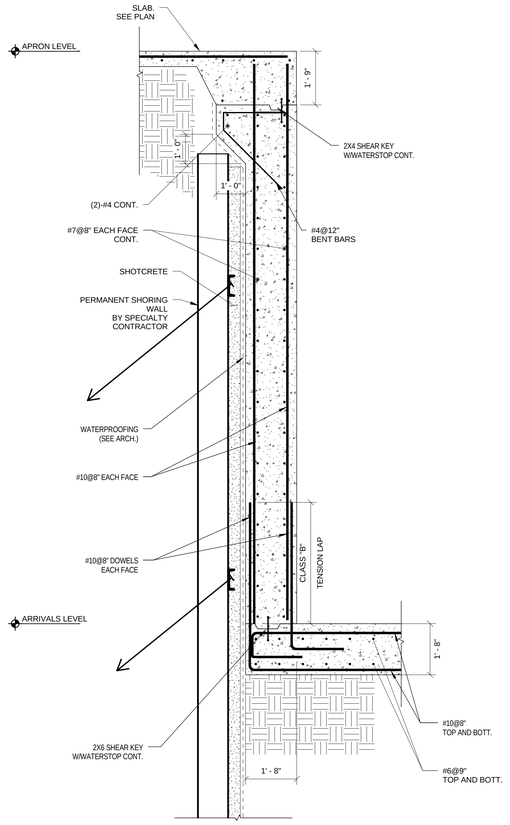
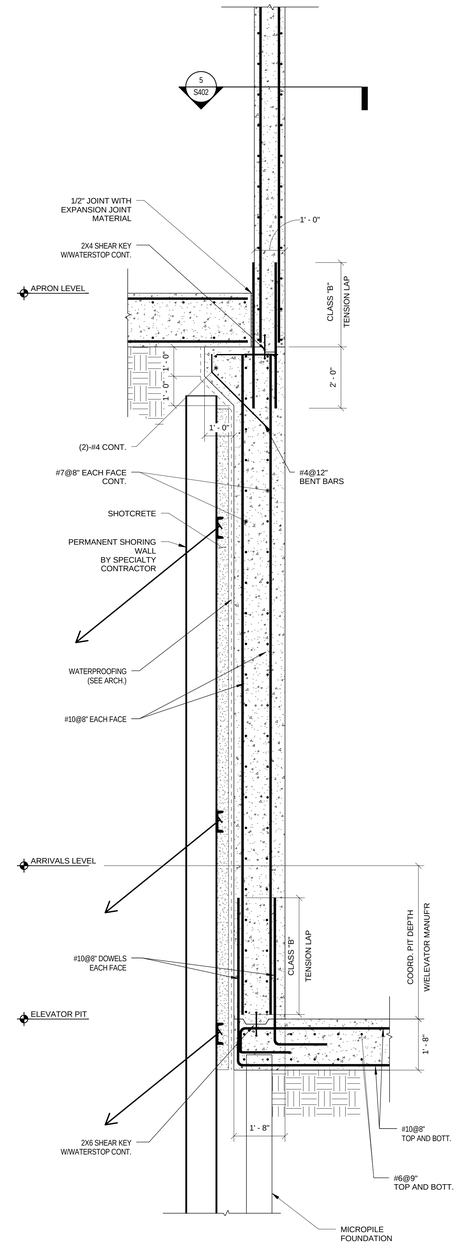


7 SECTION AT WALL EAST
1/2" = 1'-0"



6 SECTION THRU ELEVATOR PIT E-W
1/2" = 1'-0"

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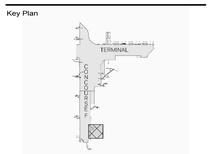

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SUBSTRUCTURE DETAILS

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S304

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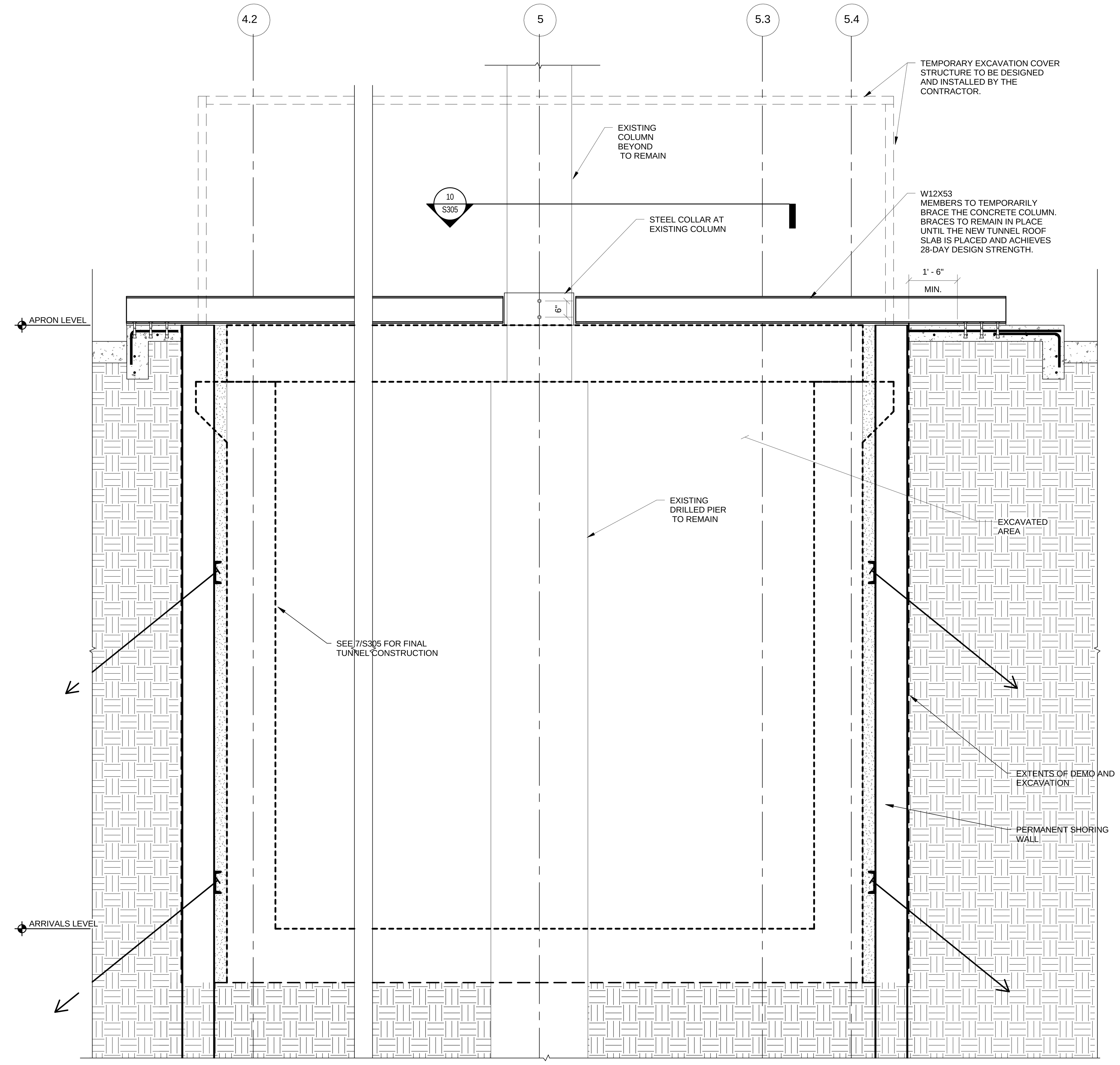
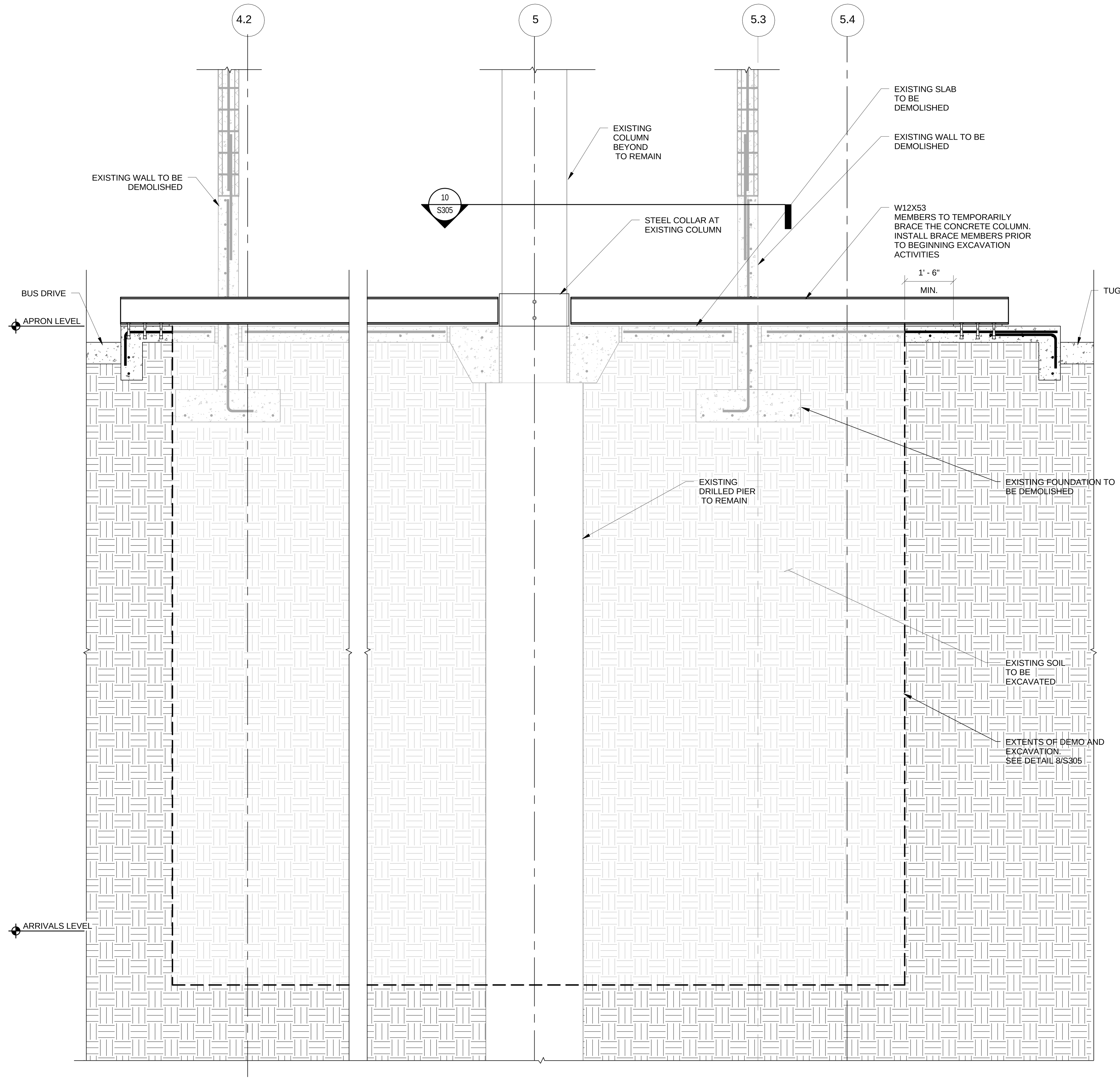
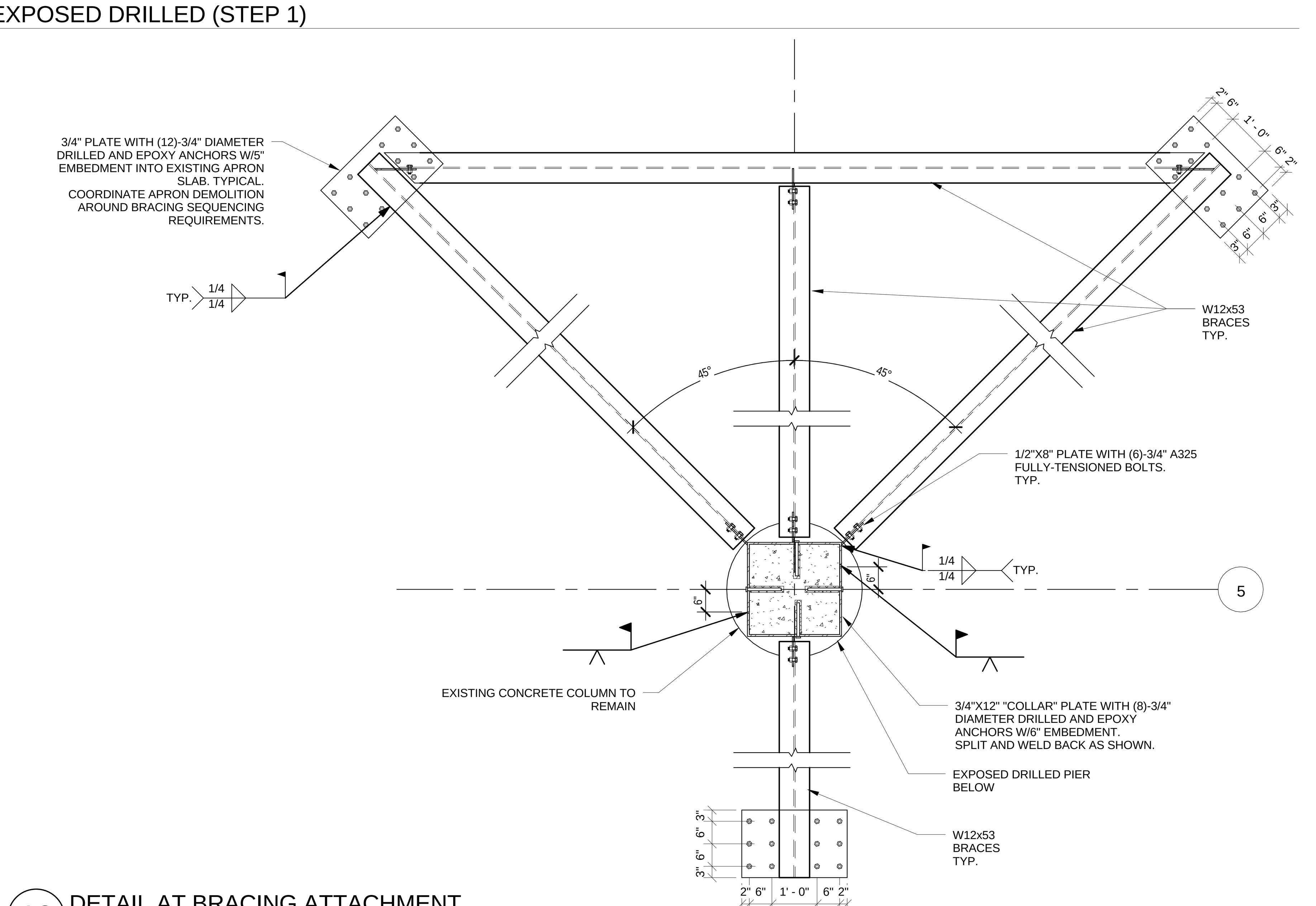


8 BRACING AT EXPOSED DRILLED (STEP 2)
1/2" = 1'-0"



6 BRACING AT EXPOSED DRILLED (STEP 1)
1/2" = 1'-0"



10 DETAIL AT BRACING ATTACHMENT
1/2" = 1'-0"

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SUBSTRUCTURE DETAILS

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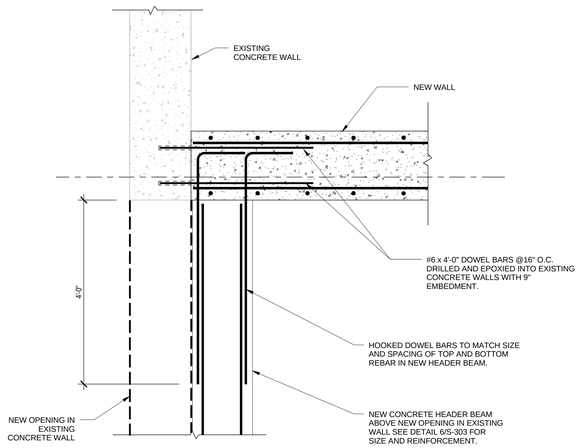
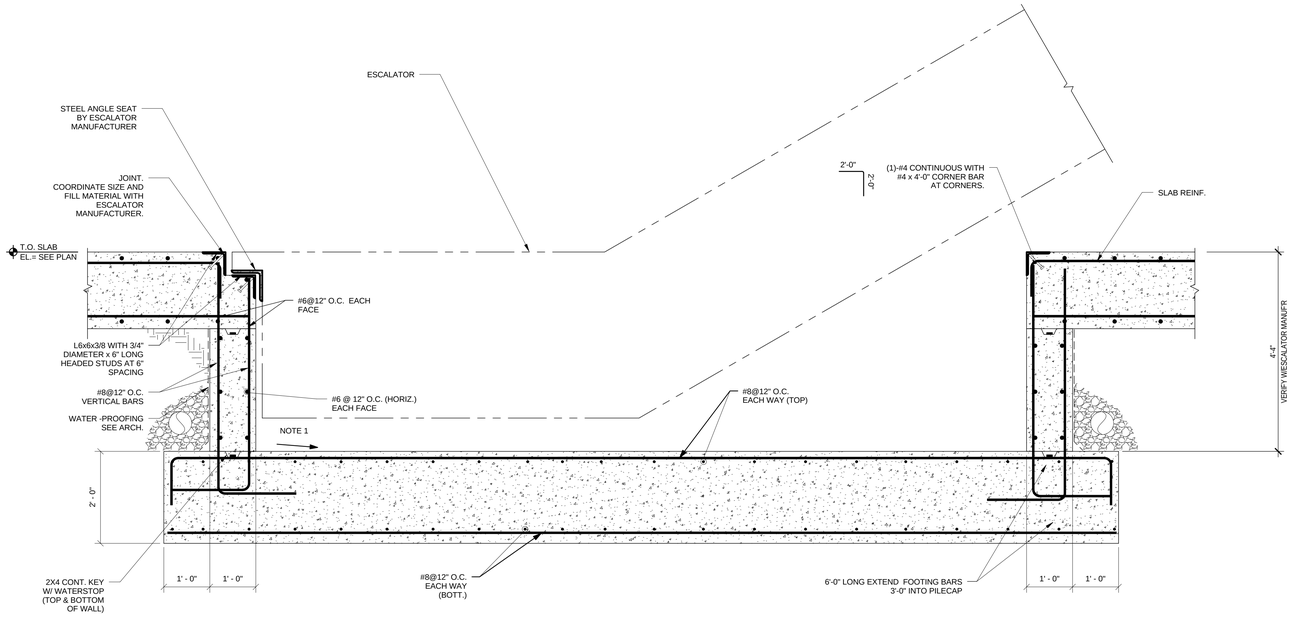
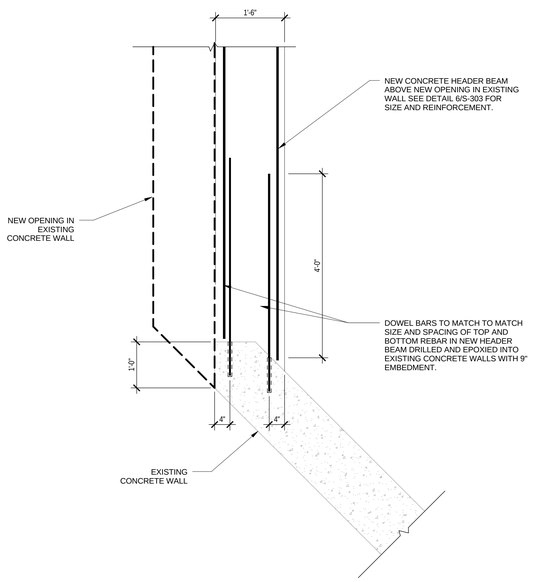


7 DETAIL 2 AT EXISTING WALL INTERFACE
3/4" = 1'-0"

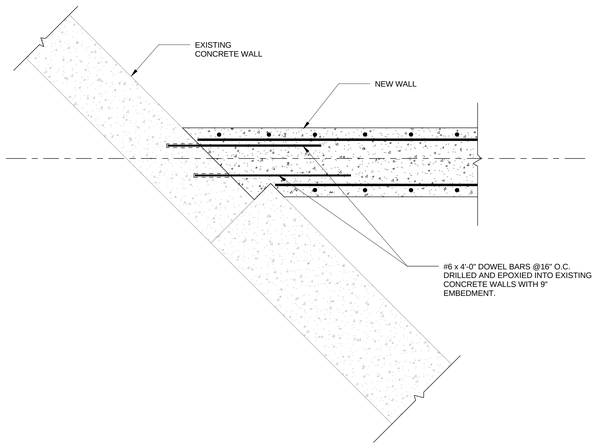


NOTES:
1. SEE PLAN FOR SUMP PIT. WHERE REQUIRED, SLOPE PIT BOTTOM SLAB 1" TO SUMP PIT. THICKNESS ON DETAILS IS THE MINIMUM THICKNESS.
2. GENERAL CONTRACTOR TO COORDINATE ESCALATOR PIT SIZE, DEPTH, SILL DETAIL, AND BLOCKOUT REQUIREMENTS WITH ESCALATOR MANUFACTURER'S APPROVED SHOP DRAWINGS.

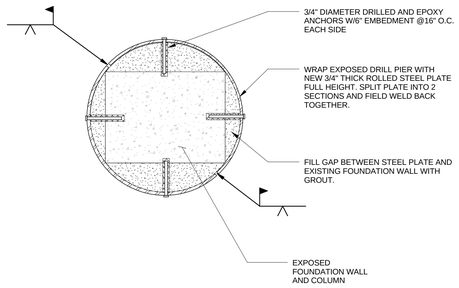
6 SECTION AT ESCALATOR PIT WALLS
3/4" = 1'-0"



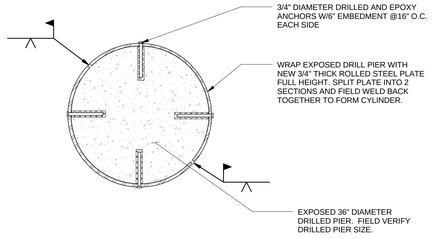
12 DETAIL 3 AT EXISTING WALL INTERFACE
3/4" = 1'-0"



11 DETAIL 1 AT EXISTING WALL INTERFACE
3/4" = 1'-0"



10 DETAIL AT STRENGTHENING FDN WALL
3/4" = 1'-0"



NOTES:
1. EXTREME CAUTION SHOULD BE USED NOT TO DAMAGE ANY PORTION OF THE DRILLED PIER DURING EXCAVATION.
2. FIELD VERIFY DIMENSION OF DRILLED PIER UPON EXCAVATION. WHERE EXTRA CONCRETE EXISTS OUTSIDE OF THE 36" DIAMETER CYLINDER, CONSULT ENGINEER FOR RECOMMENDATIONS.
3. WHERE VOIDS OR GAPS EXIST WITHIN THE 36" DIAMETER CYLINDER, FILL IN WITH NON-SHRINK GROUT.

9 DETAIL AT STRENGTHENING EXPOSED DRILLED PIERS
3/4" = 1'-0"

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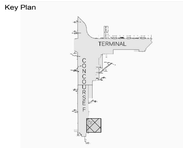

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: RQ Reviewed by: MK

Project No:

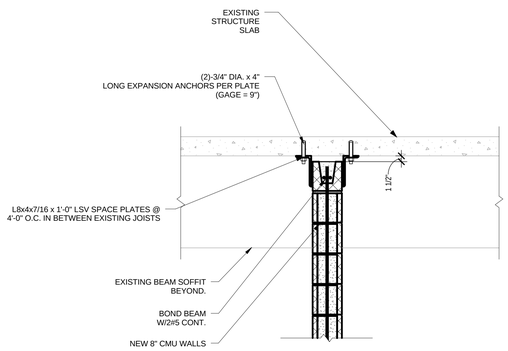
Sheet Title

SUBSTRUCTURE DETAILS

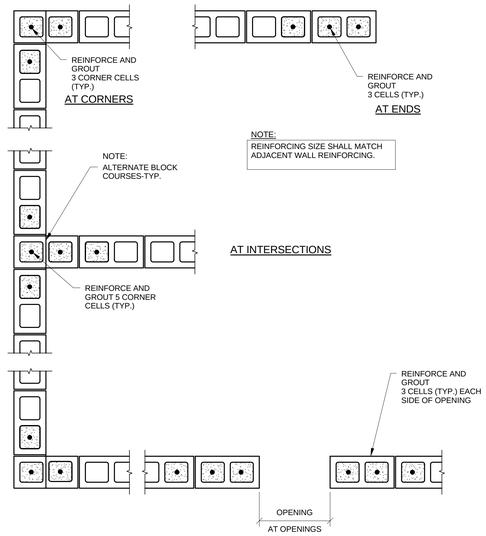
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

S306



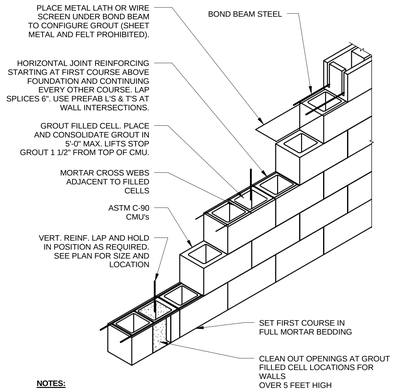
4 DETAIL AT TOP OF NEW CMU WALLS
3/4" = 1'-0"



3 TYPICAL REINFORCING AT CMU WALL INTERSECTIONS
1" = 1'-0"

CONCRETE MASONRY LINTEL SCHEDULE		
CLEAR SPAN "L"	8" BLOCK	
	LINTEL DEPTH	REINF. (BOTT)
UP TO 4'-0"	8"	2 #5
4'-1" TO 7'-0"	16"	2 #6
7'-1" TO 11'-0"	24"	2 #6
11'-0" TO 14'-0"	HSS8x8x5/16	

LINTEL SCHEDULE NOTES
1. SEE TYP. SCHEMATIC C.M.U. WALL OPENING ELEVATION FOR ADDITIONAL INFO.
2. LINTELS SUPPORT WEIGHT OF WALL ONLY. NO SUPERIMPOSED LOADS.
3. USE MIN. 2500 PSI GROUT IN LINTEL BLOCK.
4. MINIMUM BEARING 8" EACH END.
5. GROUT BEARING CELL SOLID FROM FOUNDATION TO FRAMING ABOVE.



NOTES:

1. SEE MASONRY SPECIFICATIONS FOR TYPE OF JOINT REINFORCEMENT.
2. SEE STRUCTURAL NOTES FOR HORIZONTAL JOINT REINF. SPACING.

1 TYPICAL CMU WALL CONSTRUCTION
3/4" = 1'-0"

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TASK ORDER No. : 001

h-j+p
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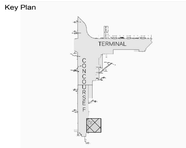
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: RQ Reviewed by: MK

Project No:

Sheet Title

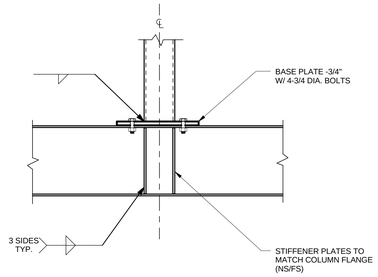
SUPERSTRUCTURE SECTIONS & DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

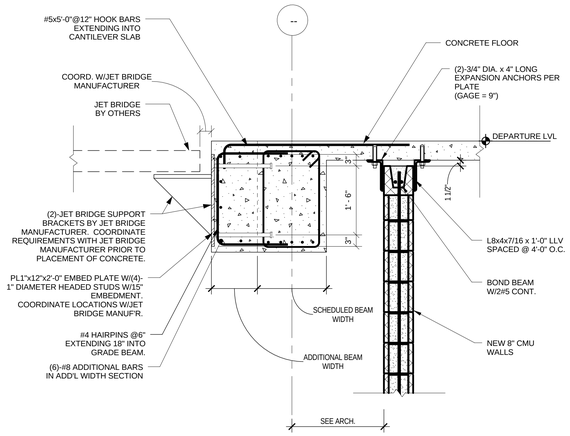
Sheet Number

S310

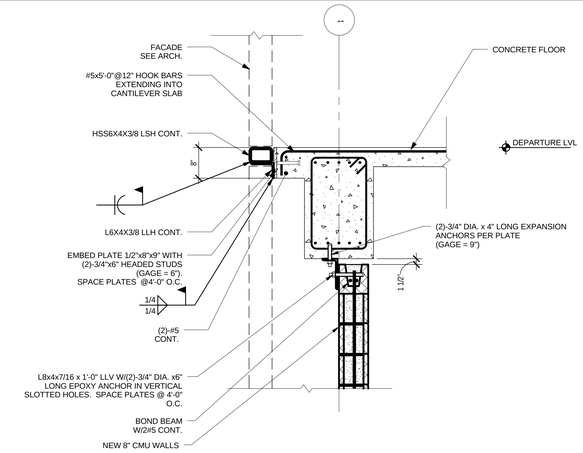
4/14/2015 6:30:41 PM



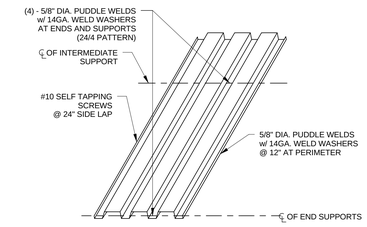
4 TYPICAL TRANSFER COLUMN BASE CONNECTION
1" = 1'-0"



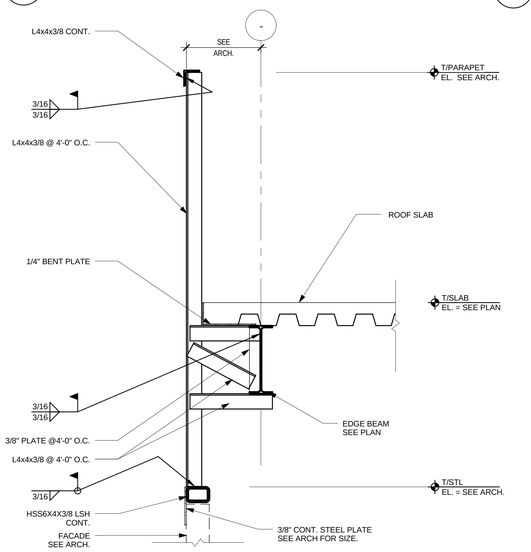
3 DETAIL AT SLAB EDGE AT JET BRIDGE
3/4" = 1'-0"



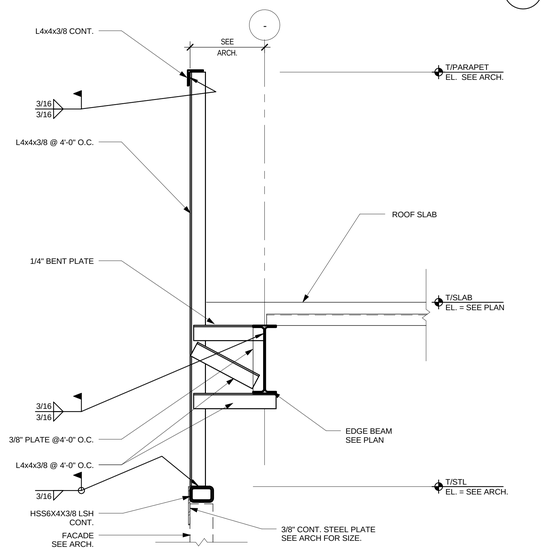
2 DETAIL AT SLAB EDGE
3/4" = 1'-0"



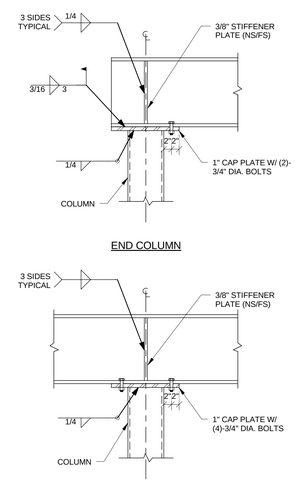
1 TYPICAL ROOF DECK ATTACHMENT FOR TYPE "N" ROOF DECK
1 1/2" = 1'-0"



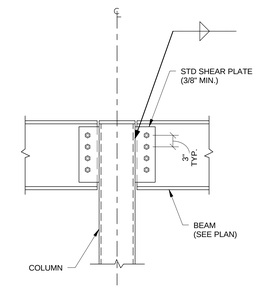
8 TYPICAL DETAIL 2 AT ROOF EDGE
3/4" = 1'-0"



7 TYPICAL DETAIL AT ROOF EDGE
3/4" = 1'-0"

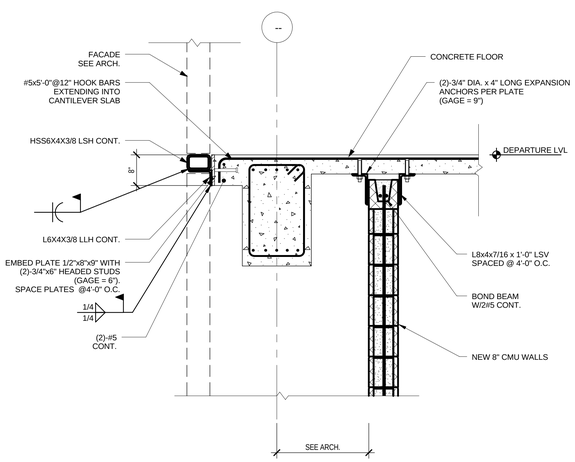


6 CONTINUOUS BEAM-OVER-COLUMN DETAIL
3/4" = 1'-0"

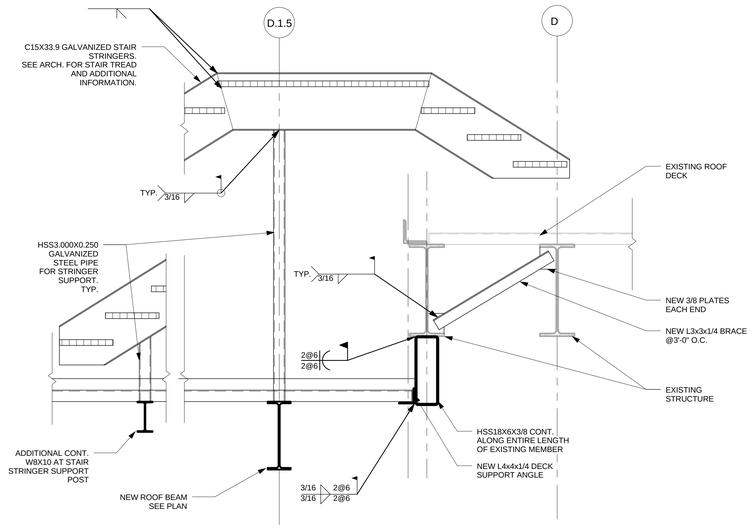


NOTES:
1. FABRICATOR/DETAILER TO DESIGN CONNECTION FOR BEAM REACTIONS SHOWN ON PLAN CONSIDERING ALL APPLICABLE LIMIT STATES SET FORTH IN AISC.

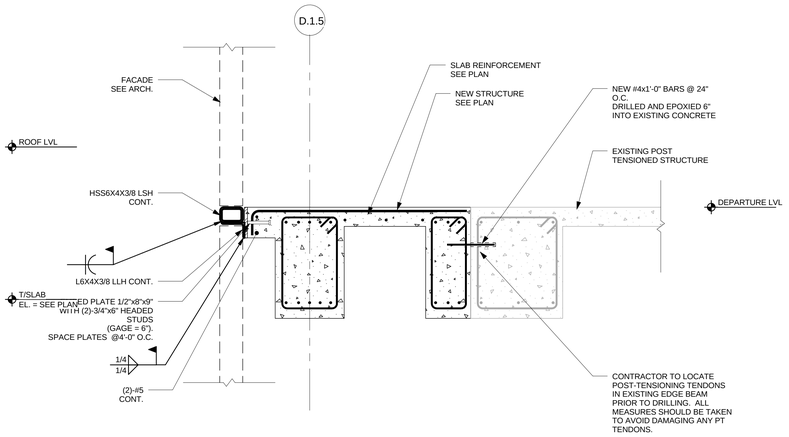
5 TYPICAL BEAM TO HSS COLUMN CONNECTION
3/4" = 1'-0"



12 DETAIL 2 AT SLAB EDGE
3/4" = 1'-0"



10 DETAIL AT EXISTING ROOF-TO-NEW ROOF
3/4" = 1'-0"



9 DETAIL AT EXISTING SLAB-TO-NEW SLAB AT DEPARTURE LVL
3/4" = 1'-0"

4/14/2015 6:30:59 PM

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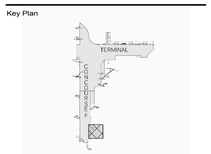
Key Plan



Professional Seals

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: RQ Reviewed by: MK

Project No:

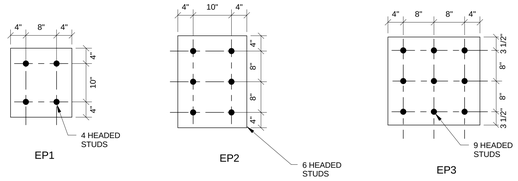
Sheet Title

SUPERSTRUCTURE TYPICAL DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

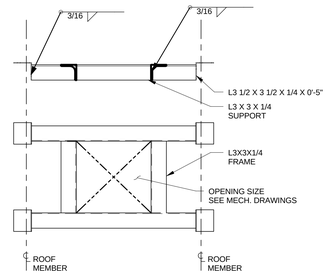
S401



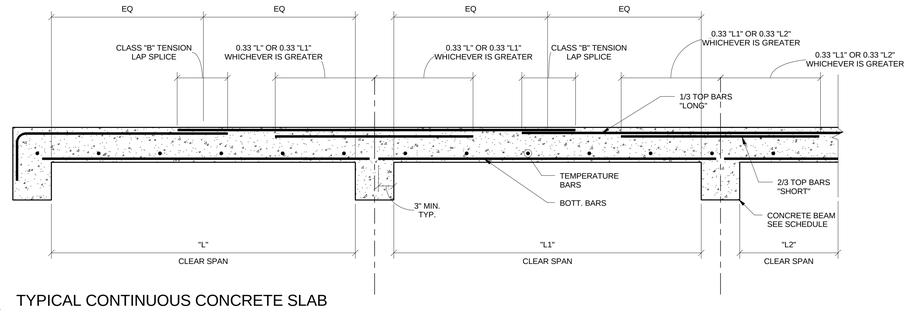
NOTES:

1. STUD ANCHORS TO BE 3/4" DIAMETER x 9" LONG.
2. ALL EMBED PLATES ARE 3/4" THICK. U.N.O.
3. SEE DETAILS AND PLANS FOR REQUIRED LOCATIONS OF EMBEDDED ITEMS. EMBEDDED ITEMS NOT CALLED OUT ON THE DRAWINGS ARE NOT USED IN THIS PROJECT.

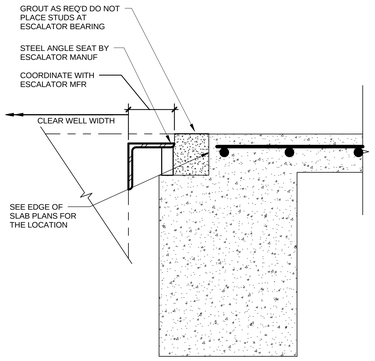
4 EMBED PLATE SCHEDULE
3/4" = 1'-0"



3 TYPICAL OPENING FRAME
1" = 1'-0"

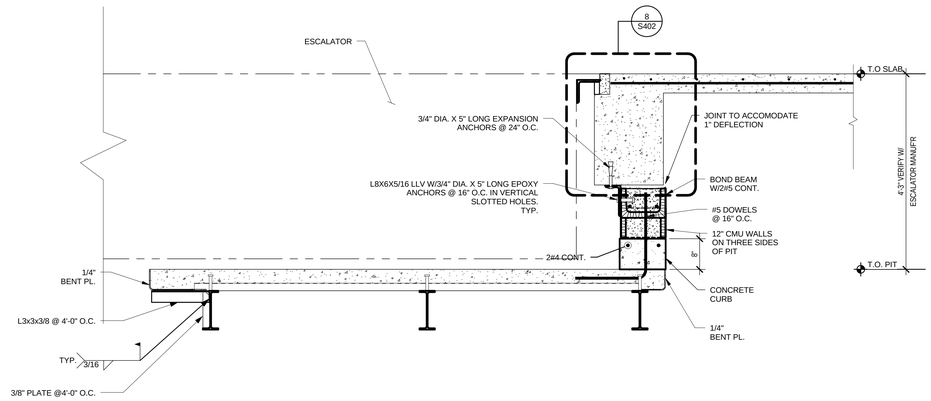


2 TYPICAL CONTINUOUS CONCRETE SLAB REINFORCEMENT
1" = 1'-0"

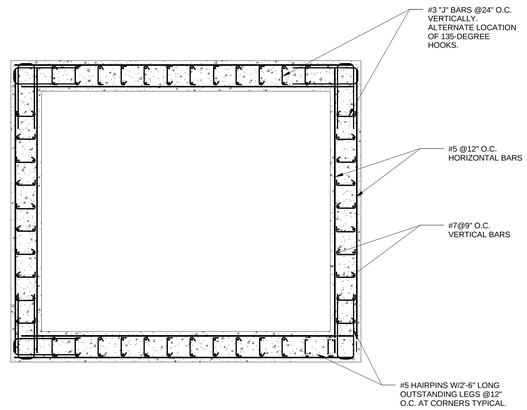


NOTE:
GC TO COORDINATE LOCATION OF ESCALATOR BEARING WITH ESCALATOR SUPPLIER.

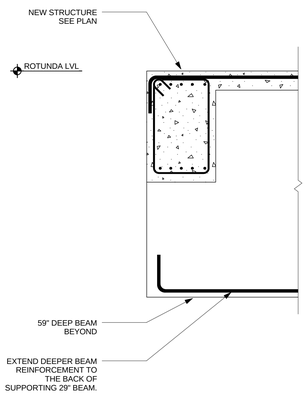
8 TYPICAL ESCALATOR BEARING AT BEAM
1 1/2" = 1'-0"



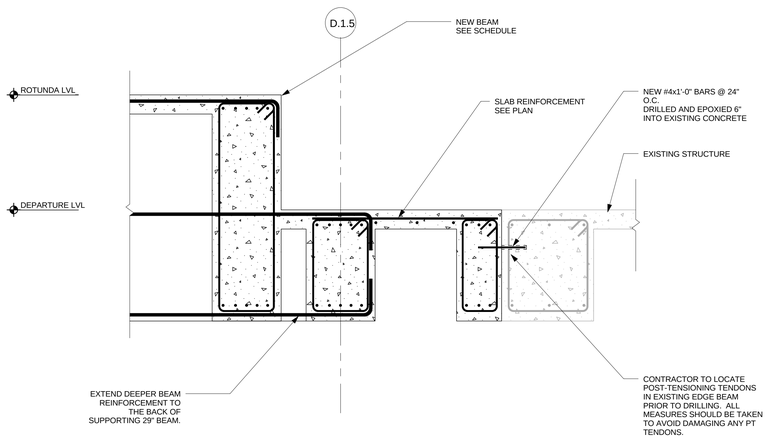
7 SECTION AT ESCALATOR PIT
3/4" = 1'-0"



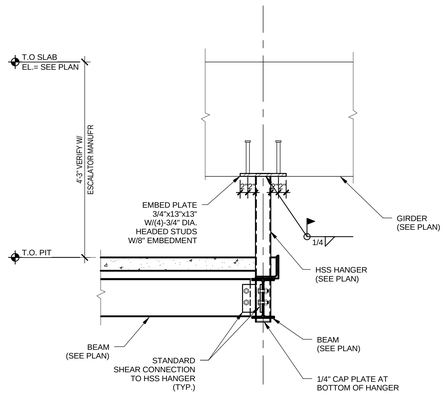
5 TYPICAL CONCRETE WALL REINFORCEMENT
1/2" = 1'-0"



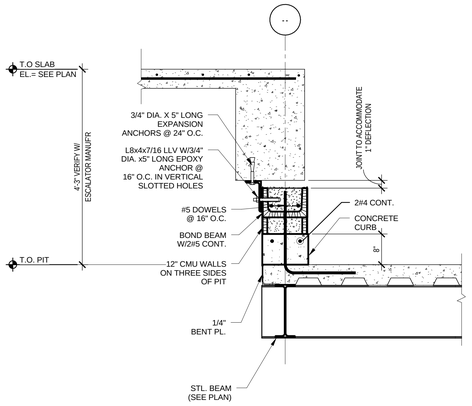
12 DEEP BEAM TO SHALLOW BEAM DETAIL
3/4" = 1'-0"



11 DETAIL AT STEP AT DEPARTURE LVL
3/4" = 1'-0"



10 DETAIL AT ESCALATOR PIT HANGER
3/4" = 1'-0"



9 TRANSVERSE SECTION AT ESCALATOR PIT
3/4" = 1'-0"

4/14/2015 6:31:15 PM

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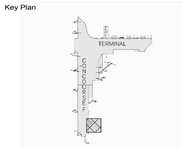
Key Plan



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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: RQ Reviewed by: MK

Project No:

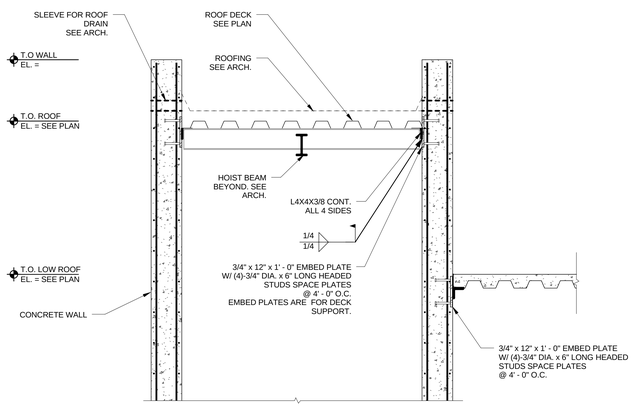
Sheet Title

SUPERSTRUCTURE DETAILS

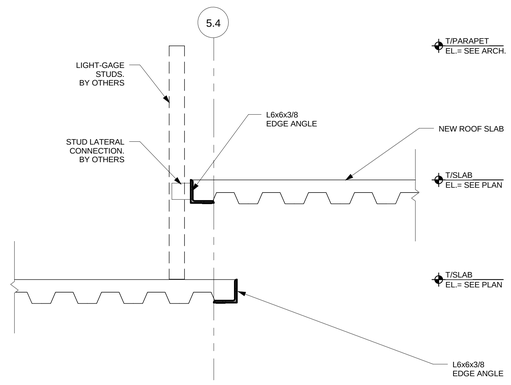
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

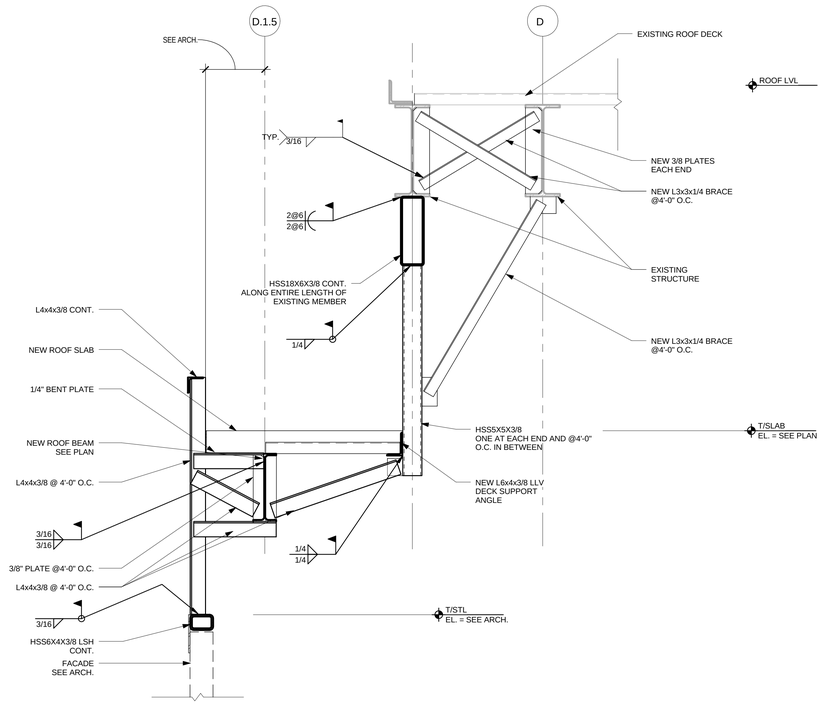
S402



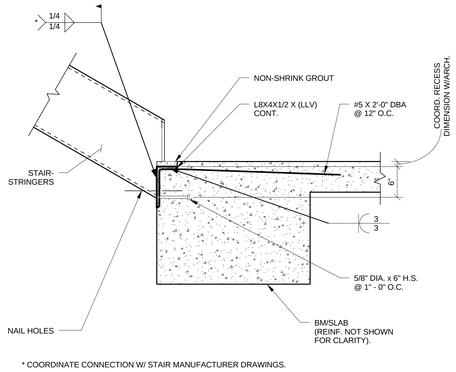
4 SECTION AT ELEVATOR LID
1/2" = 1'-0"



3 DETAIL AT ROOF STEP
3/4" = 1'-0"

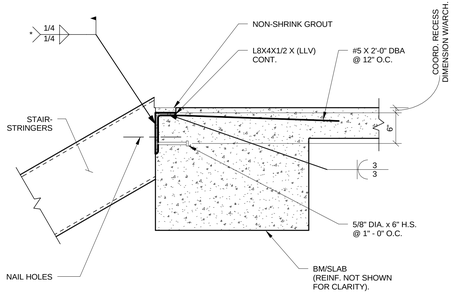


1 DETAIL 2 AT EXISTING ROOF-TO-NEW ROOF
3/4" = 1'-0"



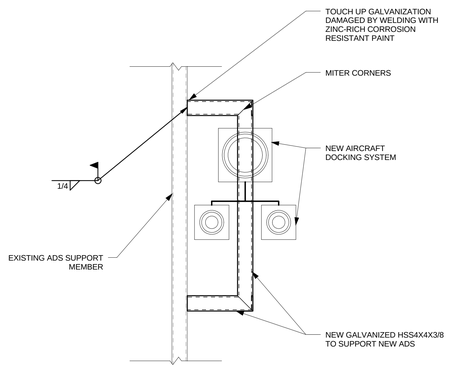
* COORDINATE CONNECTION W/ STAIR MANUFACTURER DRAWINGS.

9 TYPICAL STAIR DETAIL AT FLOOR BEAM UP
1" = 1'-0"

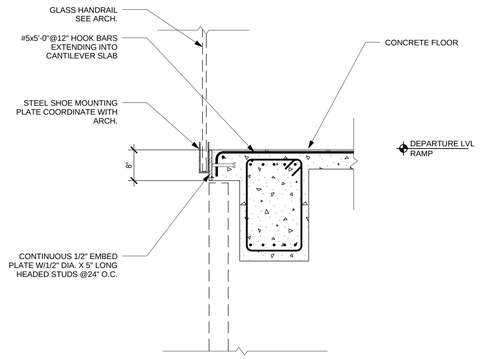


* COORDINATE CONNECTION W/ STAIR MANUFACTURER DRAWINGS.

8 TYPICAL STAIR DETAIL AT FLOOR BEAM DOWN
1" = 1'-0"



7 DETAIL AT AIRCRAFT DOCKING SYSTEM (ADS)
3/4" = 1'-0"



11 DETAIL AT GLASS HANDRAIL
3/4" = 1'-0"

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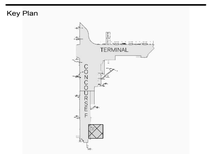

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: RQ Reviewed by: MK

Project No:

Sheet Title

SUPERSTRUCTURE DETAILS

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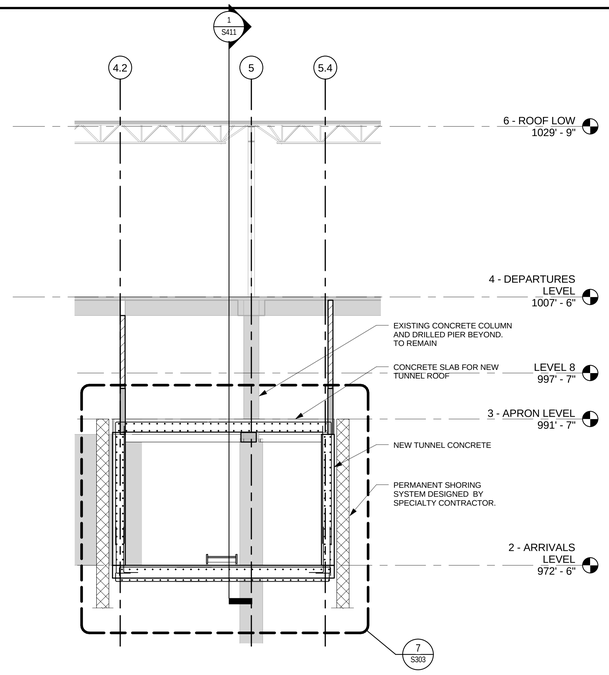
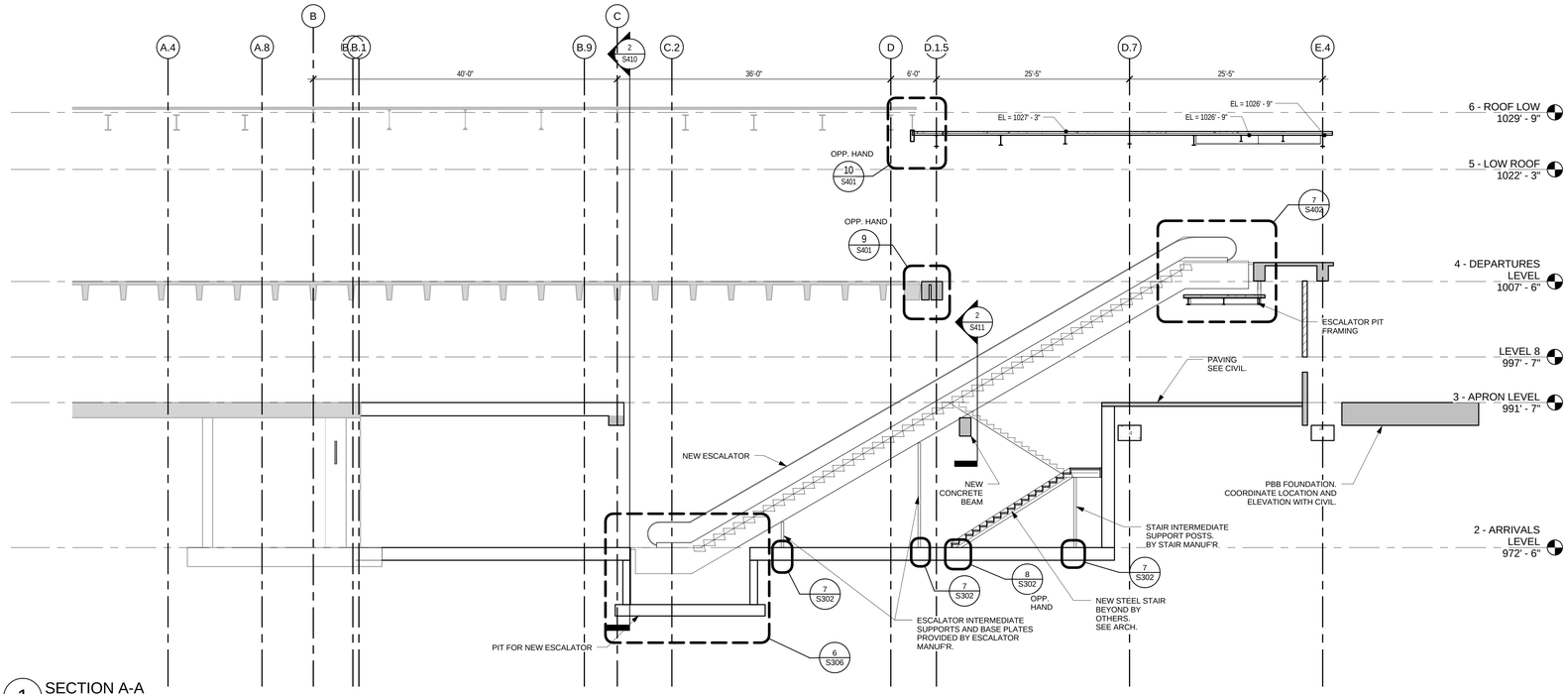
Sheet Number

S403

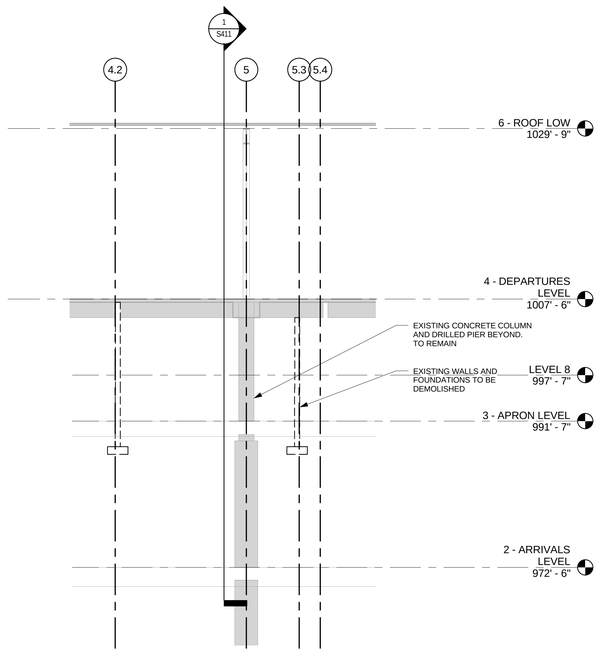
4/14/2015 6:31:29 PM



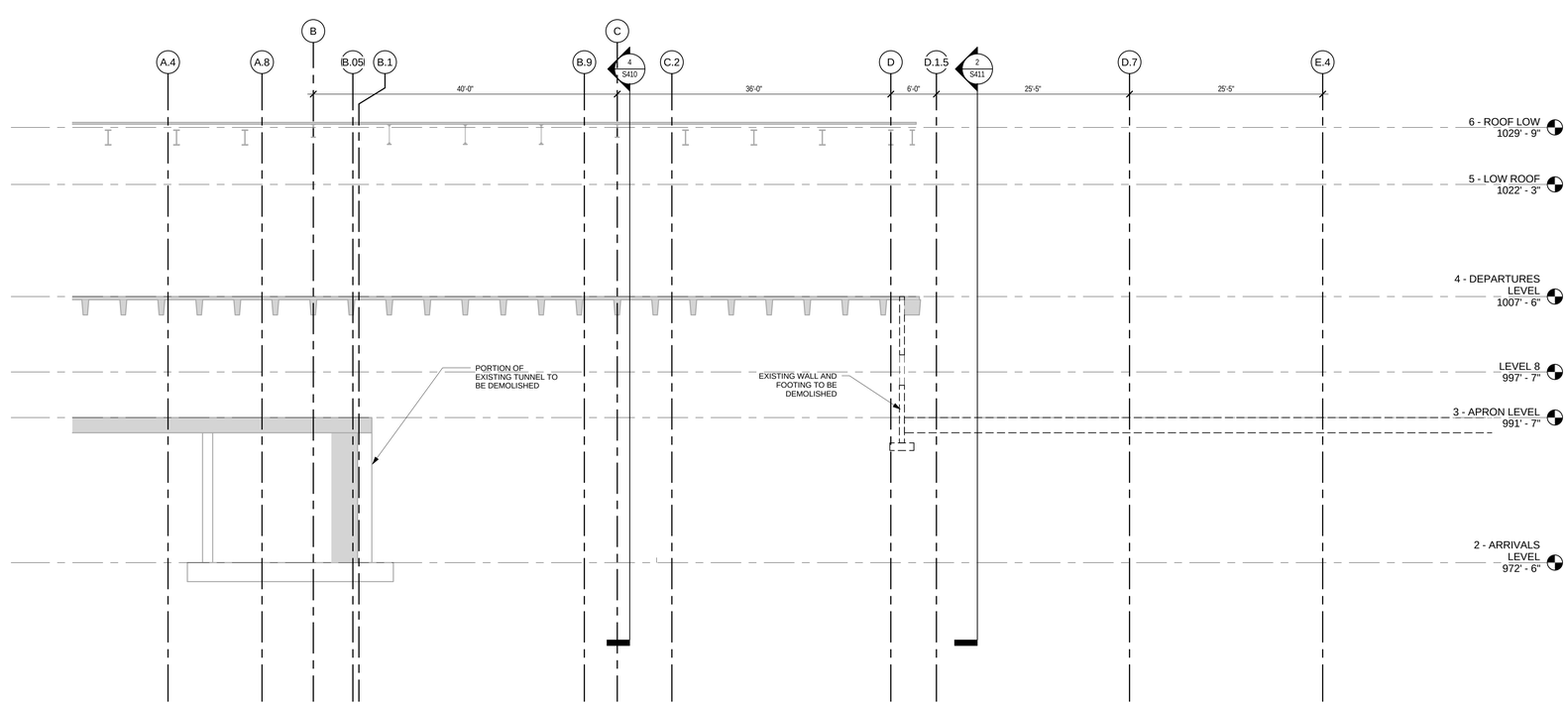
2 SECTION B-B
1/8" = 1'-0"



1 SECTION A-A
1/8" = 1'-0"



4 SECTION B-B (DEMO)
1/8" = 1'-0"



3 SECTION A-A (DEMO)
1/8" = 1'-0"

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CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p
Hartsfield Jackson + Partnership
191 Peachtree Street, NE
Suite 2250
Atlanta, GA 30303
Phone: 404-439-9000

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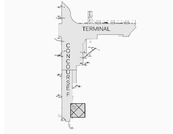
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

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Reviewed by: MK

Project No:

Sheet Title

BUILDING SECTIONS

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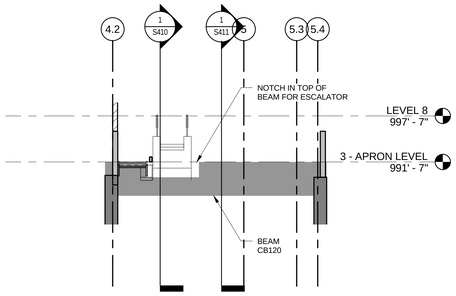
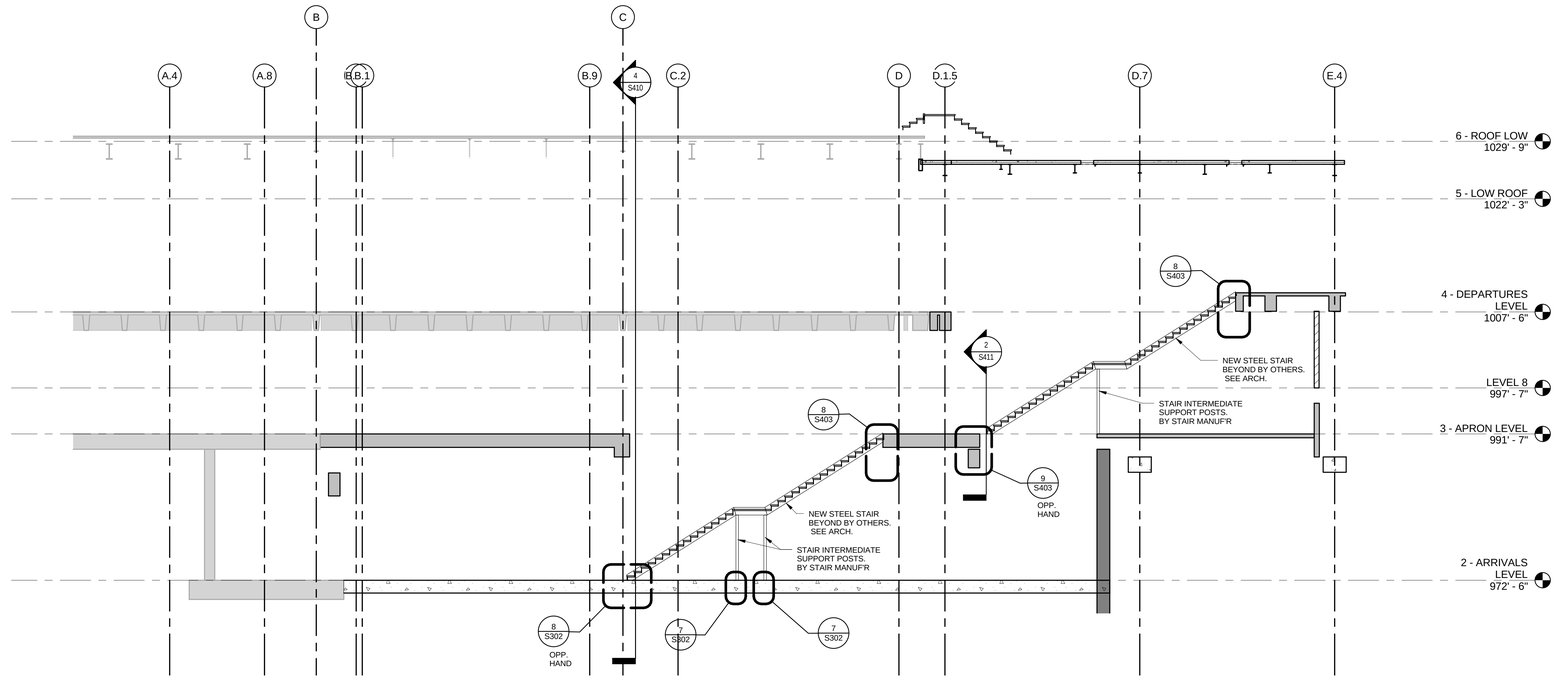
Sheet Number

S410



2 SECTION B-B1

1/8" = 1'-0"



1 SECTION THRU STAIR

1/8" = 1'-0"

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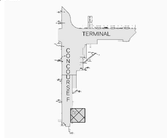

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BUILDING SECTIONS

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S411

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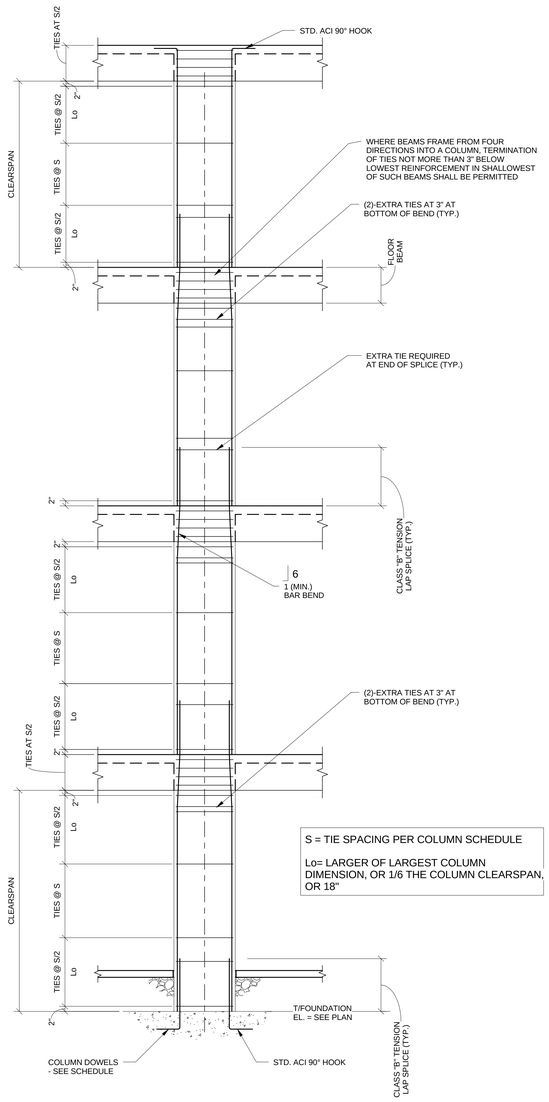


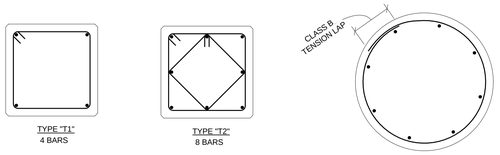
8 TYPICAL COLUMN REINFORCING DIAGRAM
1/2" = 1'-0"

COLUMN SCHEDULE

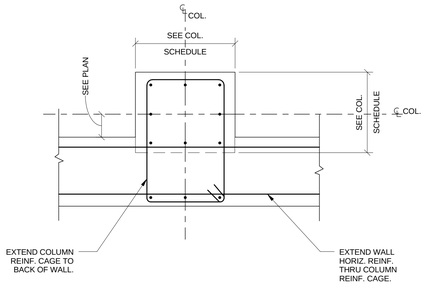
LEVEL	COLUMN GRID / LOCATION	D.1.5-4.2	D.1.5-5.4	D.1.5-6.2	COL18x18	D.7-4.2	E.4-4.2 E.4-5.3		
LOW ROOF									
EL.= BOARDING LEVEL		HSS10x0.375	HSS10x0.375	HSS10x0.375			HSS10x0.375		
EL.= APRON LEVEL	COLUMN SIZE	18" DIAMETER	18"x18"	18" DIAMETER		18" DIAMETER	18" DIAMETER		
	VERTICAL REINF.	8#8	8#8	8#8		8#8	8#8		
	TIES	#4@12"	#4@12"	#4@12"		#4@12"	#4@12"		
	TIE DETAIL	T3	T2	T3		T3	T3		
	CONC. STRENGTH	5.0 ksi*	5.0 ksi	5.0 ksi*		5.0 ksi*	5.0 ksi*		
EL.= ARRIVALS LEVEL	COLUMN SIZE	18" DIAMETER	18"x18"		18"x18"	18" DIAMETER			
	VERTICAL REINF.	8#9	8#9		8#9	8#9			
	TIES	#3@12"	#4@12"		#4@12"	#3@12"			
	TIE DETAIL	T3	T2		T2	T3			
	CONC. STRENGTH	5.0 ksi*	5.0 ksi		5.0 ksi	5.0 ksi*			
EL.=	COLUMN DOWELS	8#9	8#9	8#9	8#9	8#9	8#9		
REMARKS		*USE SELF-CONSOLIDATING CONCRETE, E.G. AGILIA MIX FOR THIS COLUMN		*USE SELF-CONSOLIDATING CONCRETE, E.G. AGILIA MIX FOR THIS COLUMN		*USE SELF-CONSOLIDATING CONCRETE, E.G. AGILIA MIX FOR THIS COLUMN	*USE SELF-CONSOLIDATING CONCRETE, E.G. AGILIA MIX FOR THIS COLUMN		

NOTES:
1. SEE DETAILS 8 & 12/S701 FOR TYPICAL COLUMN TIE AND REINFORCING DIAGRAMS.
2. EQUALLY SPACE COLUMN VERTICAL BARS ALONG EACH FACE, U.N.O.
3. PROVIDE COLUMN SPLICE LENGTH BASED ON LARGER BAR.
4. ALL COLUMN REINFORCING TO BE GRADE 60 ksi.
5. SEE DETAIL 10/S301 FOR STEEL COLUMN BASE PLATE SCHEDULE.

6 COLUMN SCHEDULE
1" = 1'-0"



12 TYPICAL COLUMN TIE DETAILS
3/4" = 1'-0"



NOTES:
1. CAST WALLS MONOLICALLY WITH COLUMNS.

10 TYPICAL DETAIL AT COLUMN-TO-WALL PILASTER
3/4" = 1'-0"

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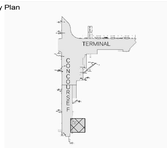

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Drawn by: RQ Reviewed by: MK

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Sheet Title

COLUMN SCHEDULE AND DETAILS

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Sheet Number

S501

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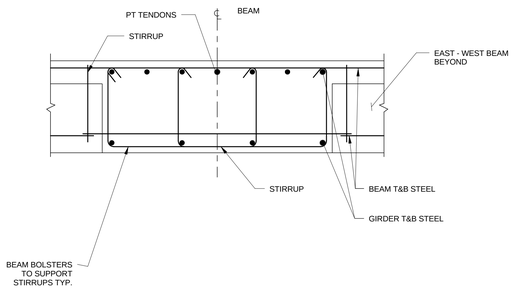
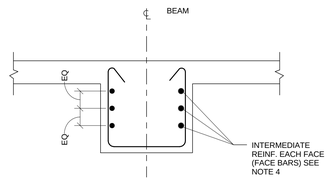


TYP BEAM LAYERING DETAIL



FACE BAR REINFORCING

1 TYPICAL CONCRETE BEAM DIAGRAM DETAIL 1

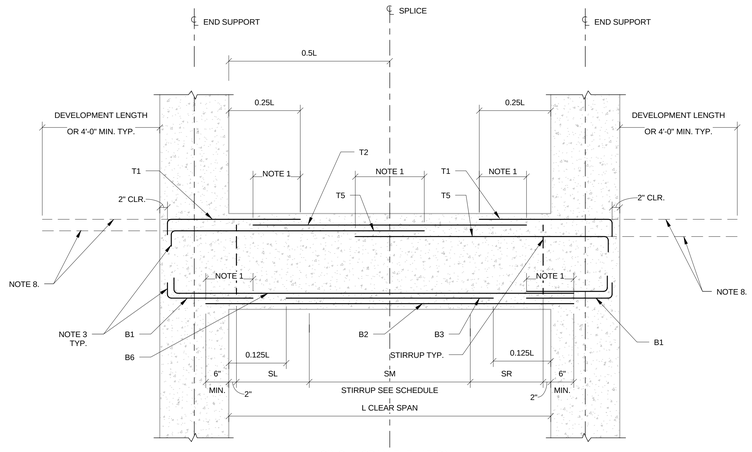
3/4" = 1'-0"

SCHEDULE NOTES

1. CLASS "B" TENSION LAP SPLICE PER ACI 318
2. WHICHEVER IS THE GREATER OF THE TWO VALUES.
3. PROVIDE ACI STANDARD 90 & 180 DEG HOOKS FOR LONGITIONAL BARS AND 135 DEG HOOKS FOR STIRRIPS.
4. FACE BARS NOT SHOWN IN ELEVATION FOR CLARITY. FACE BARS TO BE CONTINUOUS - PROVIDE CLASS "B" TENSION LAP SPLICES.
5. IF "T1" AND "T2" BARS, OR "T2" AND "T3" ARE THE SAME SIZE AND SAME NUMBER, CONTRACTORS HAS THE OPTION OF DETAILING ONE LONG BAR.
6. SUPPORT BARS NOT SHOWN. PROVIDE AS REQUIRED.
7. BEAMS SHALL BE ASSUMED TO BE SUPPORTED, UNLESS NOTED OTHERWISE.
8. WHERE SLAB EXISTS, EXTEND "T1" AND "T5" BARS INTO SLAB AS SHOWN, IN LIEU OF STANDARD HOOKS AT SUPPORT.

BEAM TYPES

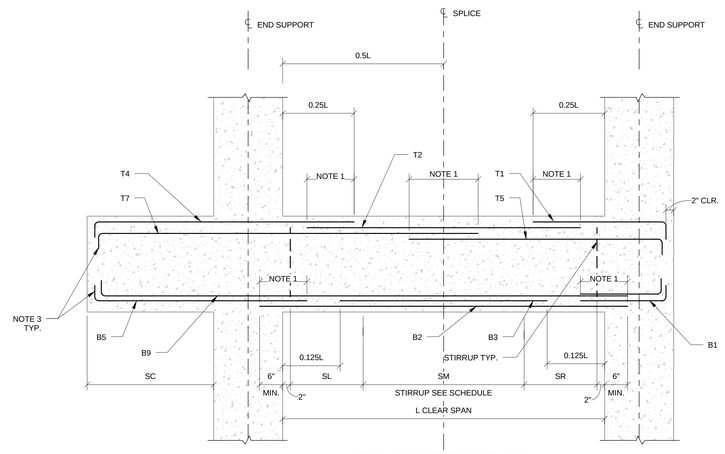
TYPE	DESCRIPTION
LE	LEFT END - START BEAM
I	INTERIOR BEAM
RE	RIGHT END - END BEAM
S	SINGLE SPAN BEAM
LC	LEFT CANTILEVER - START BEAM
RC	RIGHT CANTILEVER - END BEAM



SINGLE SPAN ELEVATION
(BEAM TYPE "S")

2 (SINGLE SPAN) CONCRETE BEAM DIAGRAM

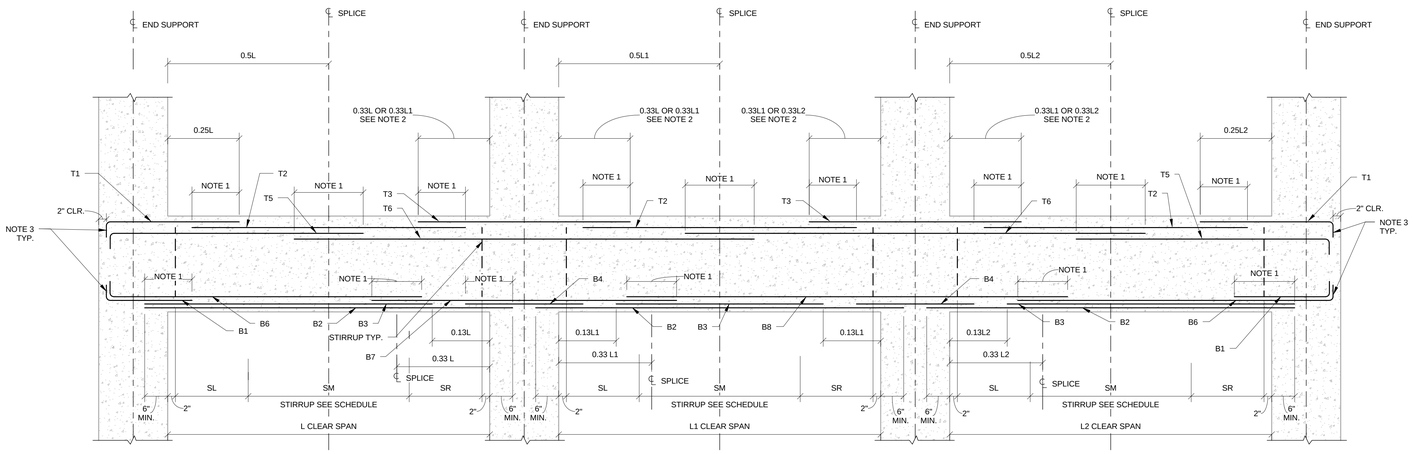
3/4" = 1'-0"



LEFT CANTILEVER BEAM ELEVATION
(BEAM TYPE "LC")

3 LEFT CANTILEVER CONCRETE BEAM DIAGRAM

3/4" = 1'-0"



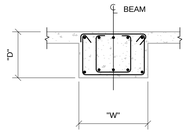
LEFT END BEAM ELEVATION
(BEAM TYPE "LE")

INTERIOR BEAM ELEVATION
(BEAM TYPE "I")

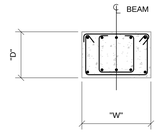
RIGHT END BEAM ELEVATION
(BEAM TYPE "RE")

5 CONCRETE BEAM DIAGRAM

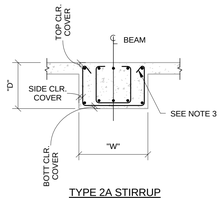
3/4" = 1'-0"



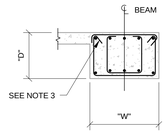
TYPE 2B STIRRUP
INTERIOR BEAM



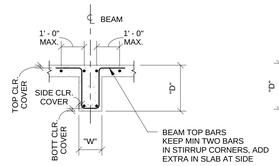
TYPE 2D STIRRUP
(BEAM WITHOUT SLAB)



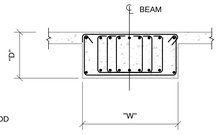
TYPE 2A STIRRUP
INTERIOR BEAM



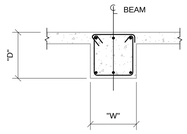
TYPE 2C STIRRUP
(SPANDREL BEAM)



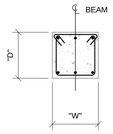
TYPE 1E STIRRUP
(INTERIOR BEAM)



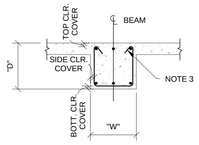
TYPE 4B STIRRUP
INTERIOR BEAM



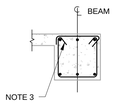
TYPE 1B STIRRUP
INTERIOR BEAM



TYPE 1D STIRRUP
(BEAM WITHOUT SLAB)



TYPE 1A STIRRUP
INTERIOR BEAM



TYPE 1C STIRRUP
(SPANDREL BEAM)

4 STIRRUP TYPES 1

3/8" = 1'-0"

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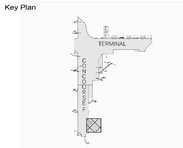

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Drawn by: RQ Reviewed by: MK

Project No:

Sheet Title

BEAM SCHEDULE AND DETAILS

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Sheet Number

S601

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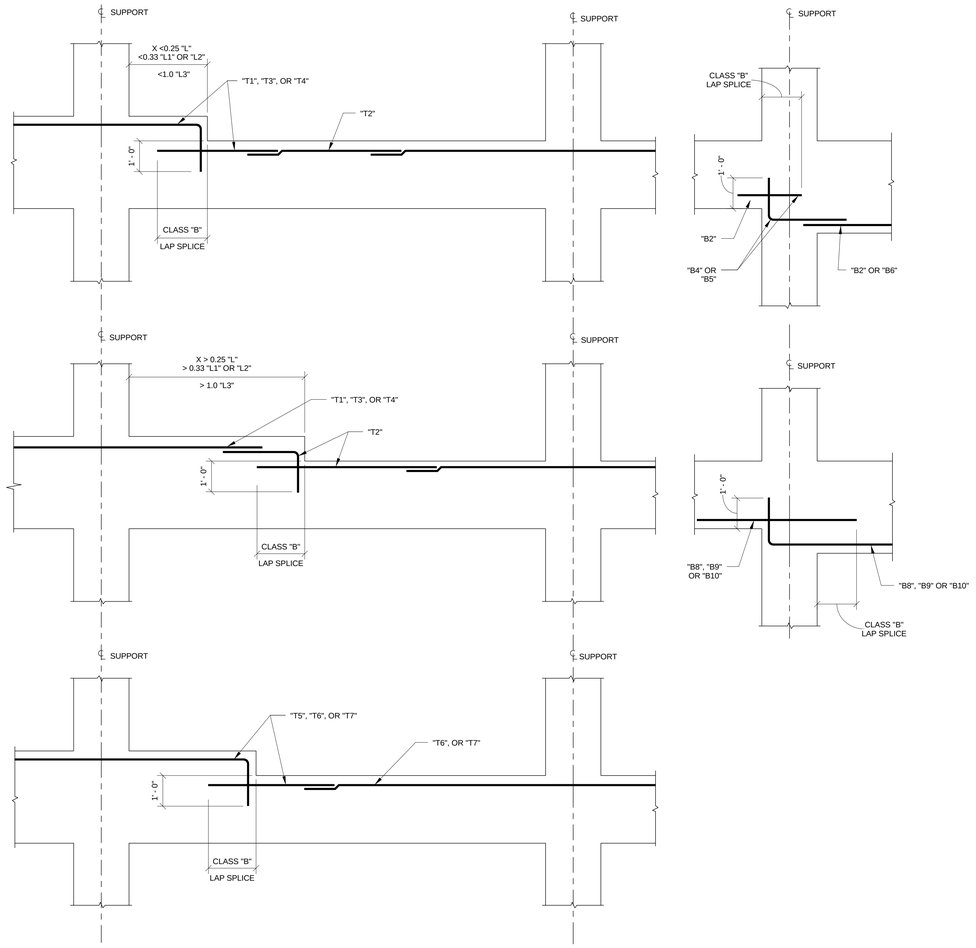
CONCRETE BEAM SCHEDULE

SEE SHEETS S601 FOR TYPICAL CONCRETE BEAM DETAILS

BEAM MARK	BEAM SIZE (INCHES) WIDTH "W"	BEAM SIZE (INCHES) DEPTH "D"	BEAM TYPE	TOP BARS "T1"	"T2"	"T3"	"T4"	"T5"	"T6"	"T7"	BOTTOM BARS "B1"	"B2"	"B3"	"B4"	"B5"	"B6"	"B7"	"B8"	"B9"	FACE BARS (E.F.)	BEAM MARK	STIRRUPS SIZE	TYPE	(SPACING SHOWN IN INCHES) SL	SM	SR	SC	BEAM TYPE	REMARKS
CB101	12	29	S	2#6	2#6	--	--	--	--	--	2#6	2#6	--	--	--	--	--	--	--	--	CB101	3	1A	12	12	12	--	S	
CB102	18	29	S	4#6	2#6	--	--	--	--	--	2#6	3#9	3#9	--	--	--	--	--	--	--	CB102	4	1C	12	12	12	--	S	
CB103	18	29	S	4#8	2#6	--	--	--	--	--	4#8	2#8	2#8	--	--	--	--	--	--	--	CB103	3	1C	12	12	12	--	S	
CB104	18	29/59	S	4#8	4#8	--	--	--	--	--	4#8	3#8	3#9	--	--	--	--	--	--	3#8	CB104	3	1C	12	12	12	--	S	SEE DETAIL 10/S602 FOR BEAM REINFORCEMENT AT STEP IN BEAM.
CB105	18	29	S	4#6	4#6	--	--	--	--	--	2#6	3#8	2#9	--	--	--	--	--	--	--	CB105	3	1C	12	12	12	--	S	
CB106	18	29	LE	--	--	--	--	4#8	4#8	--	--	--	--	--	--	4#8	4#8	--	--	--	CB106	3	1C	12	12	12	--	LE	
CB107	18	29	RE	--	--	--	--	4#8	--	--	--	2#8	--	--	--	4#8	--	--	--	--	CB107	3	1C	12	12	12	--	RE	
CB108	18	29	LE	--	--	--	--	3#8	3#8	--	--	--	--	--	--	3#8	3#8	--	--	--	CB108	3	1C	12	12	12	--	LE	
CB109	18	29	RE	--	--	--	--	3#8	--	--	--	3#10	--	--	--	3#8	--	--	--	--	CB109	3	1C	12	12	12	--	RE	PROVIDE 3#8 "T5" AND 3#8 "B6" ADDITIONAL BARS AT LEFT END OF BEAM EXTENDED AND HOOKED INTO SUPPORT CONCRETE WALL.
CB110	12	29	LE	--	--	--	--	3#8	3#8	--	--	--	--	--	--	3#8	3#8	--	--	--	CB110	3	1C	12	12	12	--	LE	
CB111	12	29	RE	--	--	--	--	3#8	--	--	--	--	--	--	--	3#8	--	--	--	--	CB111	3	1C	12	12	12	--	RE	
CB112	18	29	LE	--	--	--	--	4#8	4#8	--	--	2#8	--	--	--	4#8	4#8	--	--	--	CB112	3	1C	12	12	12	--	LE	
CB113	18	29	RE	--	--	--	--	4#8	--	--	--	--	--	--	--	4#8	--	--	--	--	CB113	3	1C	12	12	12	--	RE	
CB114	18	29	LC	--	--	--	4#6	--	--	--	--	--	--	--	--	--	--	--	4#6	--	CB114	3	1B	--	--	--	6	LC	
CB115	24	36	LE	--	--	--	--	6#10	6#10	--	--	--	--	--	--	6#10	6#10	--	--	4#10	CB115	4	2C	12	12	12	--	LE	
CB116	24	36	RE	--	--	--	--	6#10	--	--	--	--	--	--	--	6#10	--	--	--	4#10	CB116	4	2C	12	12	12	--	RE	
CB117	24	36	LE	--	--	--	--	6#10	6#10	--	--	--	--	--	--	6#10	6#10	--	--	4#10	CB117	4	2C	12	12	12	--	LE	
CB118	24	36	I	--	--	--	--	--	6#10	--	--	--	--	--	--	--	--	6#10	--	4#10	CB118	4	2C	12	12	12	--	I	
CB119	18	29	S	4#6	4#6	--	--	--	--	--	4#6	4#6	--	--	--	--	--	--	--	--	CB119	3	1C	12	12	12	--	S	
CB120	18	53/29/53	S	5#10	5#10	--	--	--	--	--	5#10	5#10	--	--	--	--	--	--	--	2#10	CB120	4	2C	12	12	12	--	S	PLACE BOTTOM BARS IN 2 LAYERS. TOP OF BEAM STEPS DOWN AT WIDTH OF STAIR AND ESCALATOR. BOTTOM OF BEAM REMAINS CONSTANT
CB121	12	59	S	3#8	3#8	--	--	--	--	--	3#8	3#8	--	--	--	--	--	--	--	3#8	CB121	3	1C	12	12	12	--	S	
CB122	18	29/59	S	3#8	3#8	--	--	--	--	--	3#8	3#8	--	--	--	--	--	--	--	3#8	CB122	3	1C	12	12	12	--	S	SEE DETAIL 10/S602 FOR BEAM REINFORCEMENT AT STEP IN BEAM.
CB123	24	36	LE	--	--	--	--	6#10	--	--	--	--	--	--	--	6#10	--	--	--	4#10	CB123	4	2C	12	12	12	--	RE	
CB124	24	24	S	--	--	--	--	5#10	--	--	--	--	--	--	--	5#10	--	--	--	3#10	CB124	4	2C	12	12	12	--	S	
CB125	18	29	LC	--	--	--	--	4#8	--	4#8	--	--	--	--	4#6	--	--	--	4#6	--	CB125	3	1B	12	12	12	6	LC	



10 TYPICAL CONCRETE BEAM STEP DETAILS
1/2" = 1'-0"

4/14/2015 6:32:46 PM

CITY OF ATLANTA, GEORGIA

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"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

Hartsfield Jackson + Partnership
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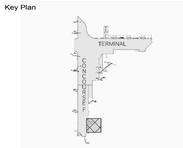
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: RQ Reviewed by: MK

Project No:

Sheet Title

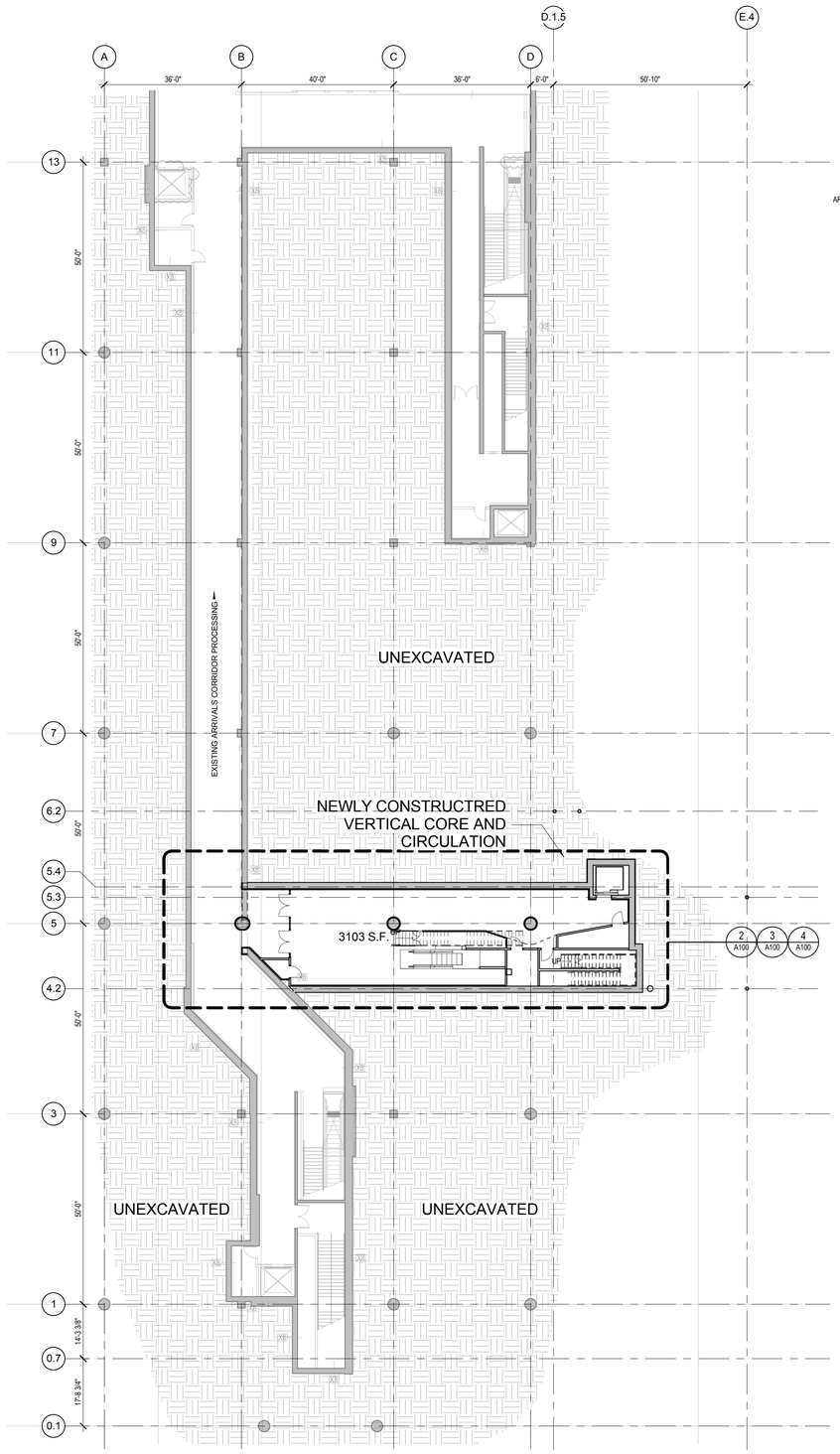
CONCRETE BEAM SCHEDULE

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

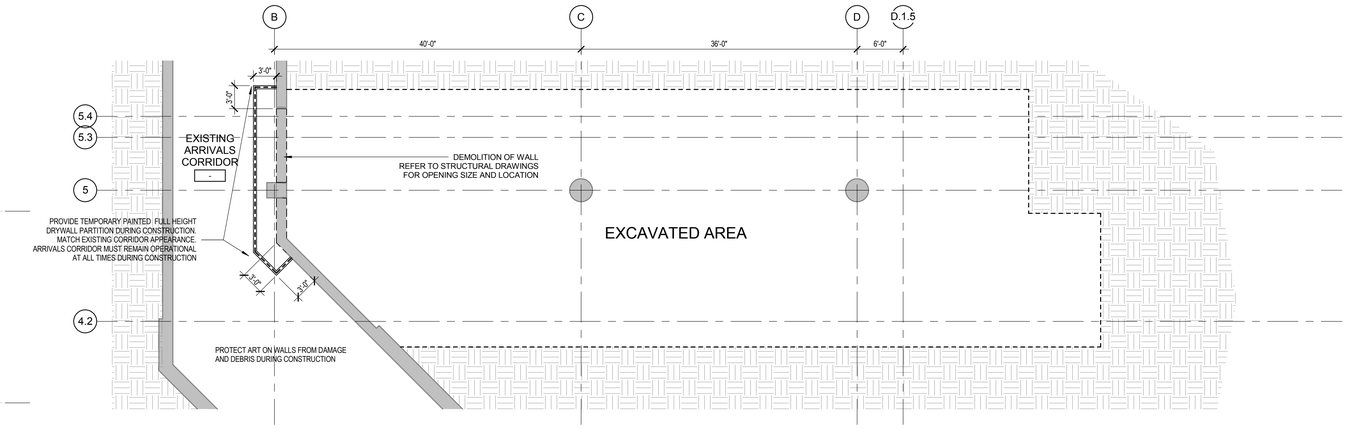
S602

EXISTING FOUNDATION WALL | NEW FOUNDATION WALL | NEW WALL (TYPE VARIES) | TEMPORARY WALL



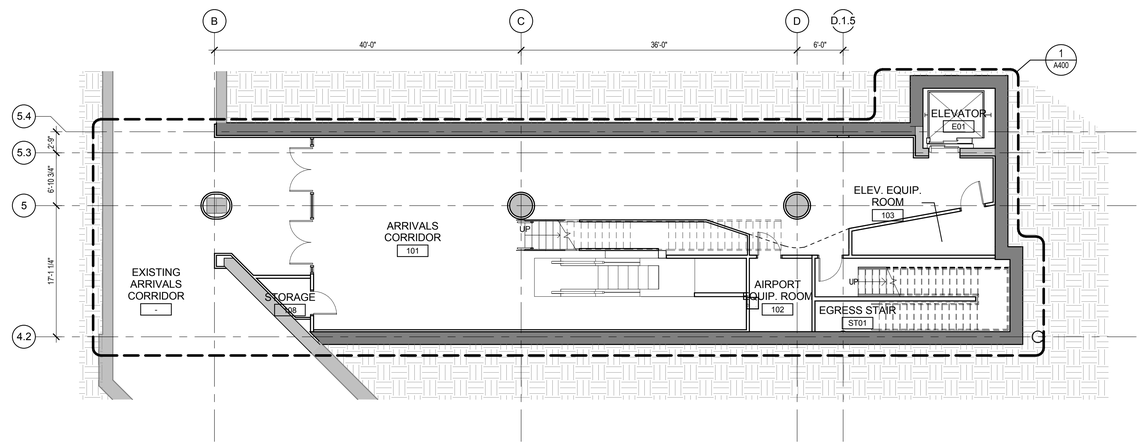
1 OVERALL PLAN - ARRIVALS LEVEL
1/16" = 1'-0"

0 4 8 16 32 FT.



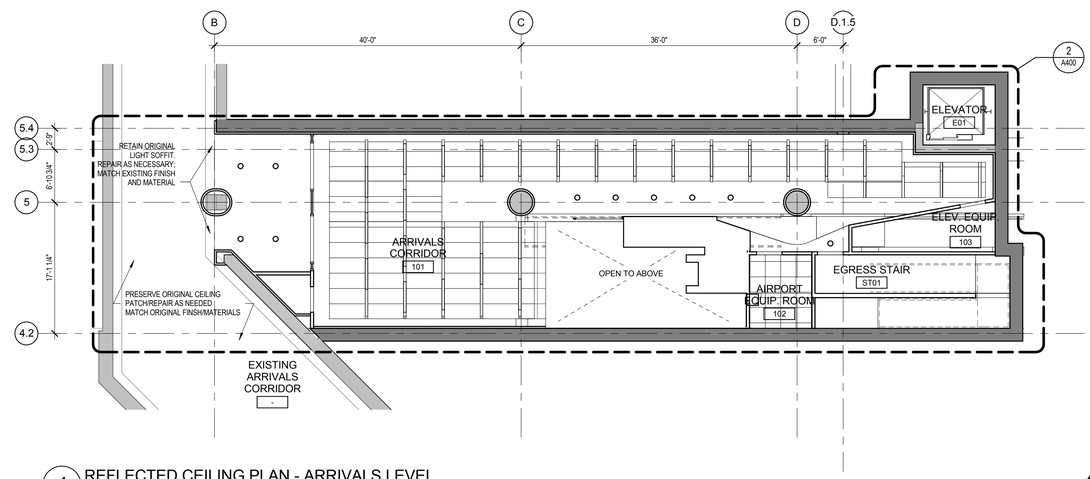
2 DEMOLITION PLAN - ARRIVALS LEVEL
1/8" = 1'-0"

0 2 4 8 16 FT.



3 FLOOR PLAN - ARRIVALS LEVEL
1/8" = 1'-0"

0 2 4 8 16 FT.



4 REFLECTED CEILING PLAN - ARRIVALS LEVEL
1/8" = 1'-0"

0 2 4 8 16 FT.

4/15/2015 10:54:19 PM

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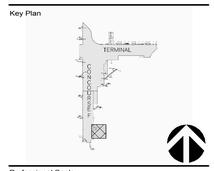
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

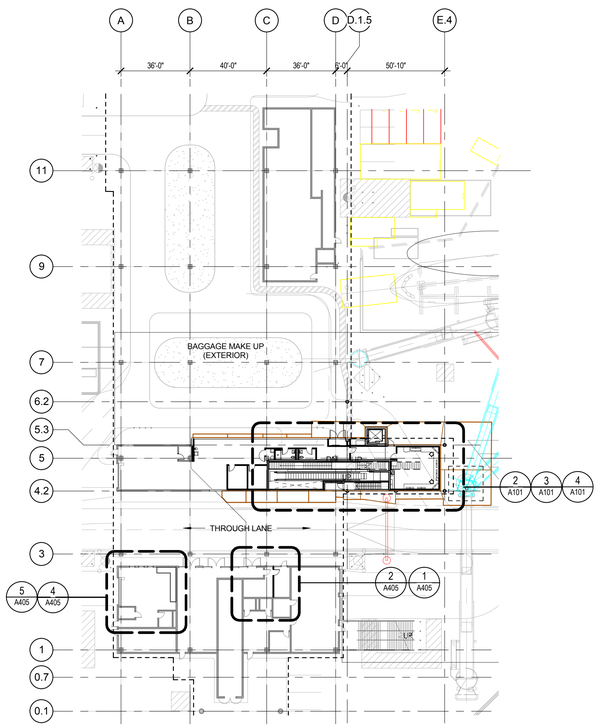
PLANS- DEMO, PROPOSED & REFLECTED CEILING - ARRIVALS LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

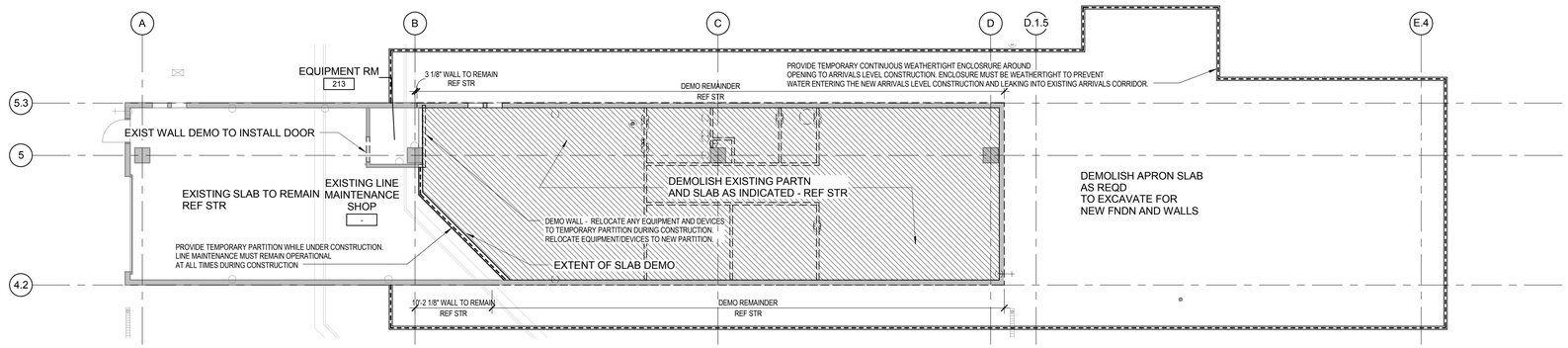
Sheet Number

A100

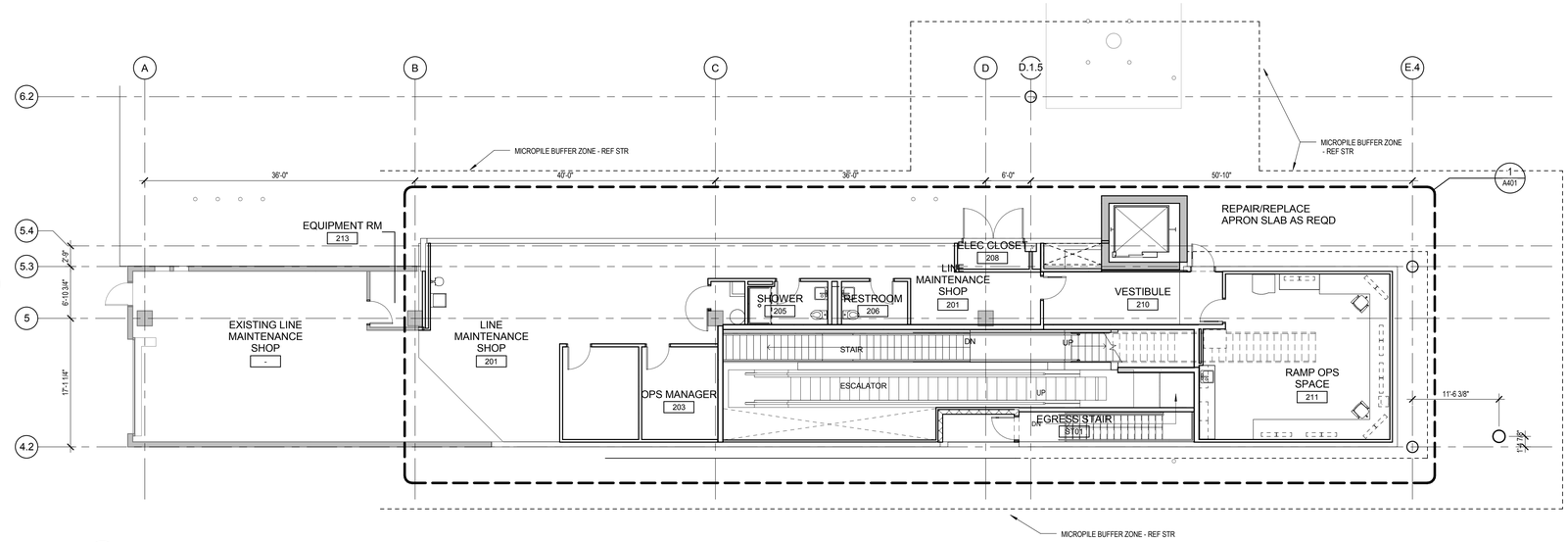
EXISTING FOUNDATION WALL | NEW FOUNDATION WALL | NEW WALL (TYPE VARIES) | TEMPORARY WALL



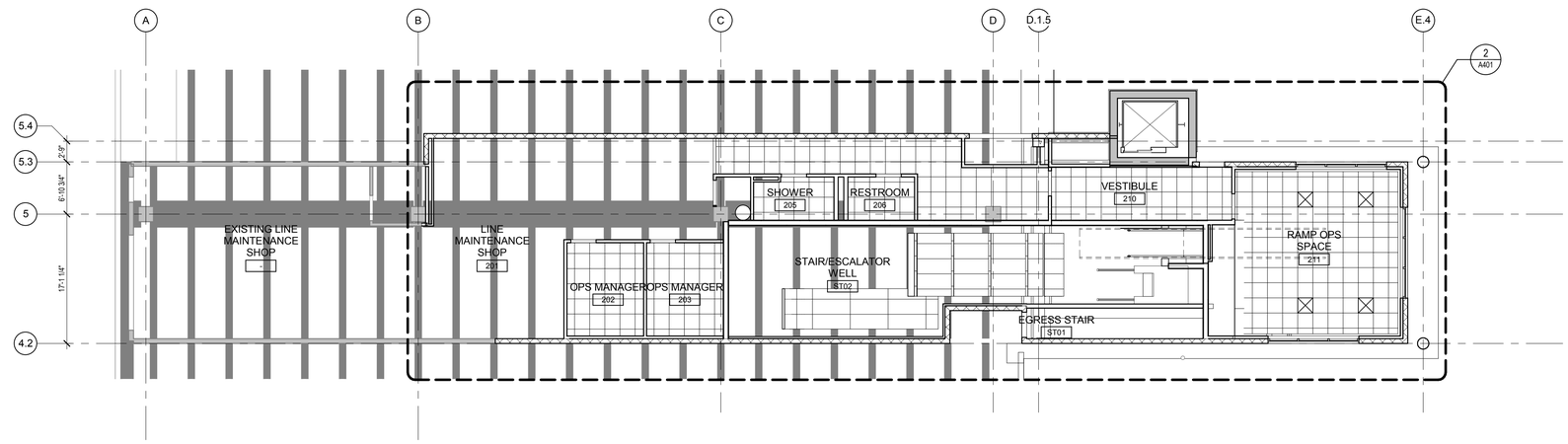
1 OVERALL PLAN - APRON LEVEL
1/32" = 1'-0"



2 DEMOLITION PLAN - APRON LEVEL
1/8" = 1'-0"



3 FLOOR PLAN- APRON LEVEL
1/8" = 1'-0"



4 REFLECTED CEILING PLAN- APRON LEVEL
1/8" = 1'-0"

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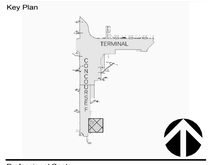
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

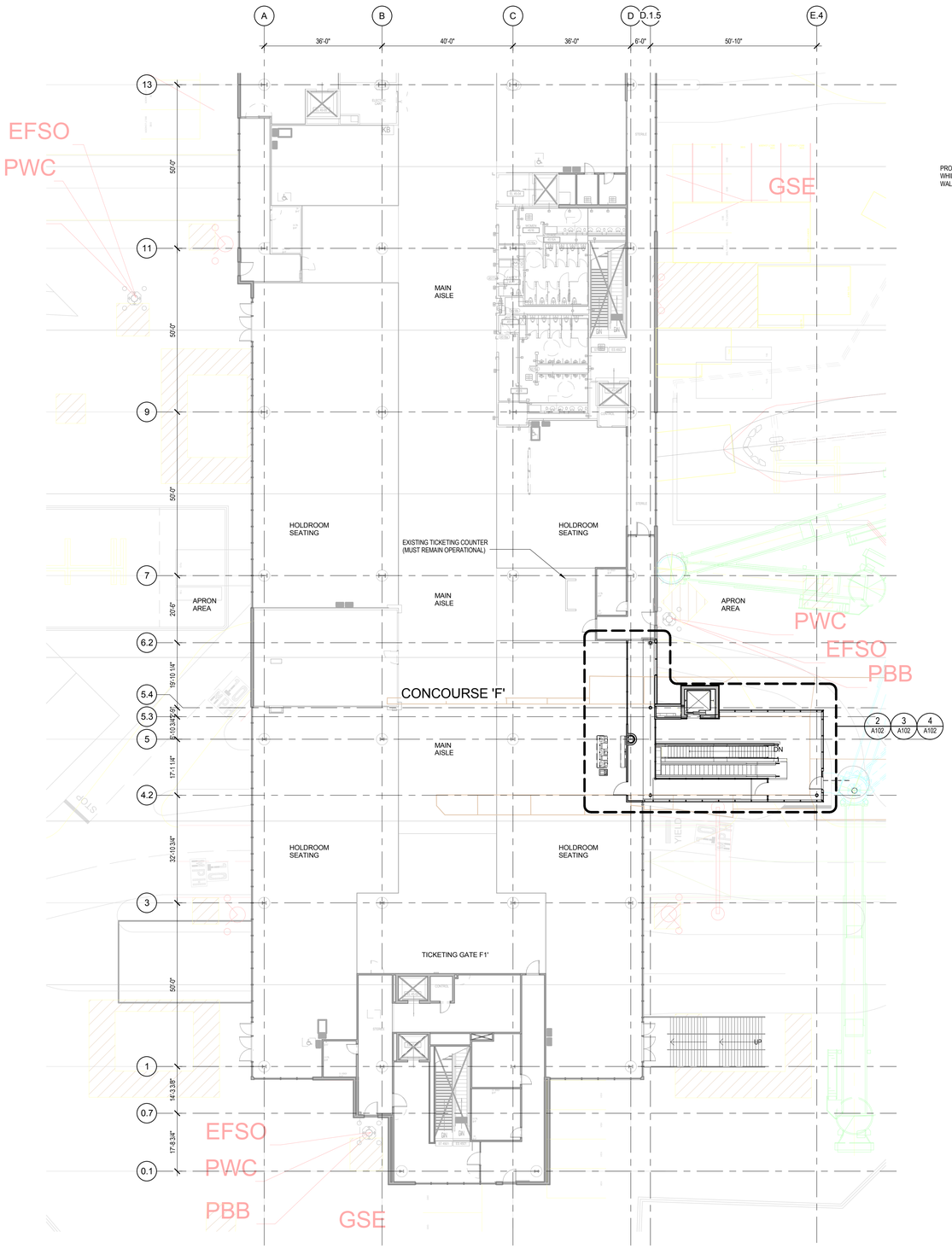
PLANS- DEMO, PROPOSED & REFLECTED CEILING- APRON LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

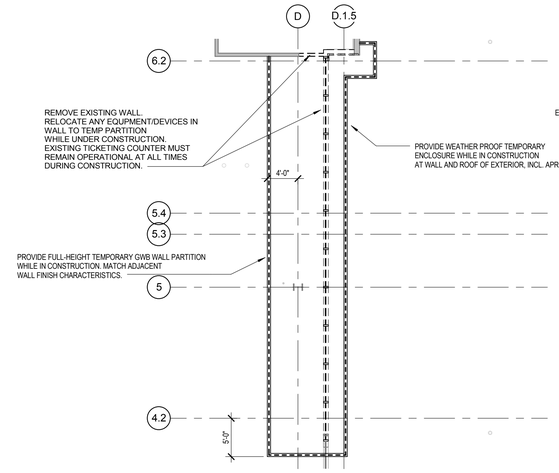
Sheet Number

A101

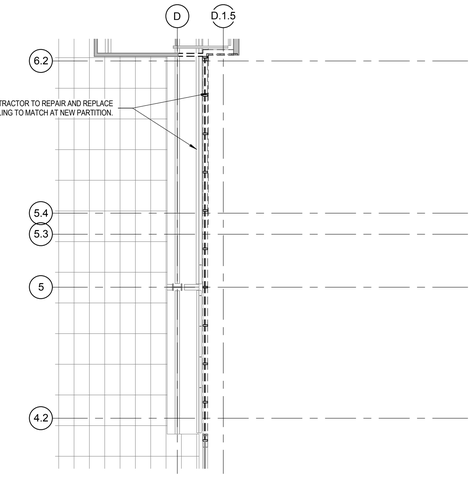
4/15/2015 10:54:33 PM



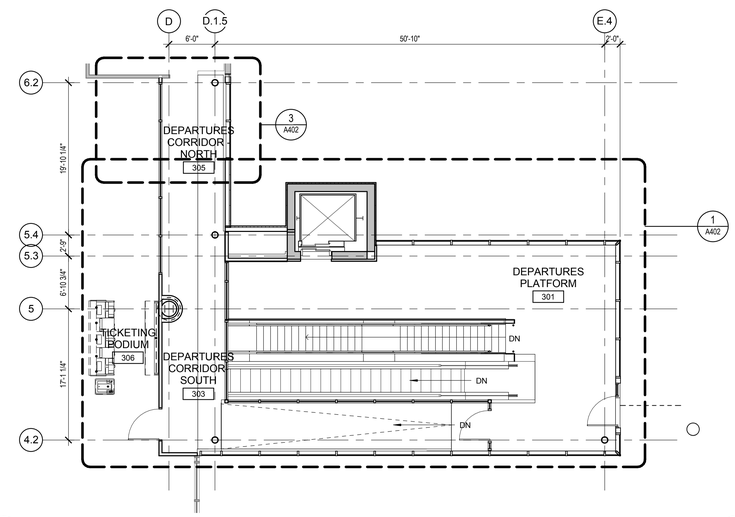
1 OVERALL PLAN - DEPARTURES LEVEL
1/16" = 1'-0"



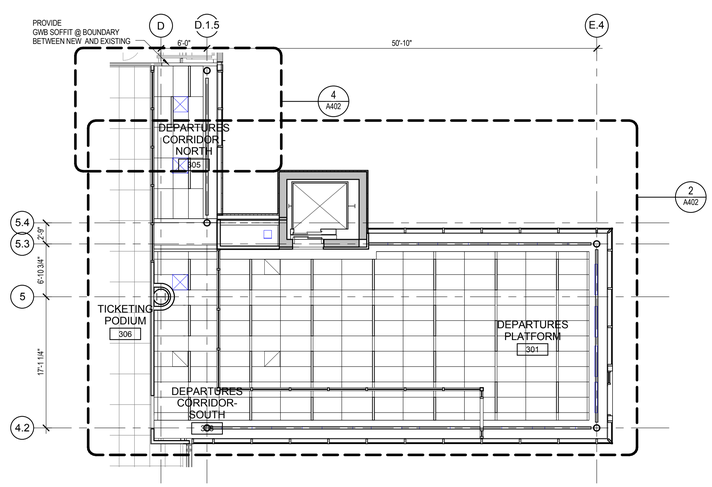
2 DEMOLITION PLAN - DEPARTURES LEVEL
1/8" = 1'-0"



5 REFLECTED CEILING DEMOLITION PLAN - DEPARTURES LEVEL
1/8" = 1'-0"



3 FLOOR PLAN - DEPARTURES LEVEL
1/8" = 1'-0"



4 REFLECTED CEILING PLAN - DEPARTURES LEVEL
1/8" = 1'-0"

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WBS No. D.05.26.001
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TASK ORDER No. : 001

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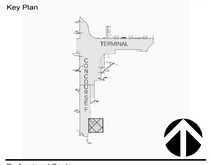
Key Plan



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2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

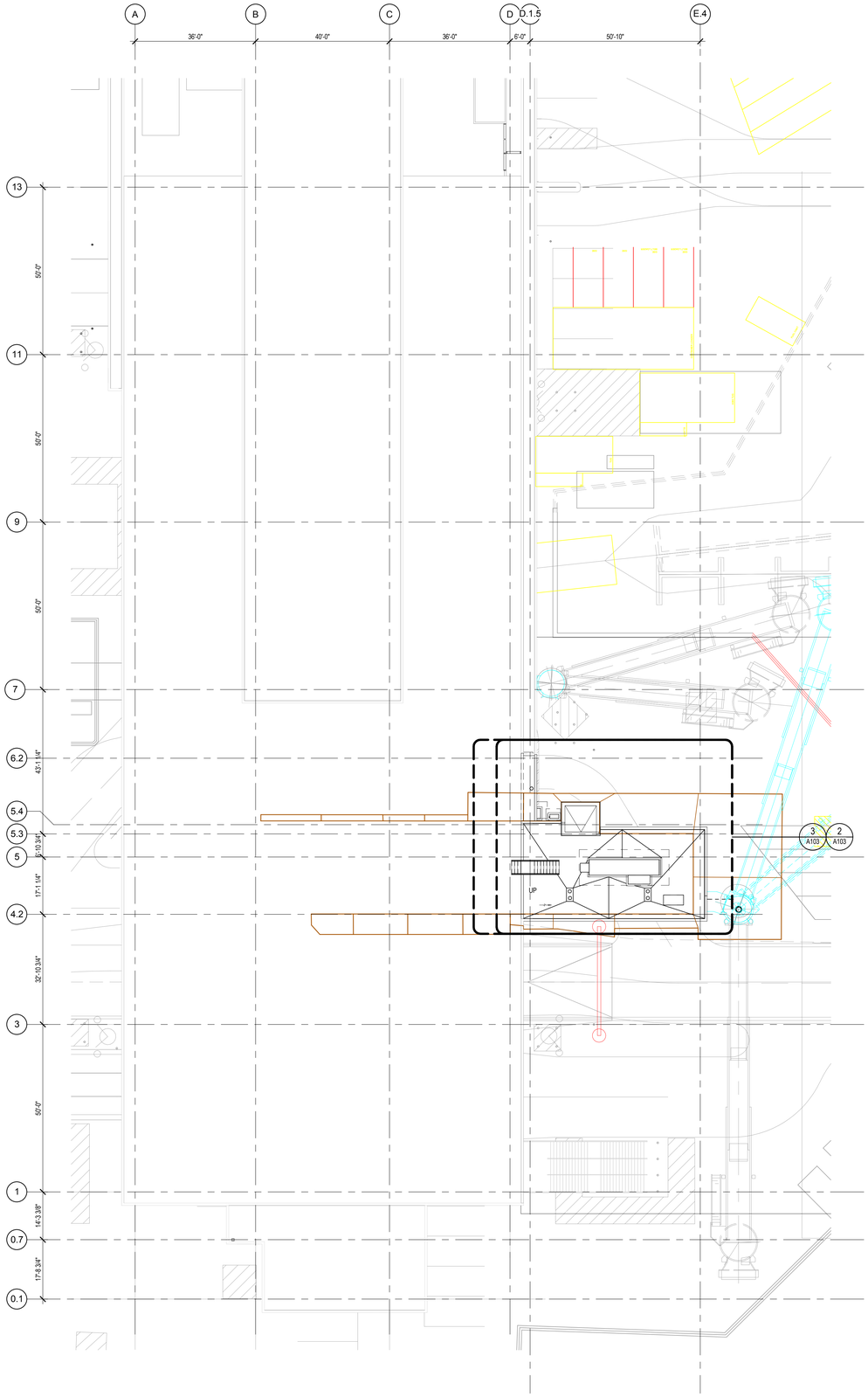
PLANS- DEMO, PROPOSED & CEILING - DEPARTURES LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

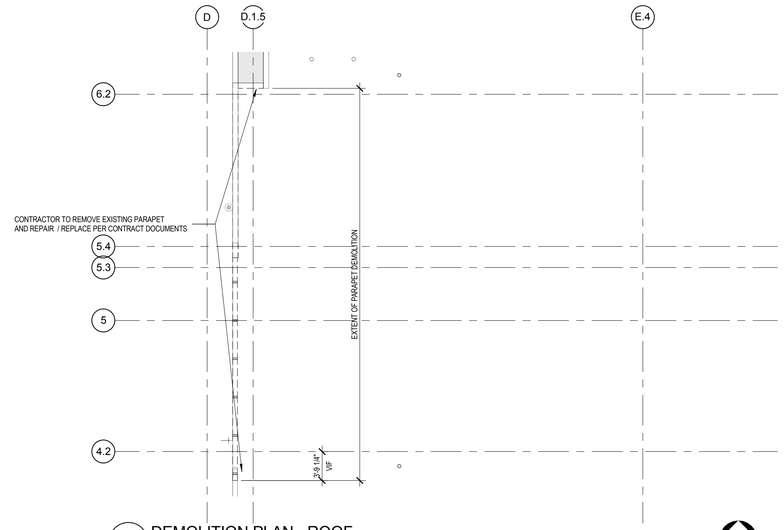
A102

4/15/2015 10:54:50 PM



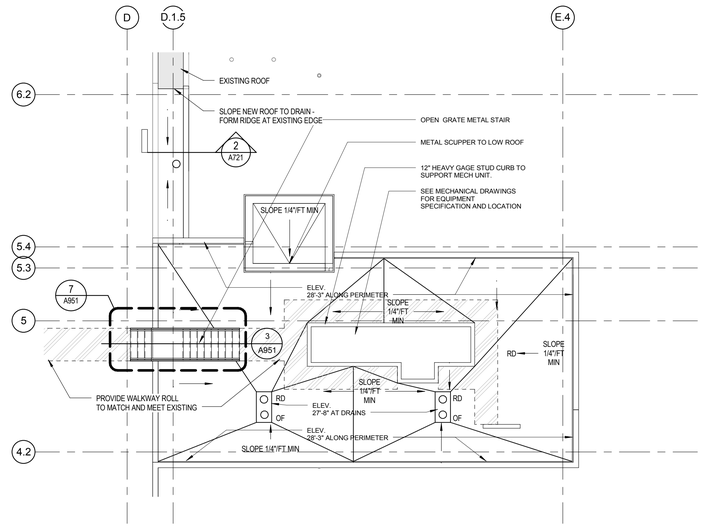
1 OVERALL ROOF PLAN
1/16" = 1'-0"

0 4 8 16 32 FT.



2 DEMOLITION PLAN - ROOF
1/8" = 1'-0"

0 2 4 8 16 FT.



3 ROOF PLAN
1/8" = 1'-0"

0 2 4 8 16 FT.

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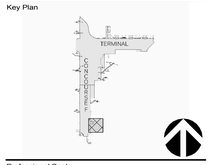
Key Plan



Professional Seals

No.	Description	Date
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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

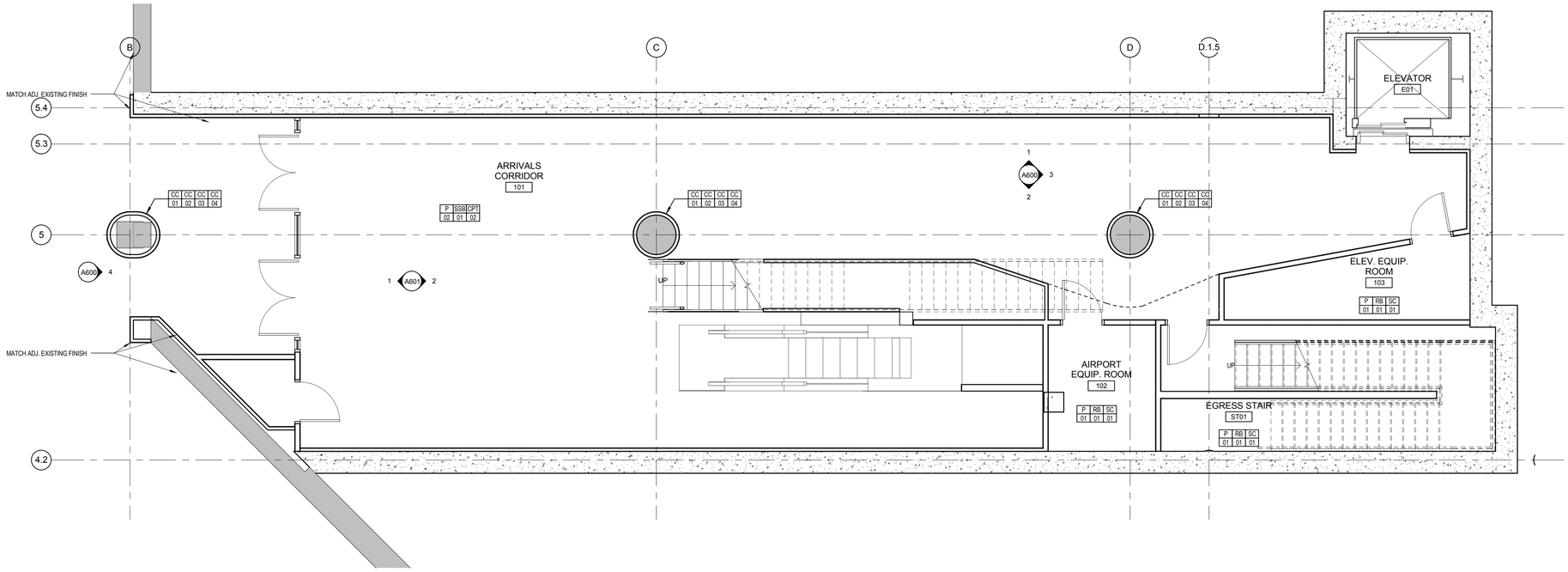
PLANS - DEMO, PROPOSED & REFLECTED CEILING PLAN - ROOF LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

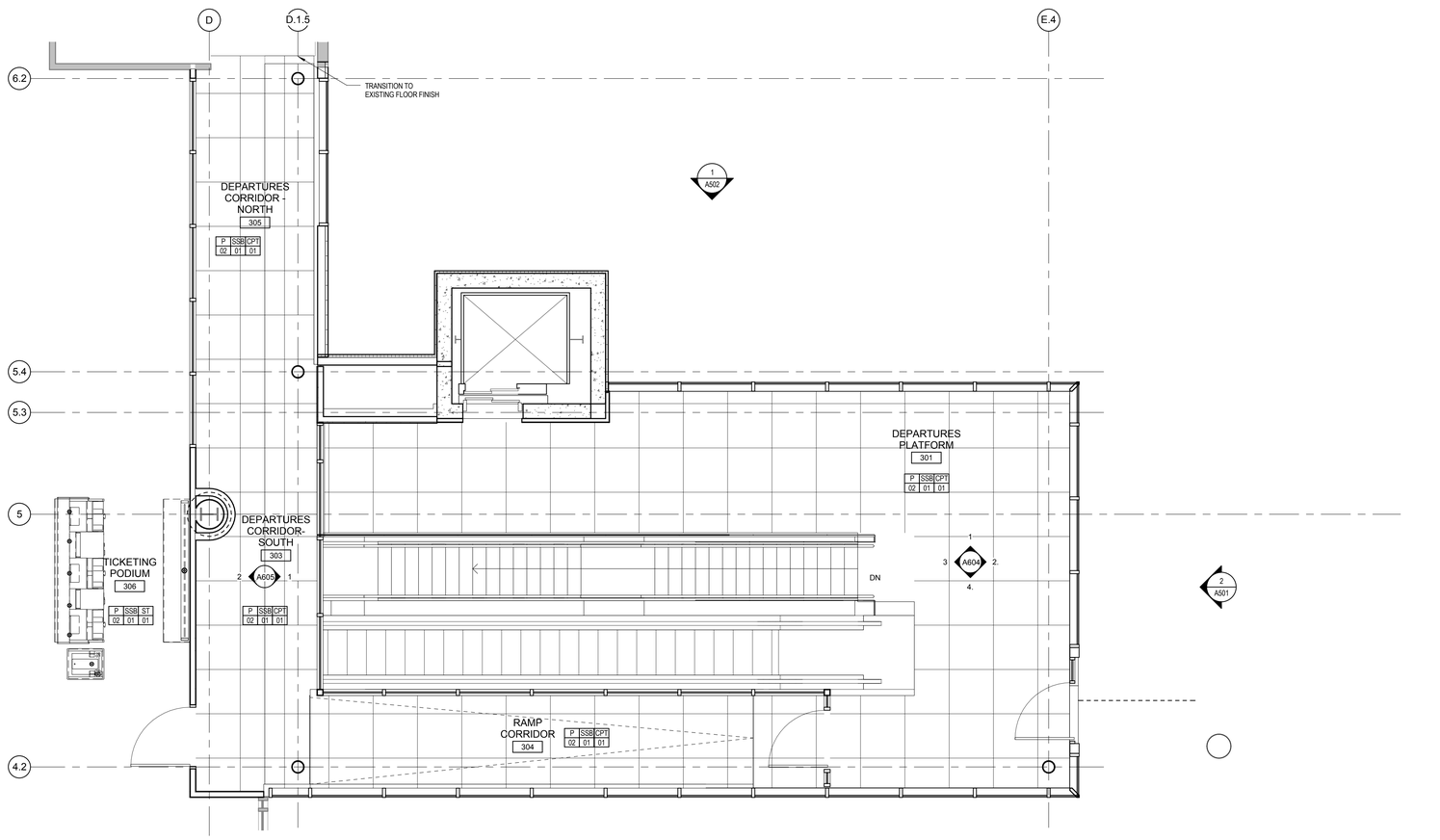
A103

4/16/2015 12:50:16 AM



1 ARRIVALS FINISH FLOOR PLAN
1/4" = 1'-0"

0 2 4 8 16 FT.



2 DEPARTURES FINISH FLOOR PLAN
1/4" = 1'-0"

0 2 4 8 16 FT.

4/15/2015 10:55:14 PM

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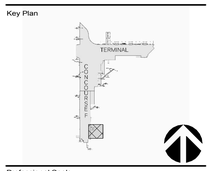
Key Plan



Professional Seals

No.	Description	Date
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2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

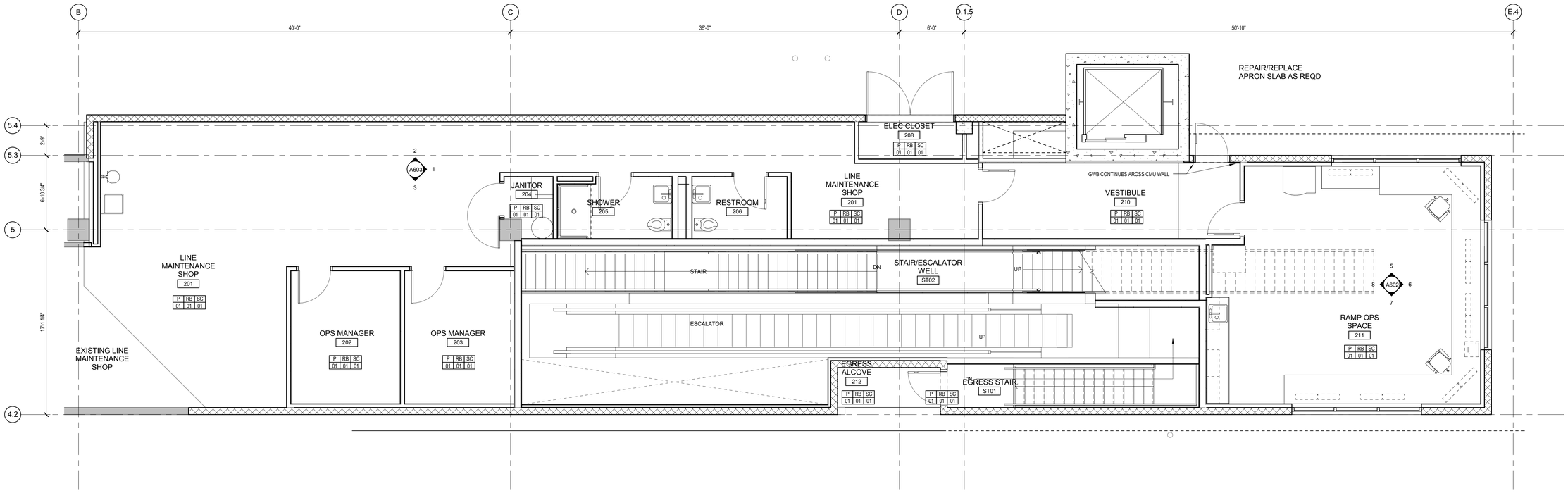
Sheet Title

PLAN - FINISH FLOOR - ARRIVALS-DEPARTURES

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A200



1 APRON FINISH FLOOR PLAN
1/4" = 1'-0"

0 2 4 8 16 FT.

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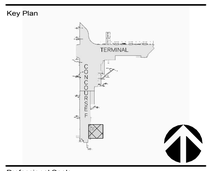
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

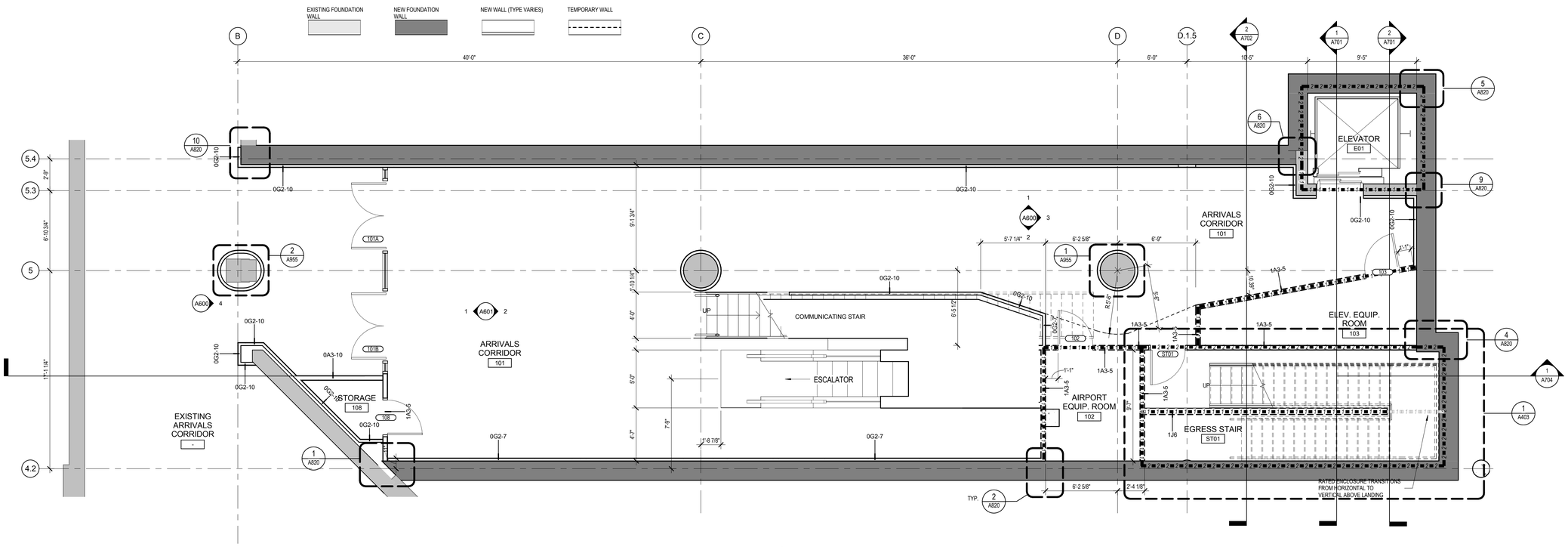
PLAN - FINISH FLOOR - APRON LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

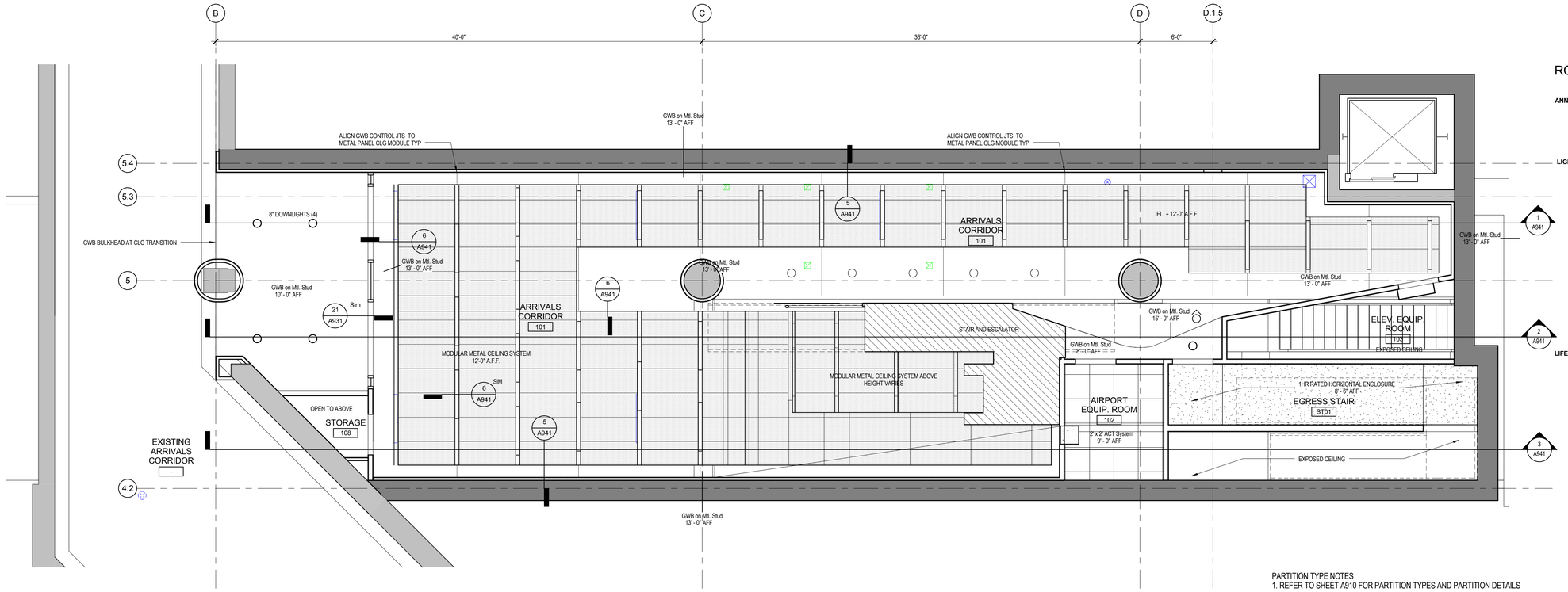
Sheet Number

A201

4/15/2015 10:55:23 PM



1 ENLARGED FLOOR PLAN - ARRIVALS LEVEL
1/4" = 1'-0"



2 ENLARGED REFLECTED CEILNG PLAN - ARRIVALS LEVEL
1/4" = 1'-0"

RCP LEGEND

ANNOTATIONS

CEILING MATERIAL X' - X" AFF	FINISHED CEILING HEIGHT AS INDICATED ON PLAN UON.

LIGHT FIXTURES

	2' x 2' OR 2' X 4' RECESSED SEMI-INDIRECT FLUORESCENT
	4' RECESSED LINEAR WALLWASH
	4' RECESSED LINEAR FLOURESCENT
	RECESSED DOWNLIGHT
	RECESSED WALL WASH DOWNLIGHT
	PENDANT
	CEILING SURFACE MOUNTED STRIP LIGHT
	WALL SCONCE

LIFE SAFETY

	EXIT SIGN, ARROW INDICATES PATH OF TRAVEL
	SMOKE DETECTOR
	LIFE SAFETY SPEAKER STROBE
	LIFE SAFETY SPEAKER
	LIFE SAFETY STROBE
	SPRINKLER

PARTITION TYPE NOTES
1. REFER TO SHEET A910 FOR PARTITION TYPES AND PARTITION DETAILS

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WBS No. D.05.26.001
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TASK ORDER No. : 001

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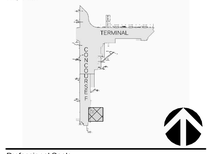
F: (404) 876-6841

Key Plan



Professional Seals

No.	Description	Date
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2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

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Project No:

Sheet Title

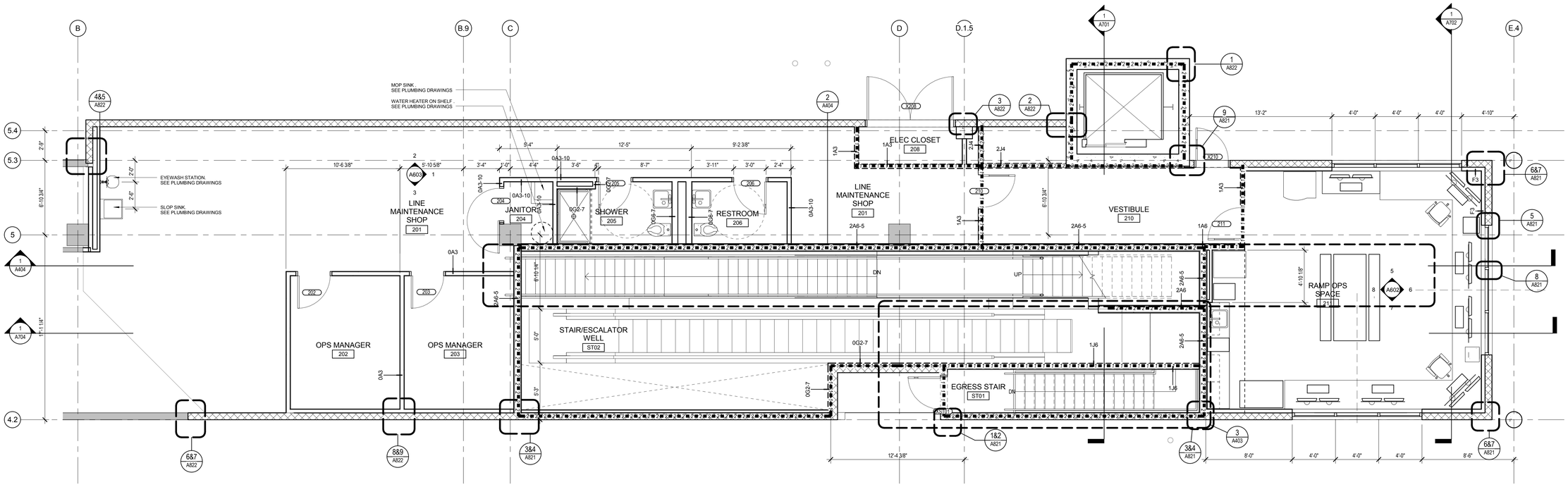
ENLARGED PLANS - ARRIVALS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A400

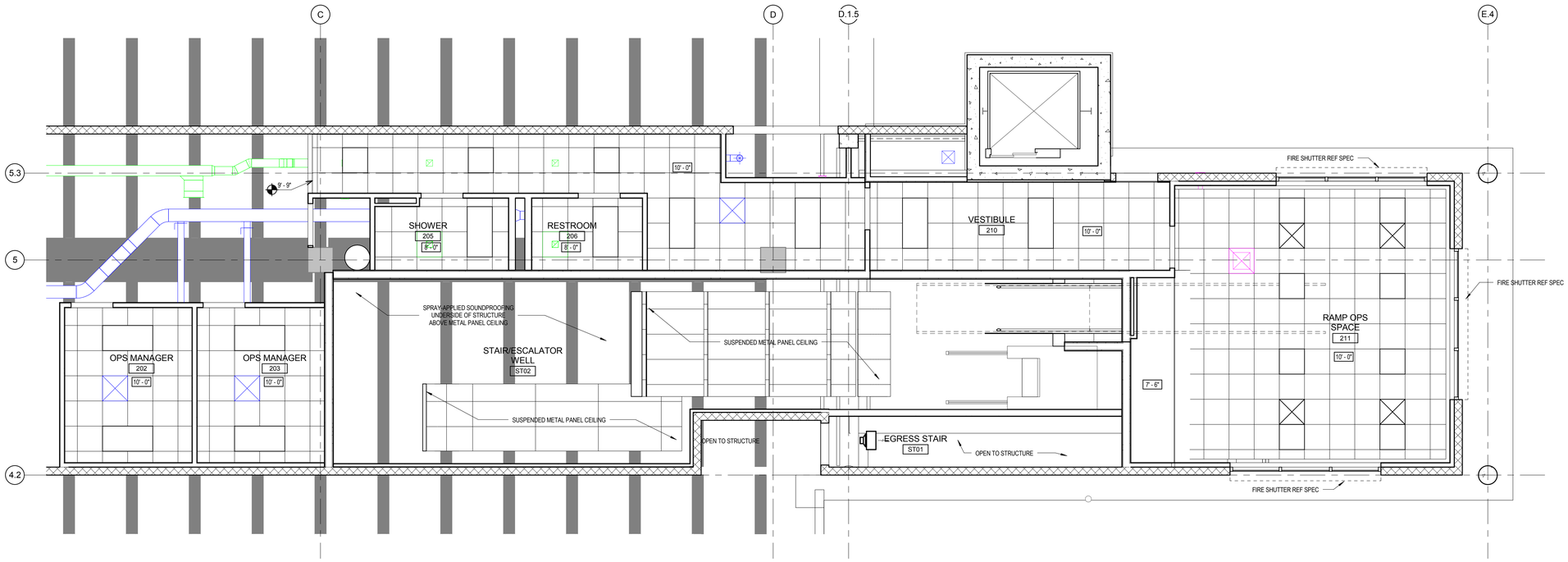
4/15/2015 10:55:37 PM



1 ENLARGED FLOOR PLAN - APRON LEVEL
1/4" = 1'-0"

0 2 4 8 16 FT.

PARTITION TYPE NOTES
1. REFER TO SHEET A910 FOR PARTITION TYPES AND PARTITION DETAILS



2 ENLARGED REFLECTED CEILING PLAN - APRON LEVEL
1/4" = 1'-0"

0 2 4 8 16 FT.

RCP LEGEND

ANNOTATIONS

CEILING MATERIAL X' - X" AFF — FINISHED CEILING HEIGHT AS INDICATED ON PLAN UON.

LIGHT FIXTURES

- 2' x 2' OR 2' X 4' RECESSED SEMI-INDIRECT FLUORESCENT
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- PENDANT
- CEILING SURFACE MOUNTED STRIP LIGHT
- WALL SCONCE

LIFE SAFETY

- EXIT SIGN, ARROW INDICATES PATH OF TRAVEL
- SMOKE DETECTOR
- LIFE SAFETY SPEAKER STROBE
- LIFE SAFETY SPEAKER
- LIFE SAFETY STROBE
- SPRINKLER

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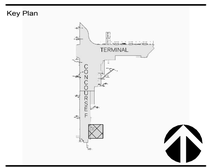
Key Plan



Professional Seals

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

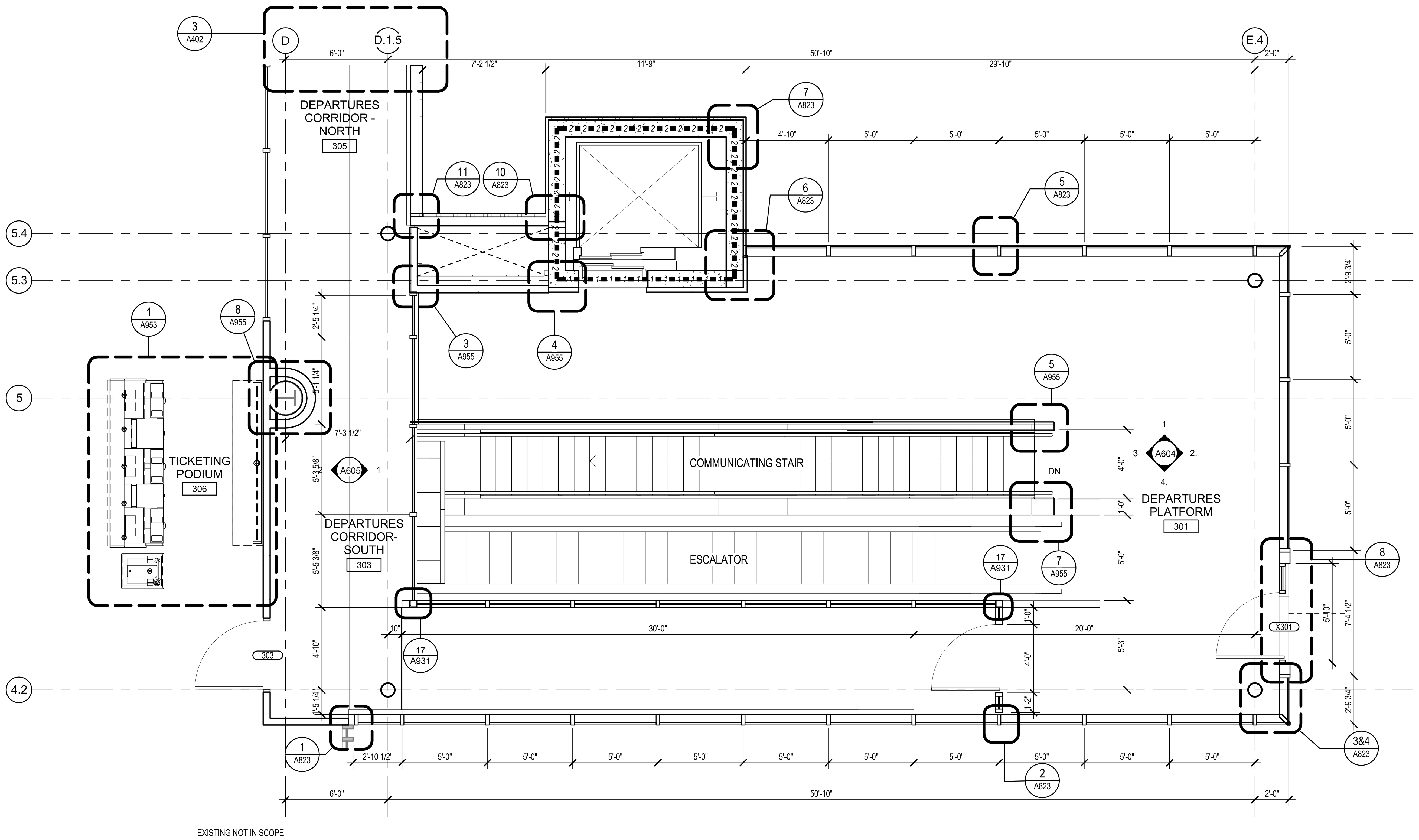
ENLARGED PLANS - APRON LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

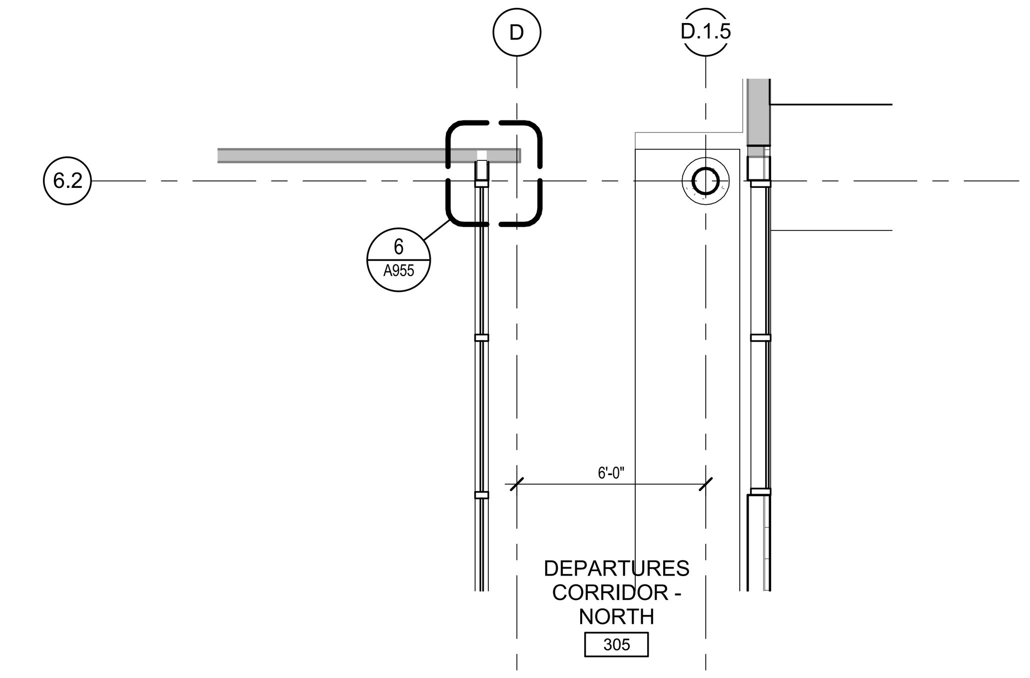
Sheet Number

A401

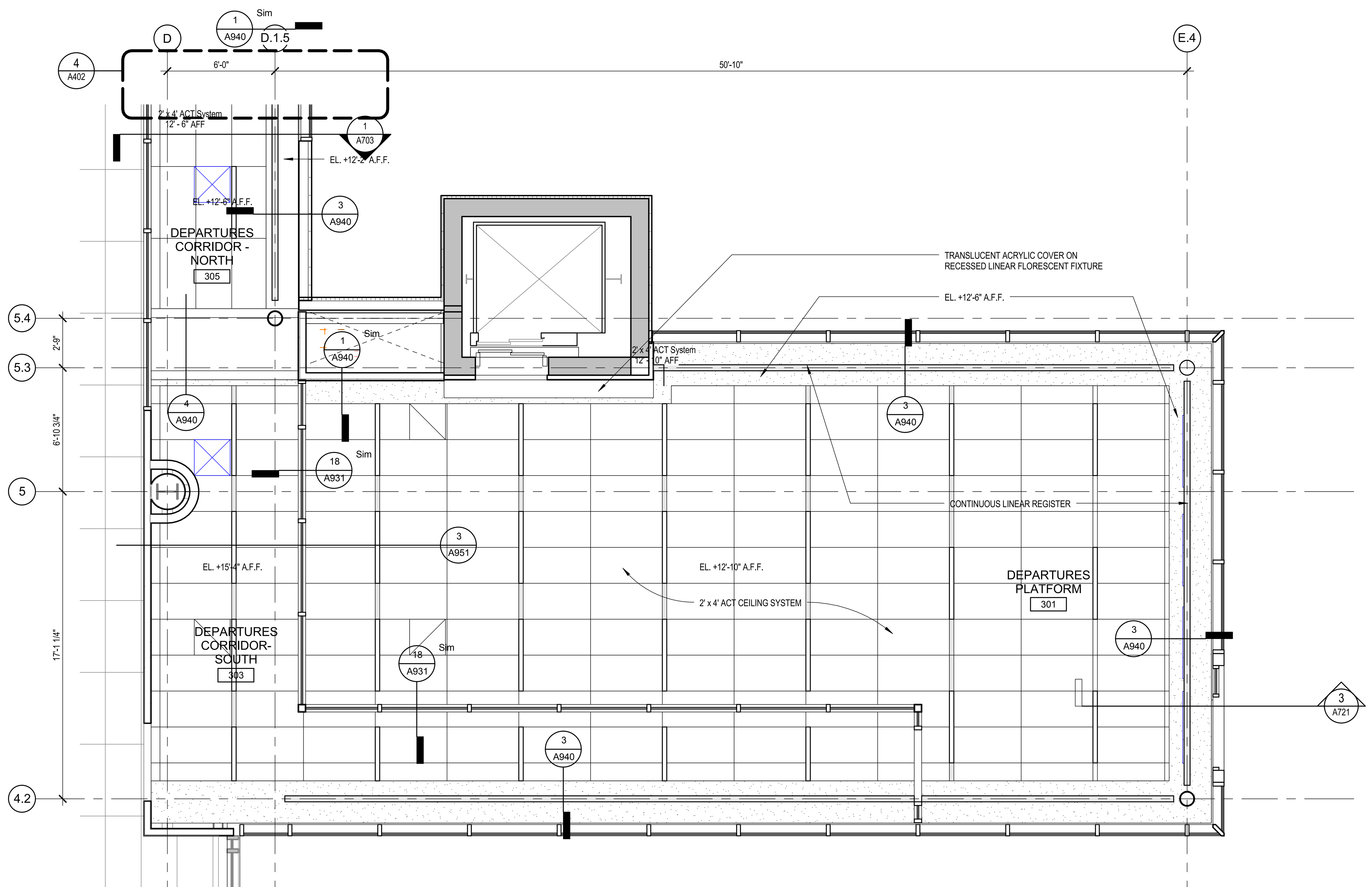
PARTITION TYPE NOTES
1. REFER TO SHEET A910 FOR PARTITION TYPES AND PARTITION DETAILS



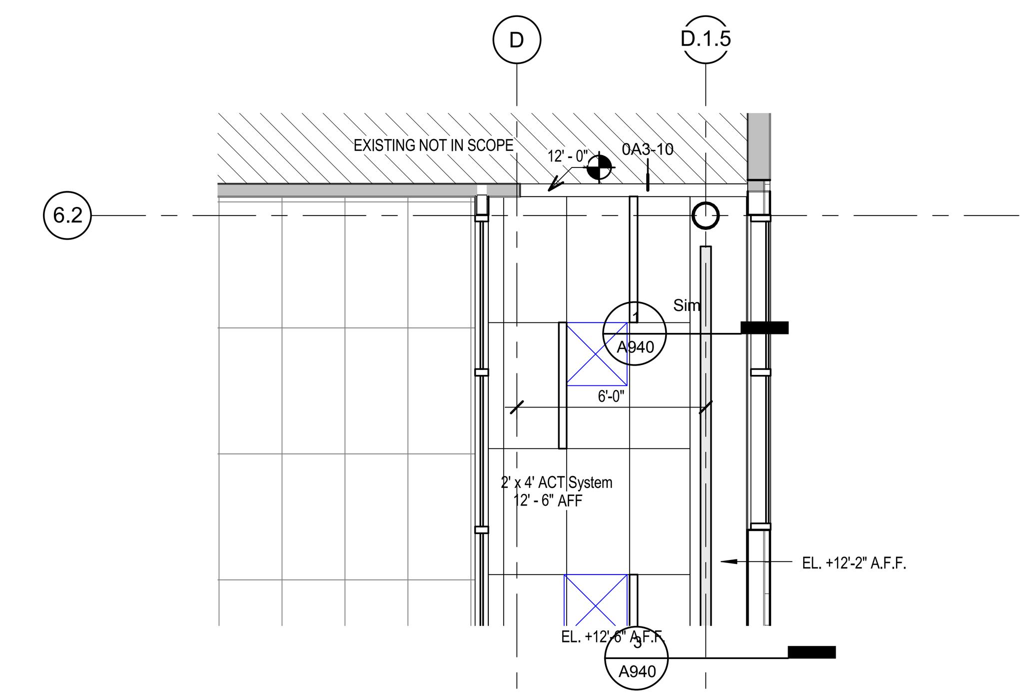
1 ENLARGED FLOOR PLAN - DEPARTURES LEVEL
1/4" = 1'-0"
0 2 4 8 16 FT.



3 ENLARGED FLOOR PLAN - DEPARTURES LEVEL
1/4" = 1'-0"



2 ENLARGED REFLECTED CEILING PLAN - DEPARTURES LEVEL
1/4" = 1'-0"
0 2 4 8 16 FT.



4 ENLARGED REFLECTED CEILING PLAN - DEPARTURES LEVEL
1/4" = 1'-0"

RCP LEGEND

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- SPRINKLER

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TASK ORDER No. : 001

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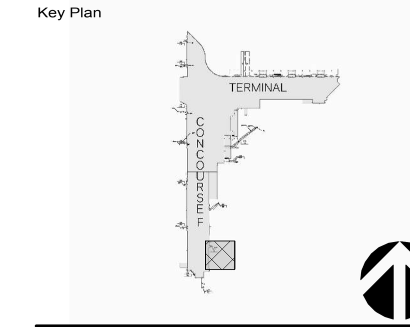
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

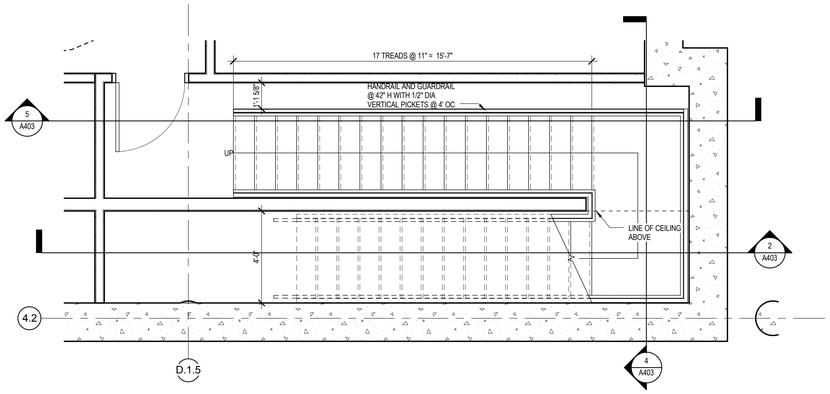
Sheet Title

ENLARGED PLANS - DEPARTURES LEVEL

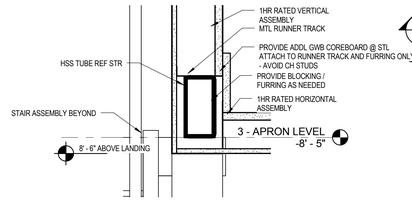
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

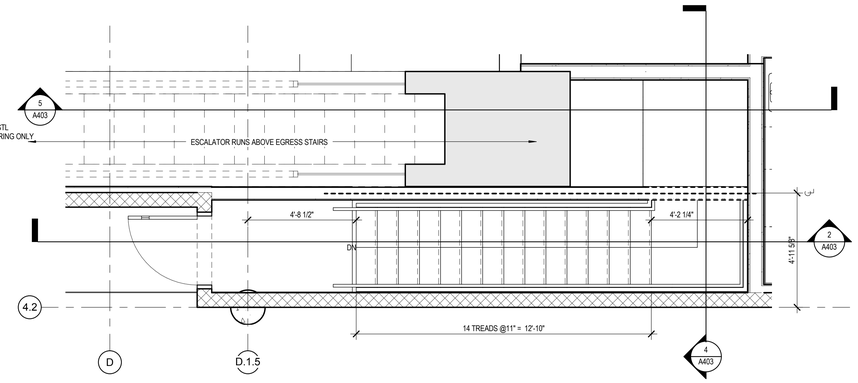
A402



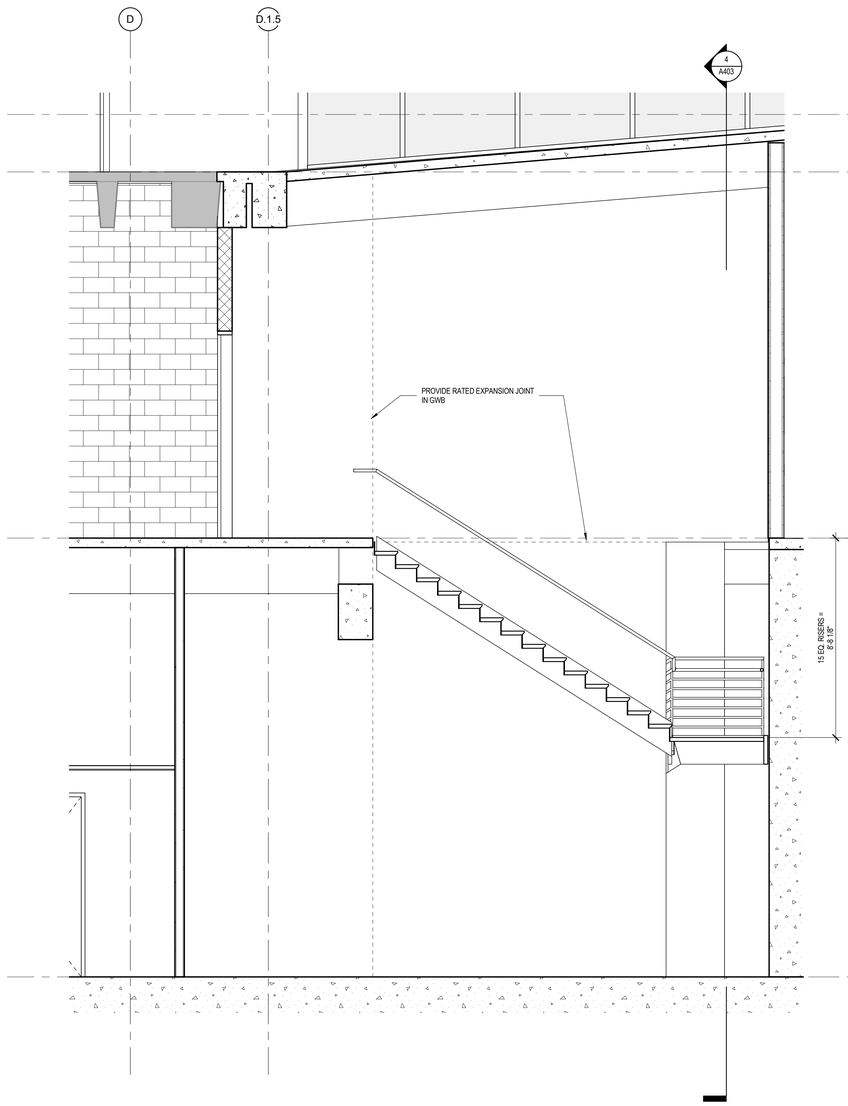
1 EXIT STAIR - ARRIVALS LEVEL
3/8" = 1'-0"



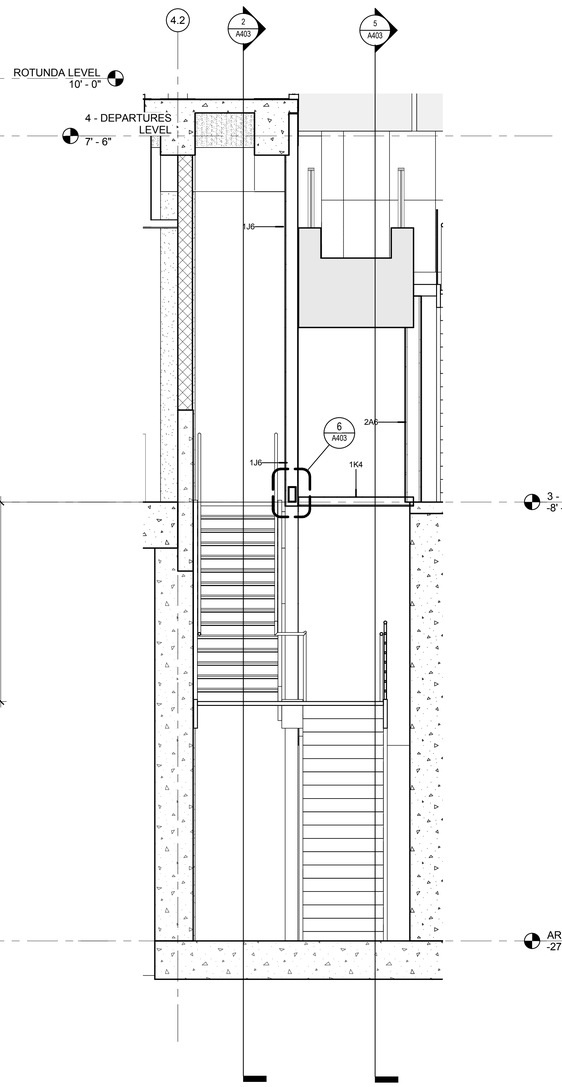
6 RATED SEPARATION TRANSITION DETAIL
1 1/2" = 1'-0"



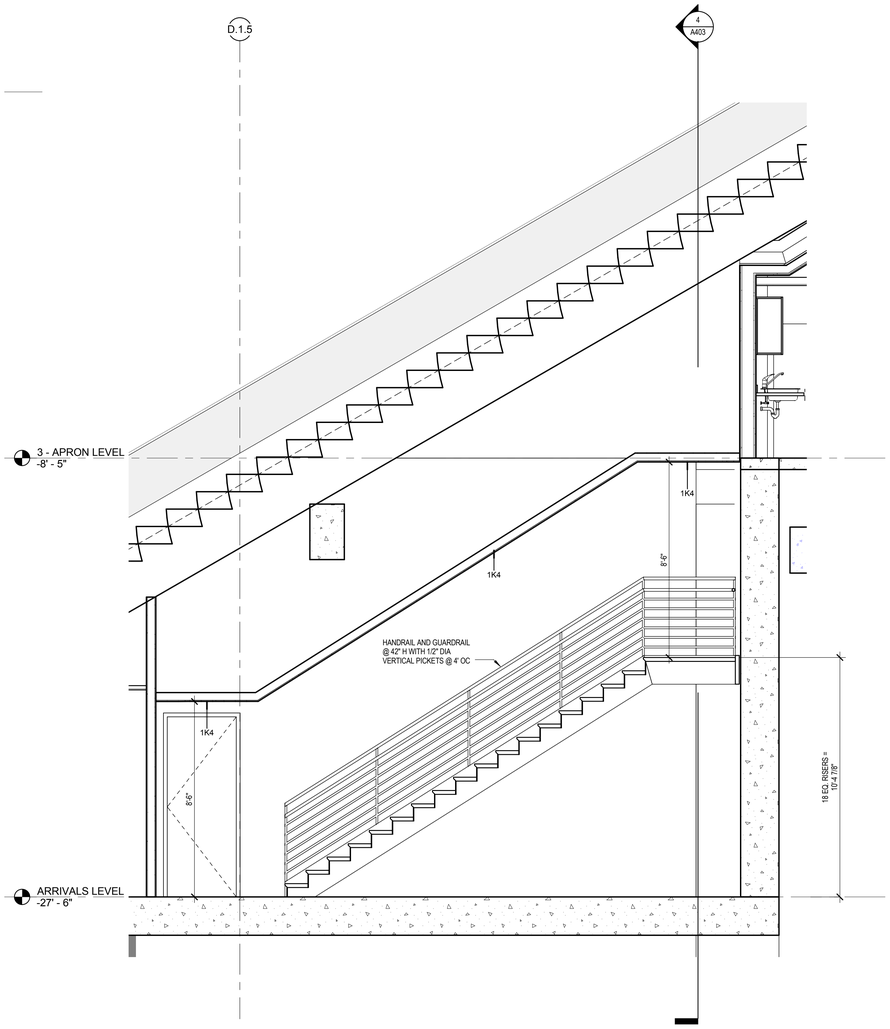
3 EXIT STAIR - APRON LEVEL
3/8" = 1'-0"



2 EXIT STAIR SECTION
3/8" = 1'-0"



4 EXIT STAIR SECTION
3/8" = 1'-0"



5 EXIT STAIR SECTION
3/8" = 1'-0"

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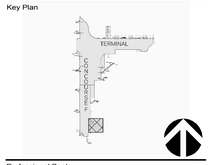
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

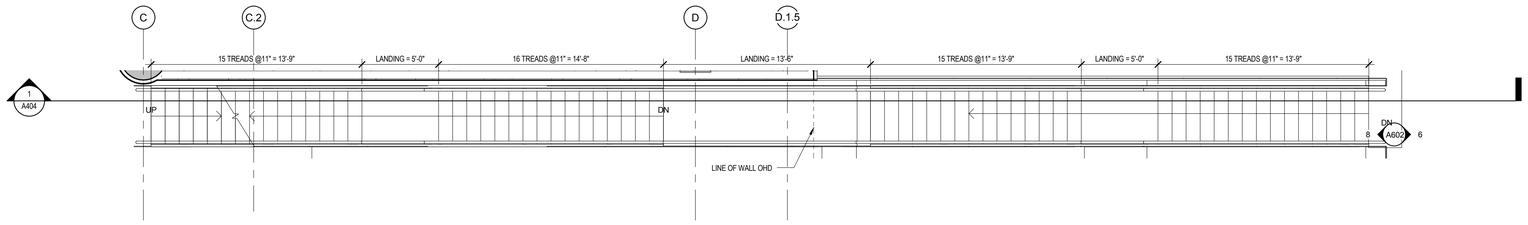
ENLARGED PLANS - EGRESS STAIR

Original drawing is 42 x 30. Do not scale contents of this drawing.

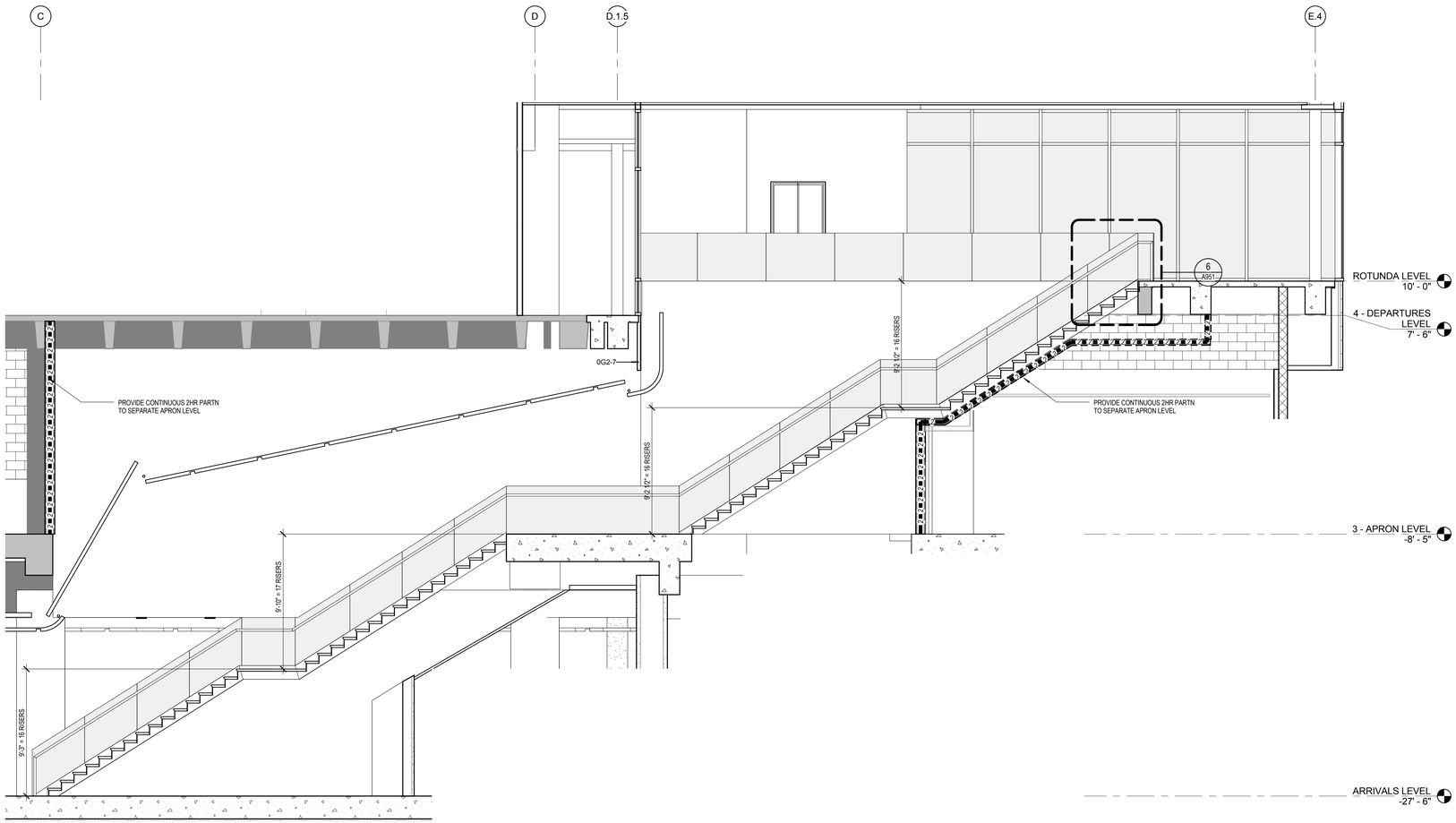
Sheet Number

A403

4/15/2015 10:56:22 PM



2 PLAN - COMMUNICATION STAIR
1/4" = 1'-0"



1 SECTION - COMMUNICATION STAIR
1/4" = 1'-0"

4/15/2015 10:56:35 PM

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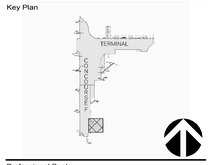
Key Plan



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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

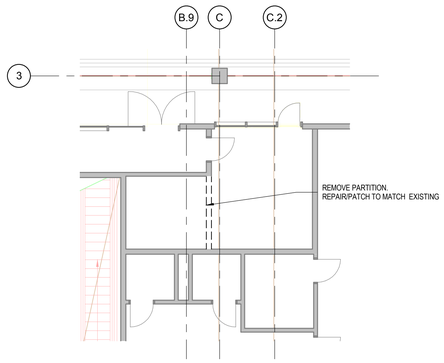
Sheet Title

ENLARGED PLANS - COMMUNICATION STAIR

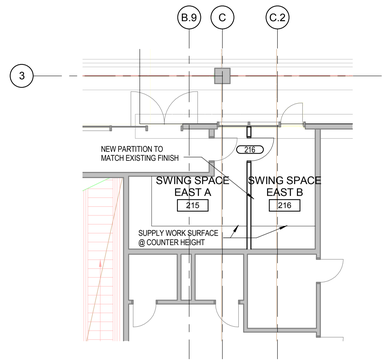
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

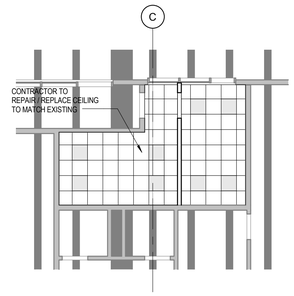
A404



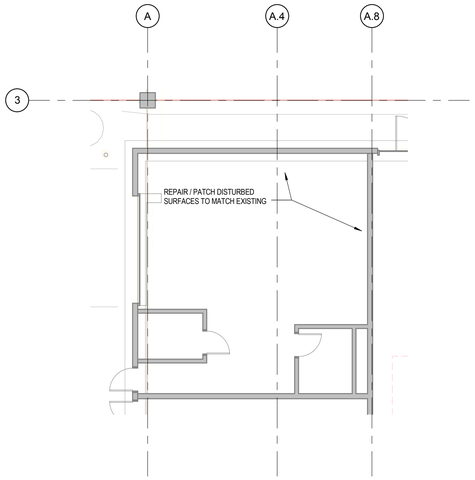
1 SWING SPACE- EAST- DEMO PLAN
1/8" = 1'-0"



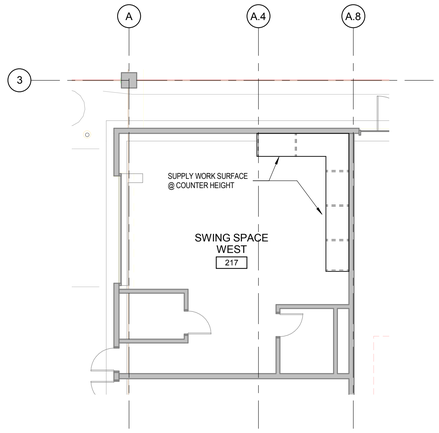
2 SWING SPACE- EAST- PLAN
1/8" = 1'-0"



3 REFLECTED CEILING PLAN- APRON LEVEL
1/8" = 1'-0"



4 SWING SPACE- WEST- DEMO PLAN
1/8" = 1'-0"



5 SWING SPACE- WEST- PLAN
1/8" = 1'-0"

RCP LEGEND

ANNOTATIONS

CEILING MATERIAL
X' - X" AFF

FINISHED CEILING HEIGHT AS INDICATED ON PLAN UON.

LIGHT FIXTURES

2' x 2' OR 2' X 4' RECESSED SEMI-INDIRECT FLUORESCENT

4' RECESSED LINEAR WALLWASH

4' RECESSED LINEAR FLOURESCENT

RECESSED DOWNLIGHT

RECESSED WALL WASH DOWNLIGHT

PENDANT

CEILING SURFACE MOUNTED STRIP LIGHT

WALL SCONCE

LIFE SAFETY

EXIT SIGN, ARROW INDICATES PATH OF TRAVEL

SMOKE DETECTOR

LIFE SAFETY SPEAKER STROBE

LIFE SAFETY SPEAKER

LIFE SAFETY STROBE

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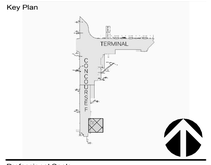
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

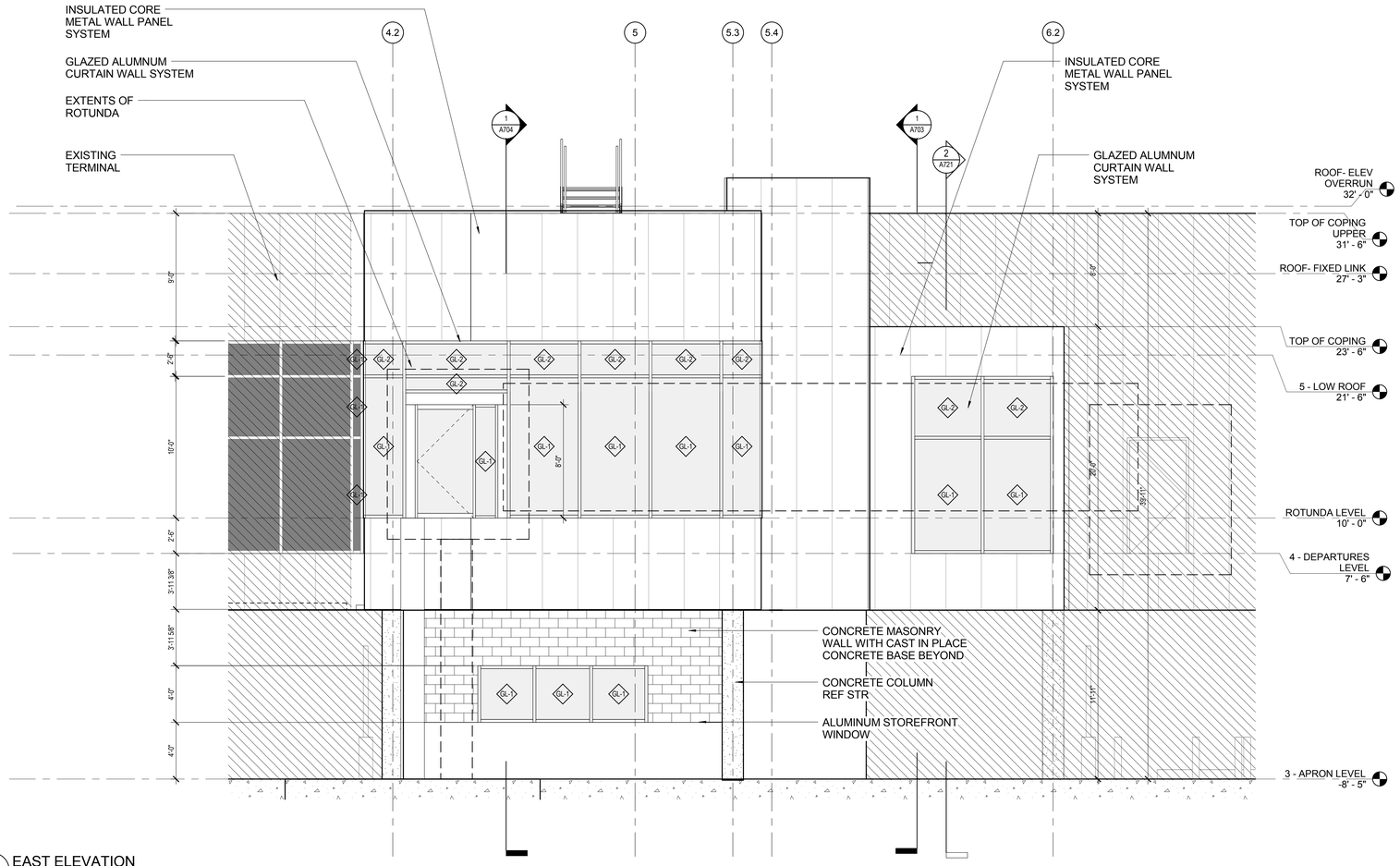
ENLARGED PLANS - TEMPORARY SPACE

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

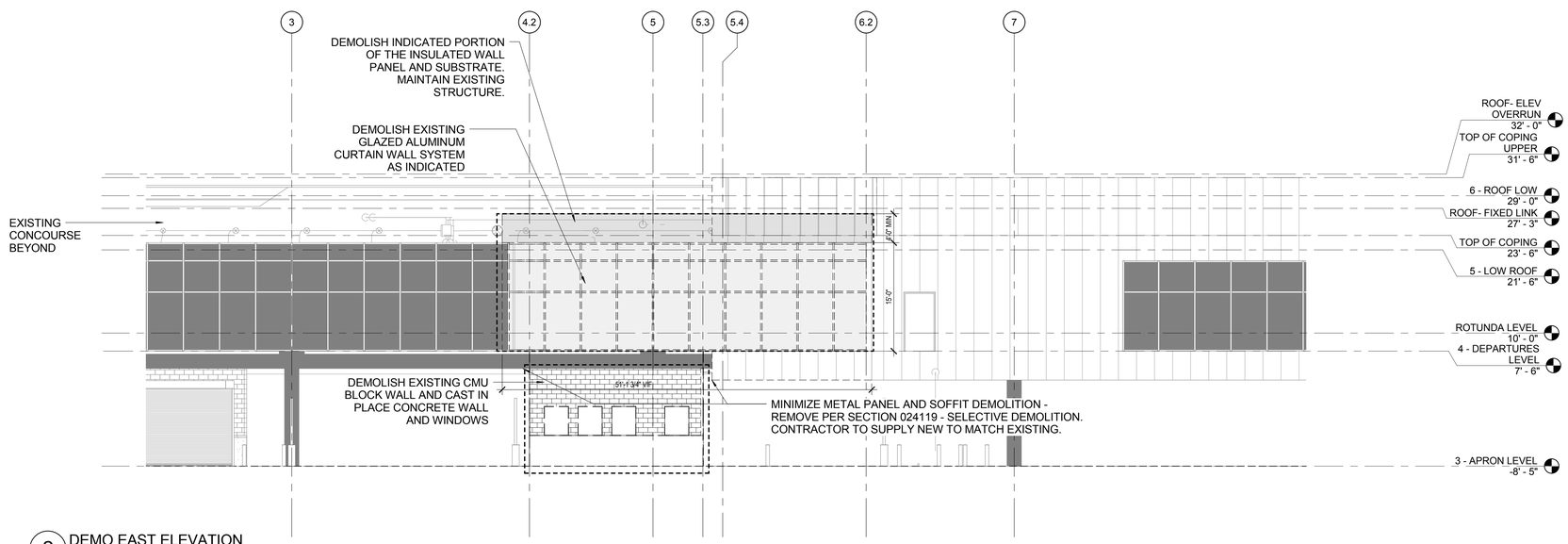
A405

4/15/2015 10:56:46 PM



1 EAST ELEVATION
1/4" = 1'-0"

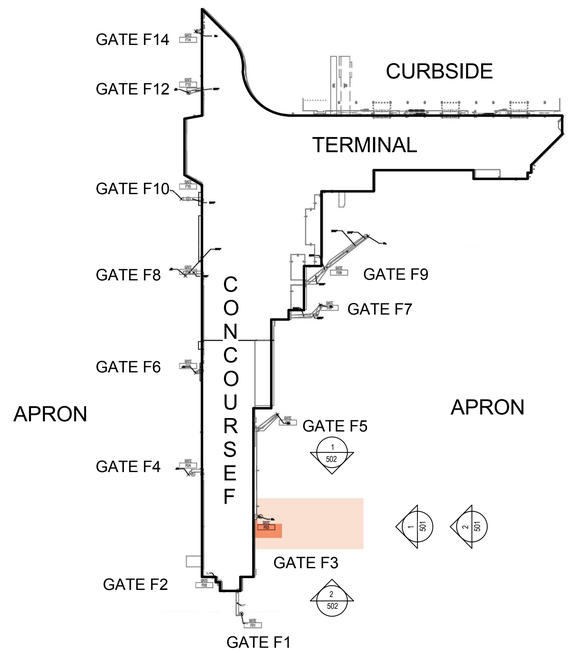
0 2 4 8 16 FT.



2 DEMO EAST ELEVATION
1/8" = 1'-0"

0 2 4 8 16 FT.

KEY PLAN



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WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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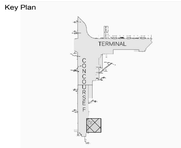
F: (404) 876-6841

Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

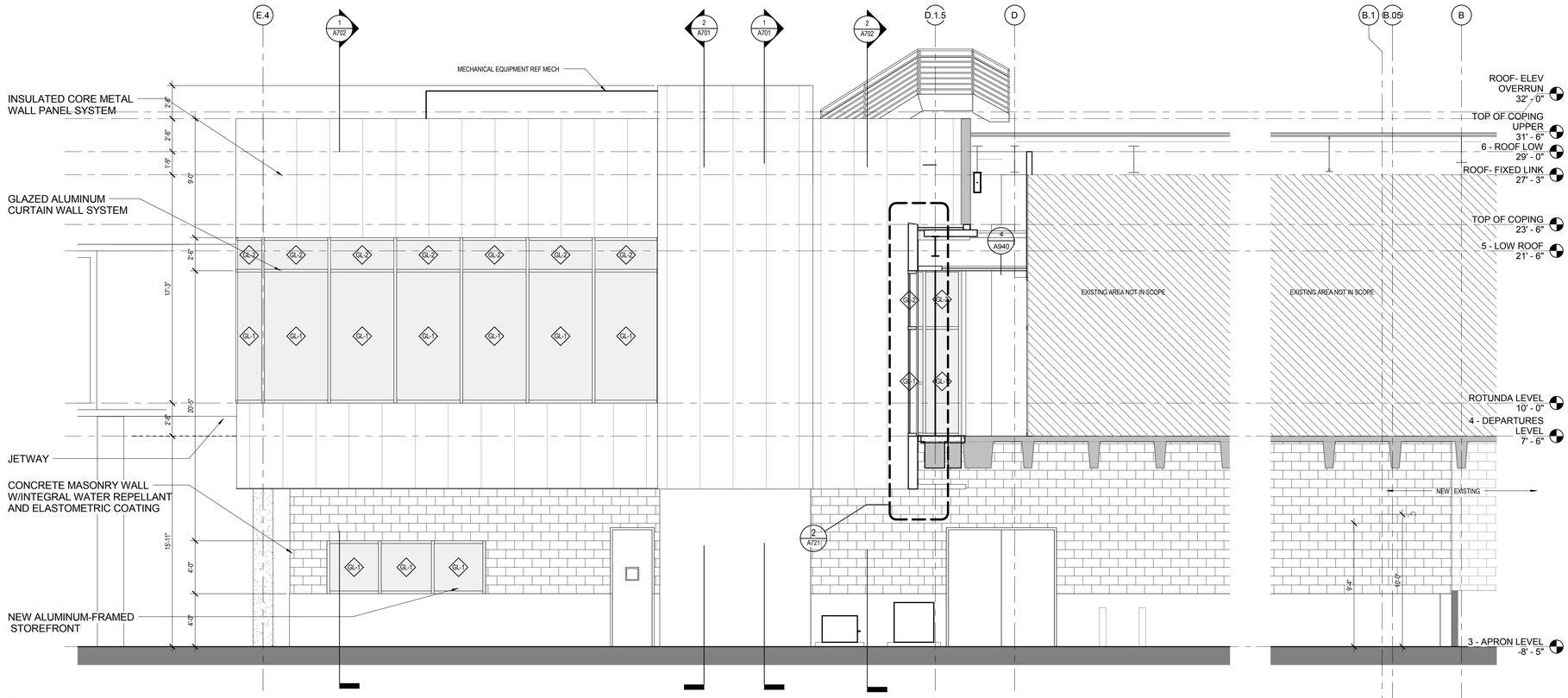
EXTERIOR ELEVATIONS - EAST - DEMO-PROPOSED

Original drawing is 42 x 30. Do not scale contents of this drawing.

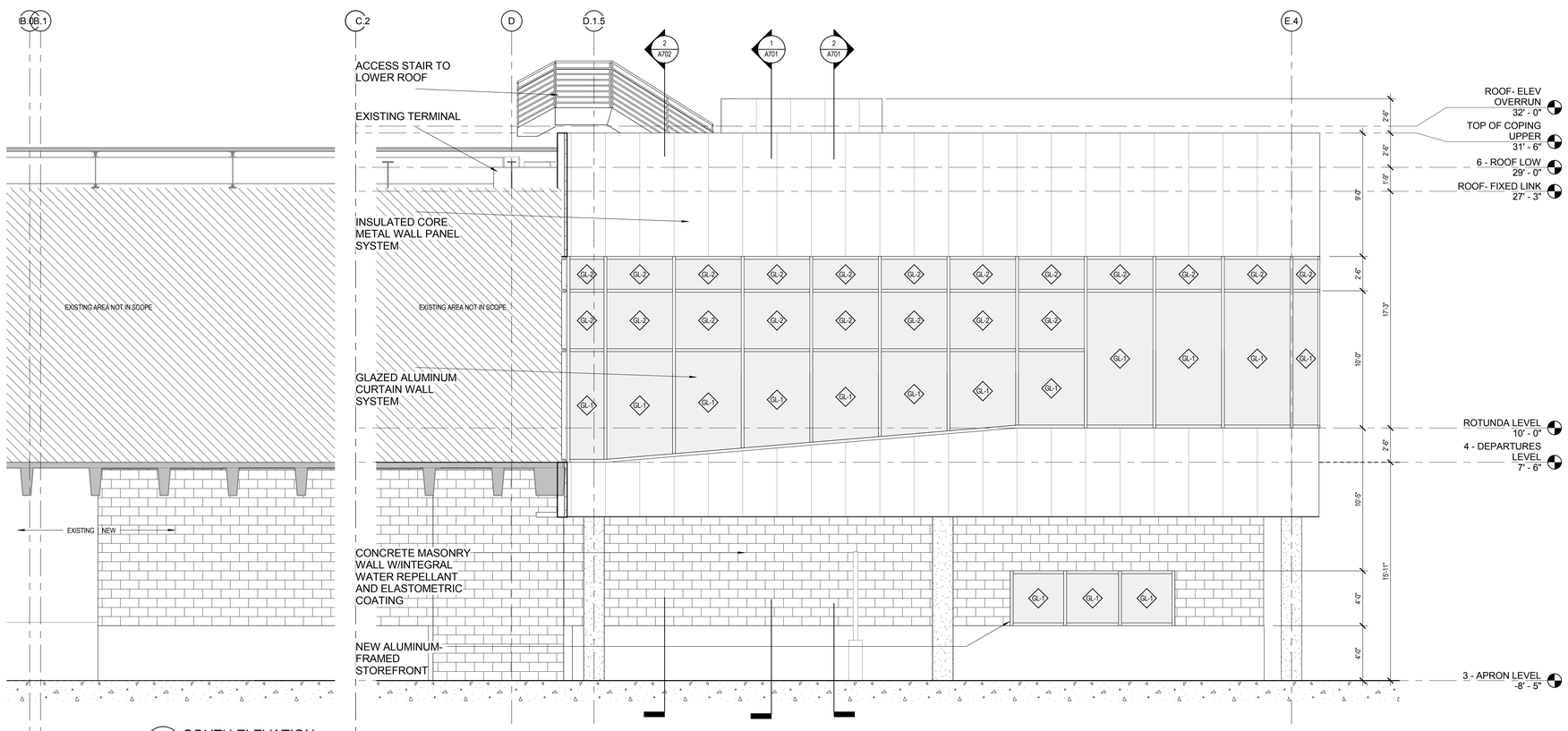
Sheet Number

A501

4/15/2015 10:56:58 PM



1 NORTH ELEVATION
1/4" = 1'-0"



2 SOUTH ELEVATION
1/4" = 1'-0"

4/15/2015 10:57:12 PM

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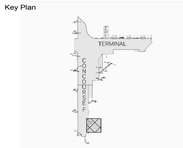
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

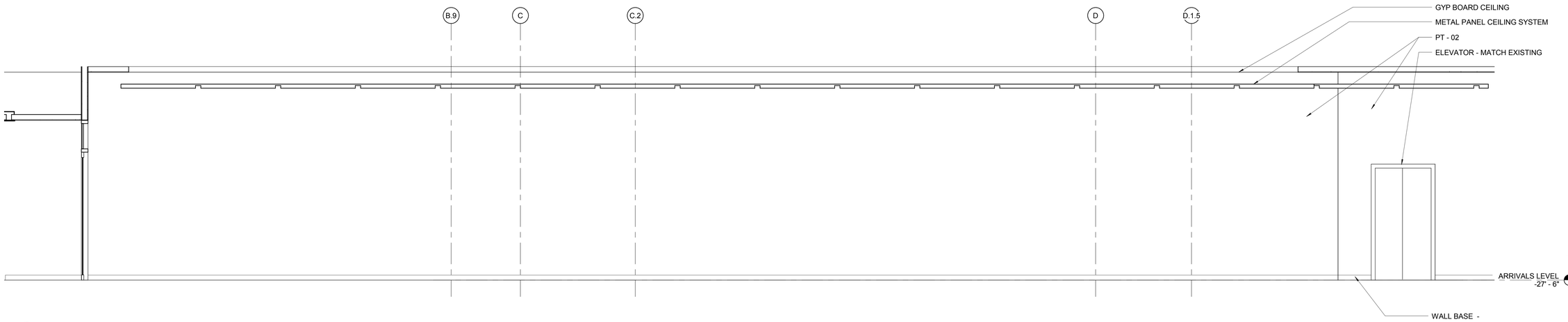
Sheet Title

EXTERIOR ELEVATIONS - NORTH & SOUTH

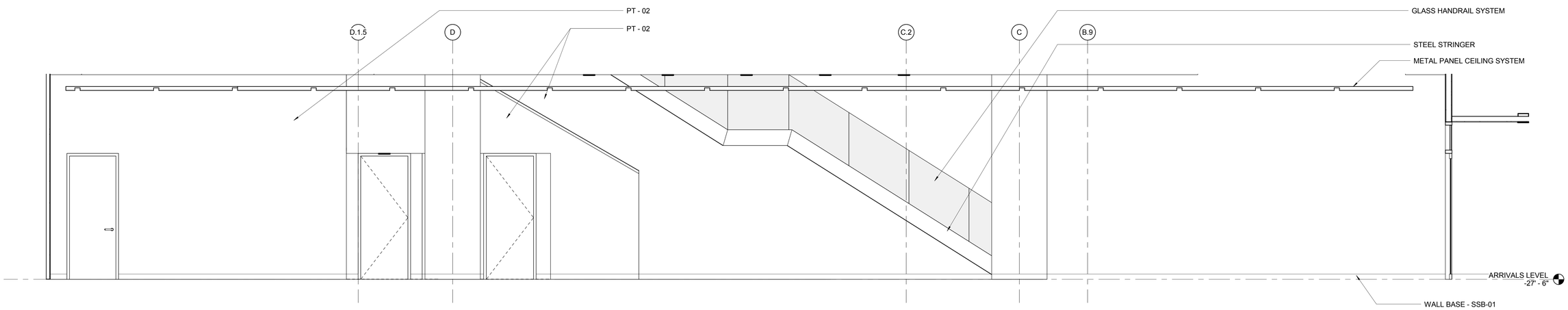
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

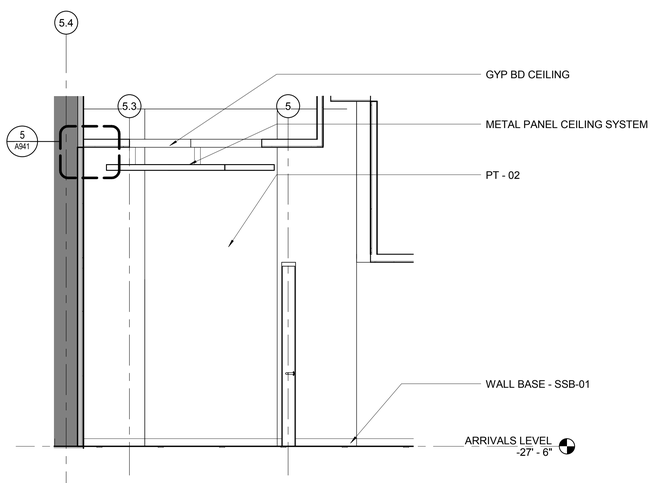
A502



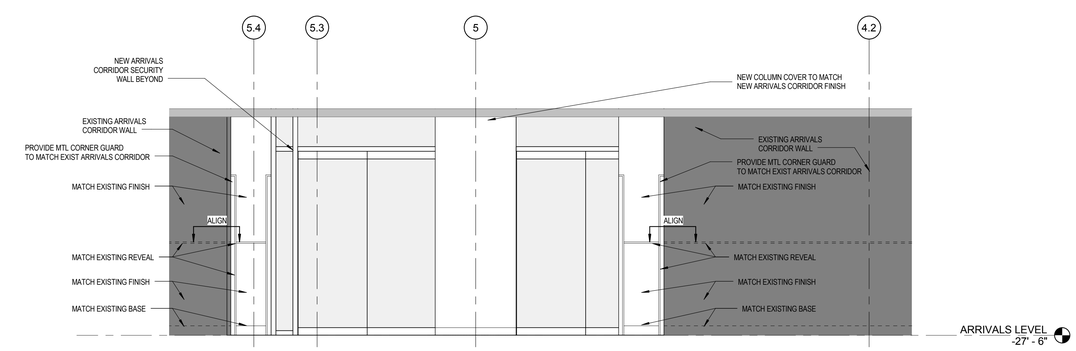
1 ARRIVALS CORRIDOR - NORTH ELEVATION- EAST
3/8" = 1'-0"



2 ARRIVALS CORRIDOR - SOUTH ELEVATION - EAST
3/8" = 1'-0"



3 ARRIVALS CORRIDOR- EAST - EAST ELEVATION
3/8" = 1'-0"



4 ARRIVALS CORRIDOR - CONNECTION AT STERILE CORRIDOR
3/8" = 1'-0"

4/15/2015 10:57:23 PM

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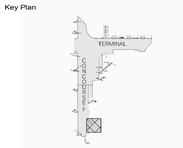

Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
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3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

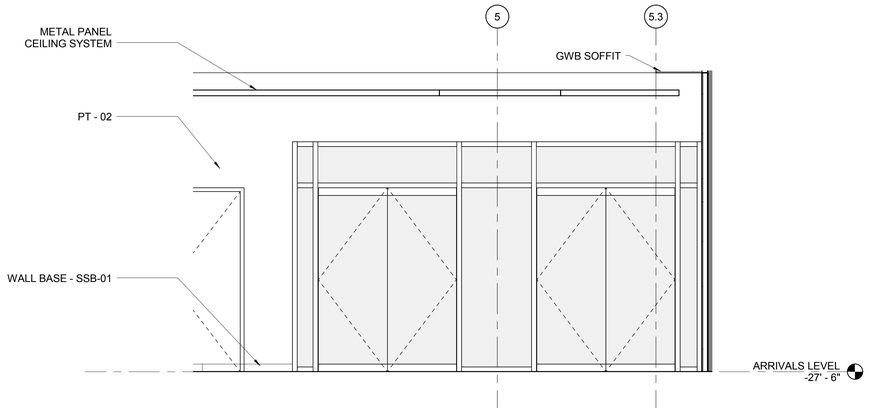
Sheet Title

INTERIOR ELEVATIONS - ARRIVALS LEVEL

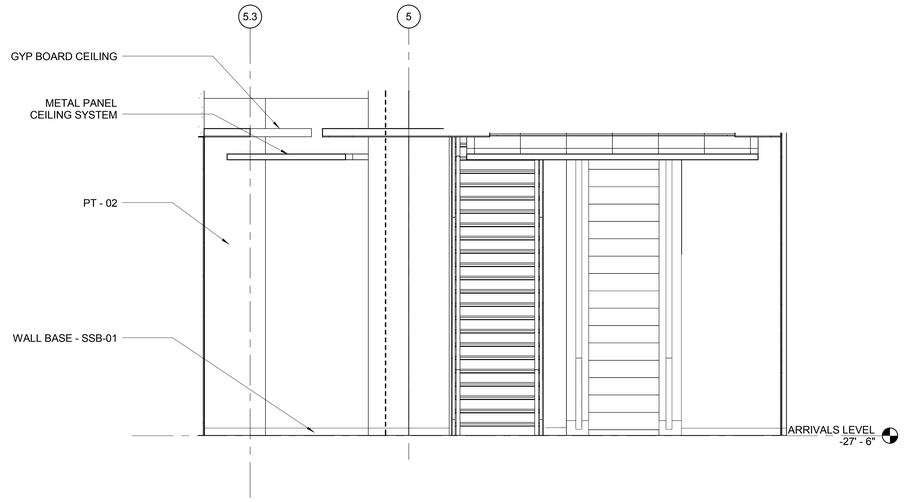
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A600



1 ARRIVALS CORRIDOR - WEST ELEVATION
3/8" = 1'-0"



2 ARRIVALS CORRIDOR - EAST ELEVATION
3/8" = 1'-0"

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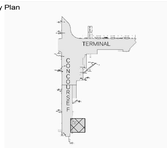
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

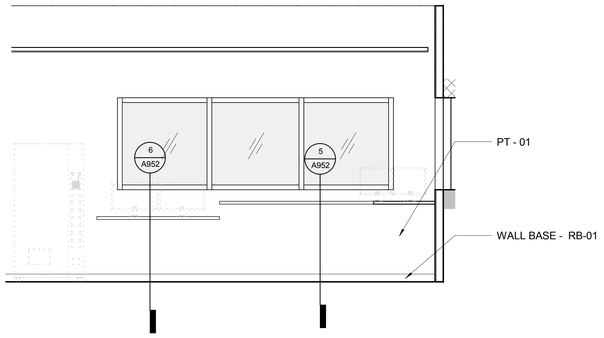
INTERIOR ELEVATIONS - ARRIVALS LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

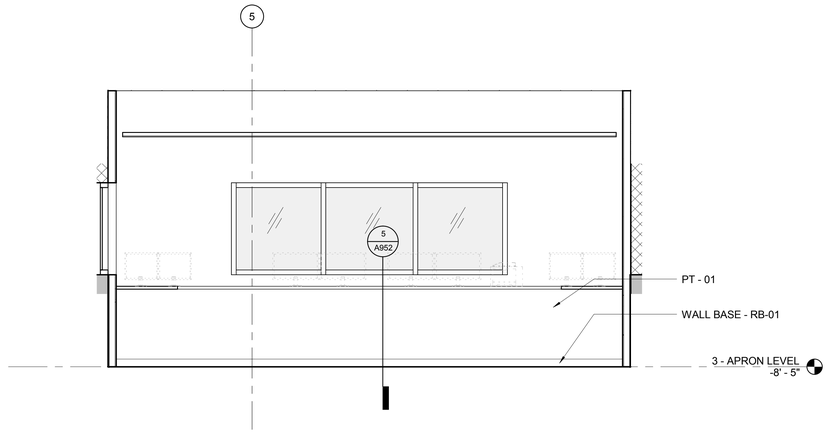
Sheet Number

A601

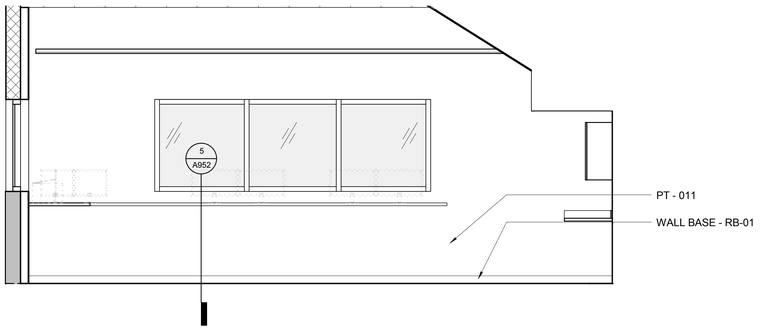
4/15/2015 10:57:30 PM



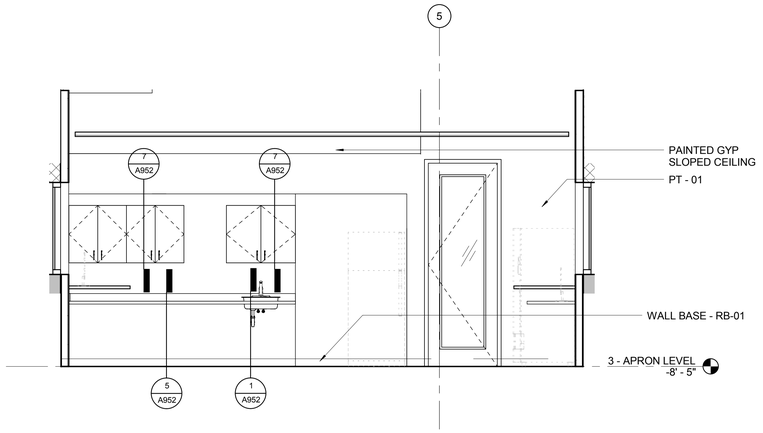
5 PROPOSED LINE MAINTENANCE 2 - NORTH
3/8" = 1'-0"



6 PROPOSED LINE MAINTENANCE 2 - EAST
3/8" = 1'-0"



7 PROPOSED LINE MAINTENANCE 2 - SOUTH
3/8" = 1'-0"



8 PROPOSED LINE MAINTENANCE 2 - EAST
3/8" = 1'-0"

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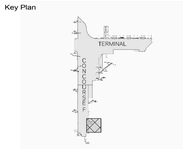
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

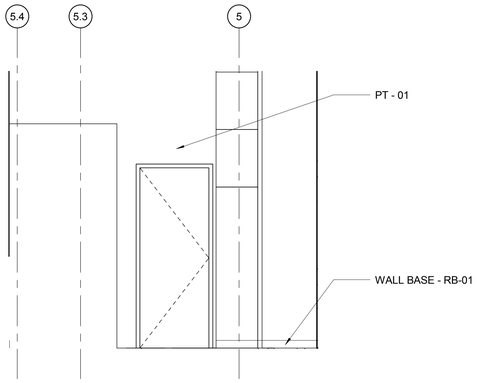
INTERIOR ELEVATIONS - LINE OFFICE WEST

Original drawing is 42 x 30. Do not scale contents of this drawing.

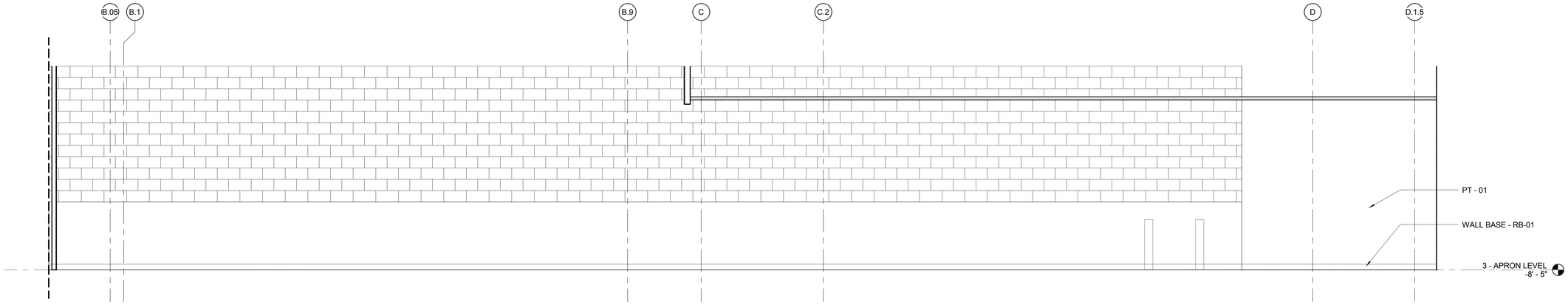
Sheet Number

A602

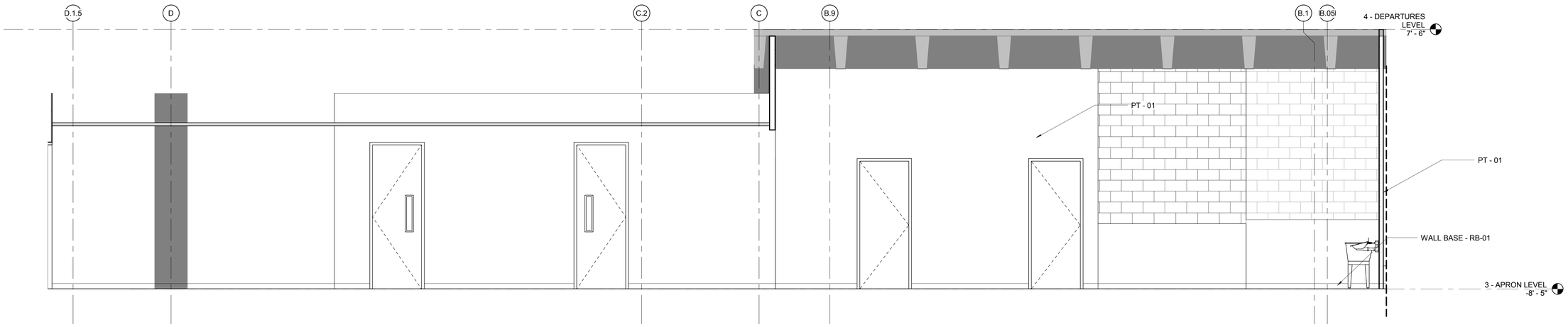
4/15/2015 10:57:39 PM



1 PROPOSED LINE MAINTENANCE 1 - EAST
3/8" = 1'-0"



2 PROPOSED LINE MAINTENANCE 1 - NORTH
3/8" = 1'-0"



3 PROPOSED LINE MAINTENANCE 1 - NORTH
3/8" = 1'-0"

4/15/2015 10:57:54 PM

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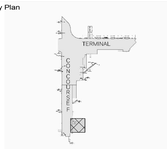
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

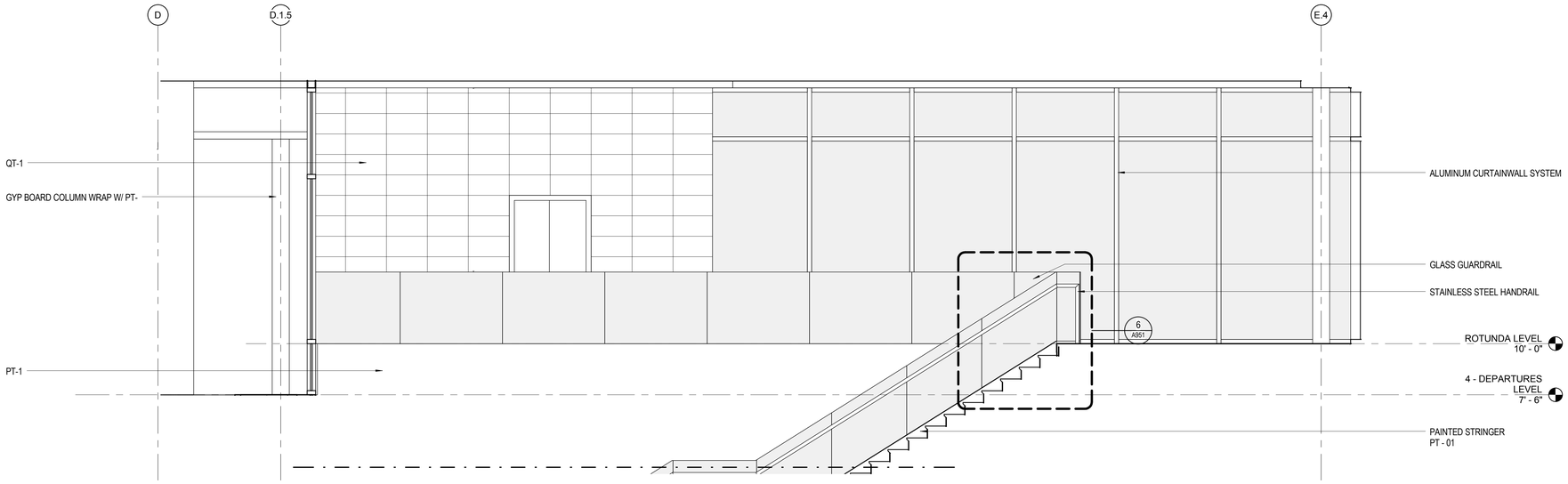
Sheet Title

INTERIOR ELEVATIONS - APRON LEVEL

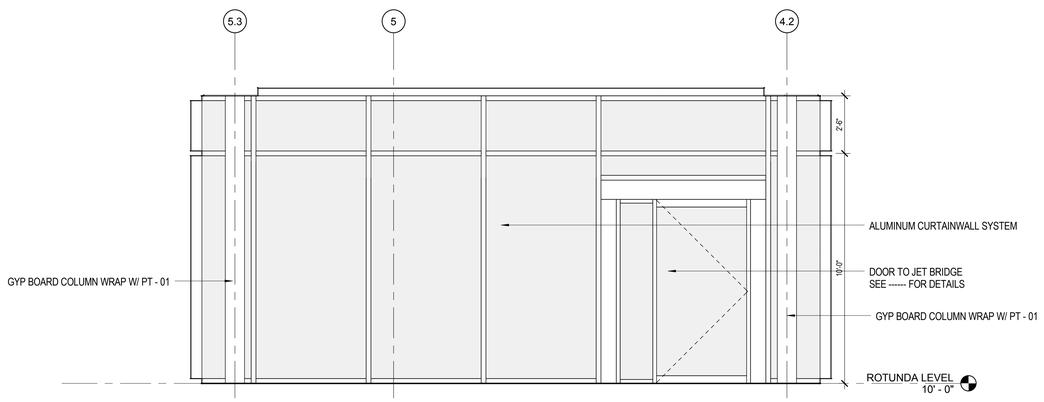
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

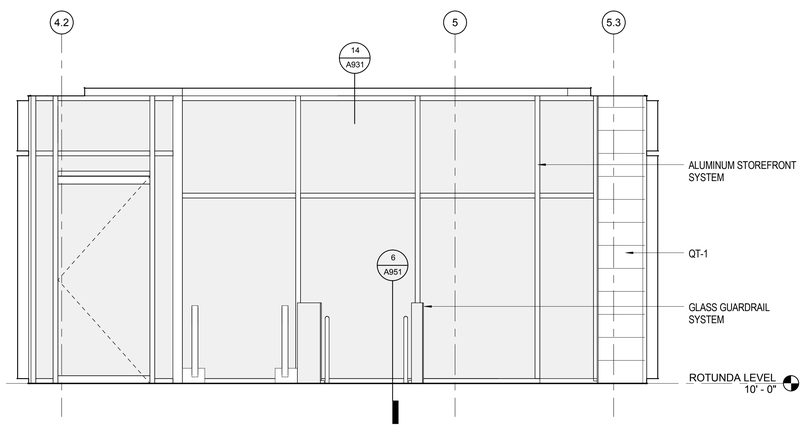
A603



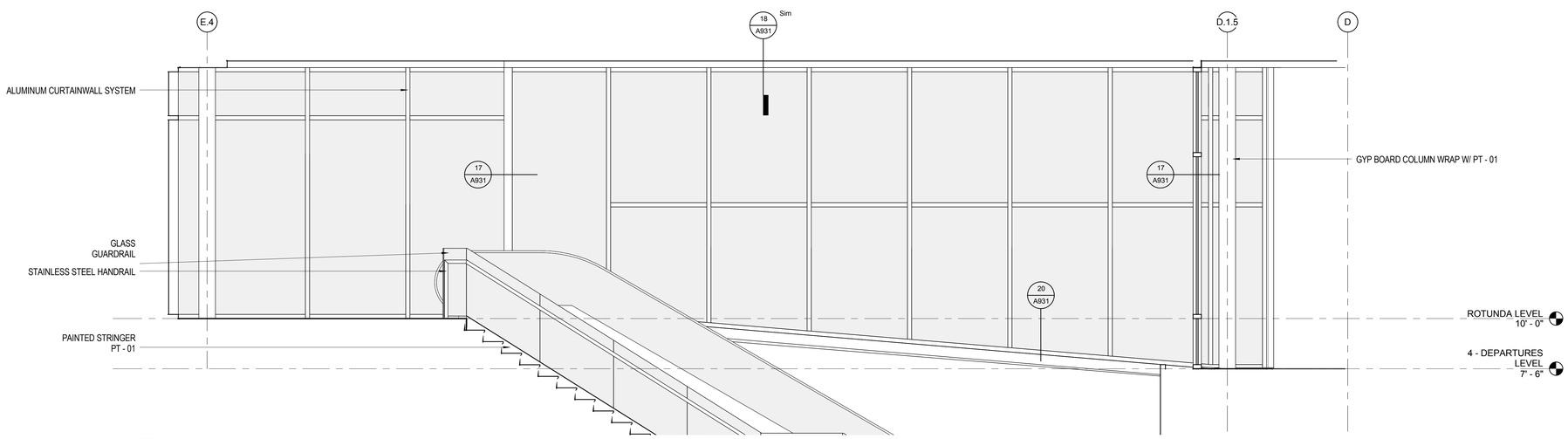
1 DEPARTURES LEVEL - NORTH ELEVATION
3/8" = 1'-0"



2. DEPARTURES LEVEL - EAST ELEVATION
3/8" = 1'-0"



3 DEPARTURES LEVEL - WEST ELEVATION
3/8" = 1'-0"



4. DEPARTURES LEVEL - SOUTH ELEVATION
3/8" = 1'-0"

4/15/2015 10:58:03 PM

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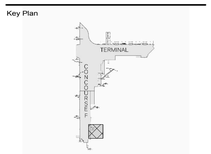
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

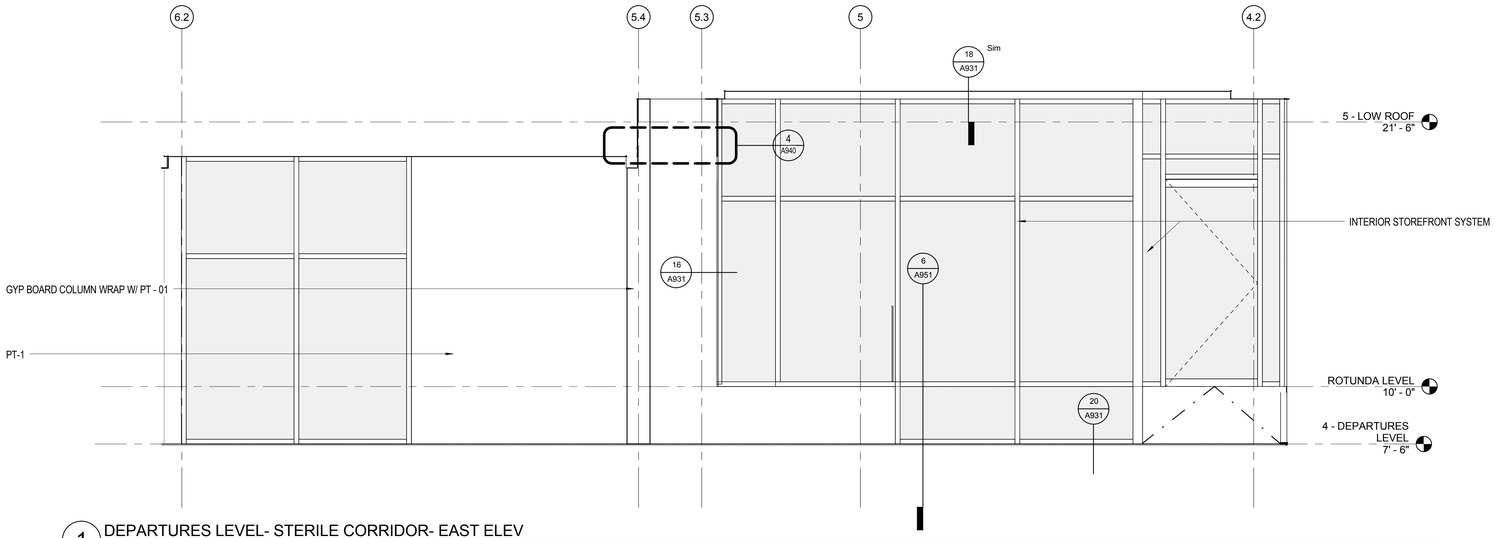
Sheet Title

INTERIOR ELEVATIONS - DEPARTURES LEVEL

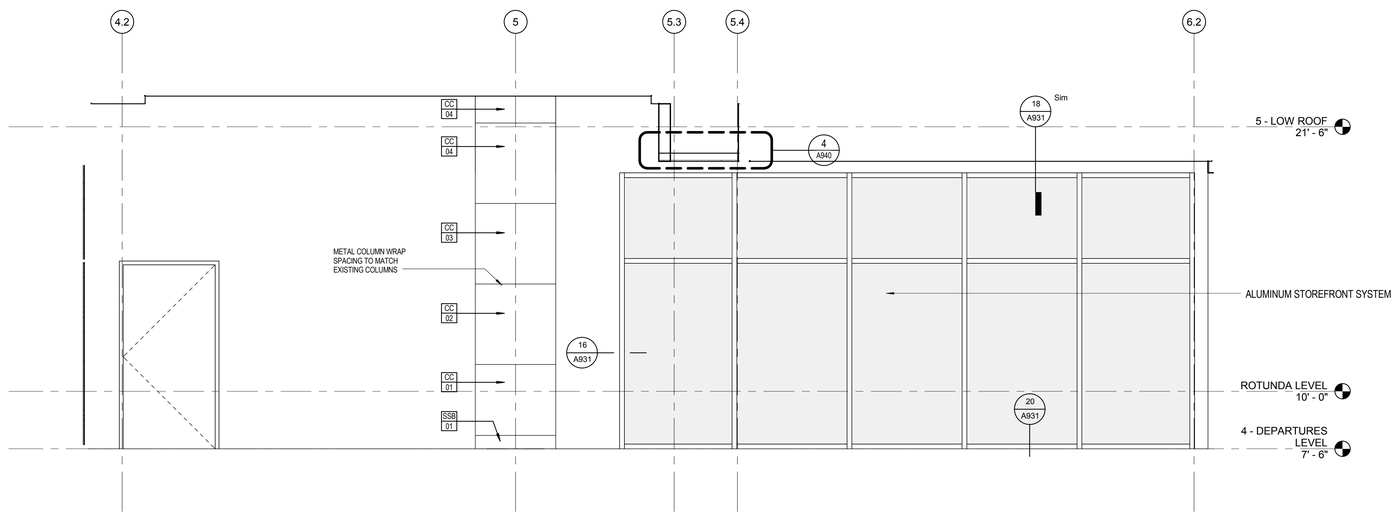
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A604



1 DEPARTURES LEVEL- STERILE CORRIDOR- EAST ELEV
3/8" = 1'-0"



2 DEPARTURES LEVEL - STERILE CORRIDOR- WEST ELEV
3/8" = 1'-0"

4/15/2015 10:58:11 PM

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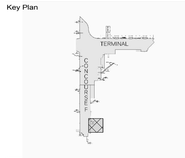
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

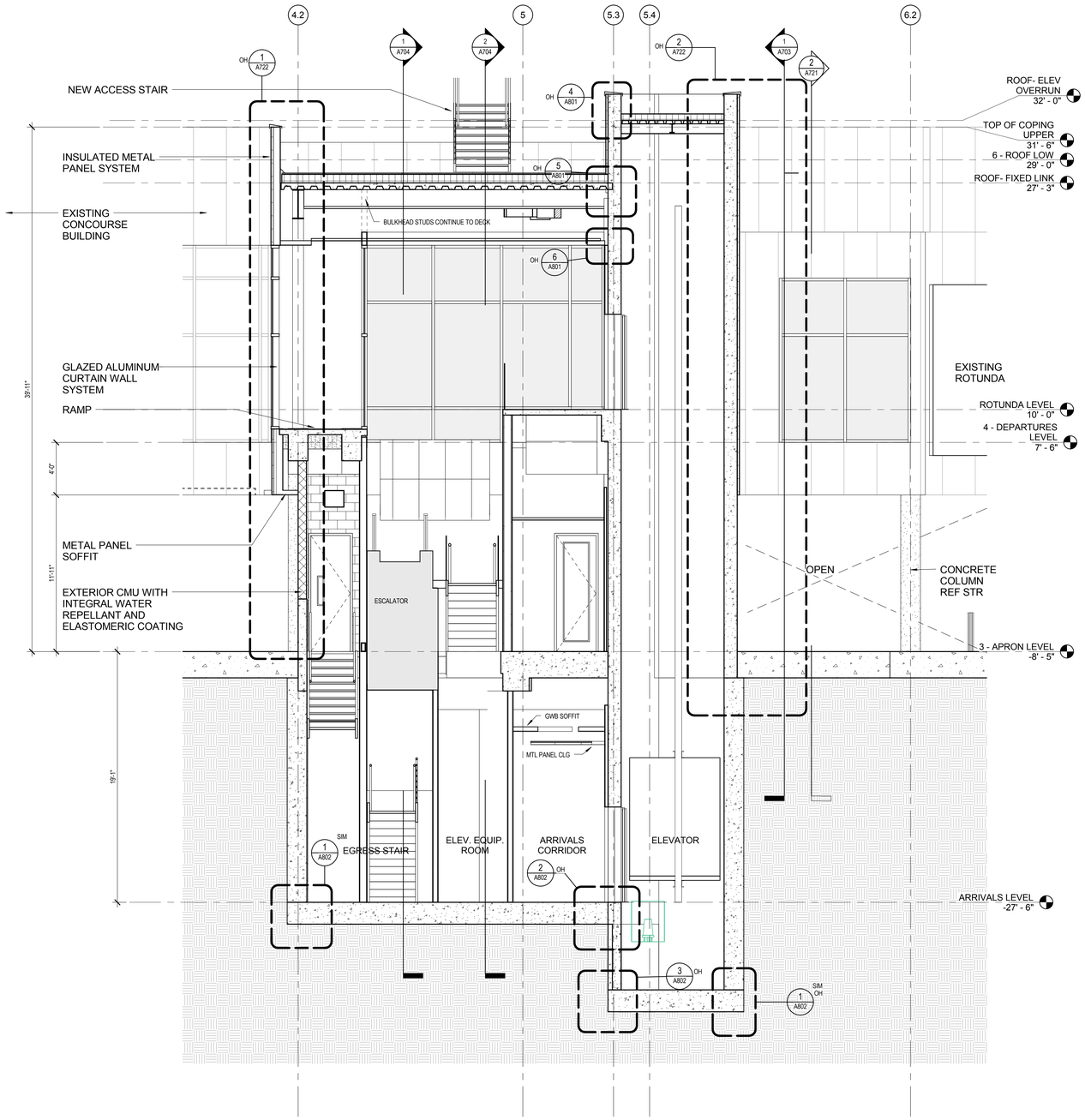
Sheet Title

INTERIOR ELEVATIONS - DEPARTURES LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

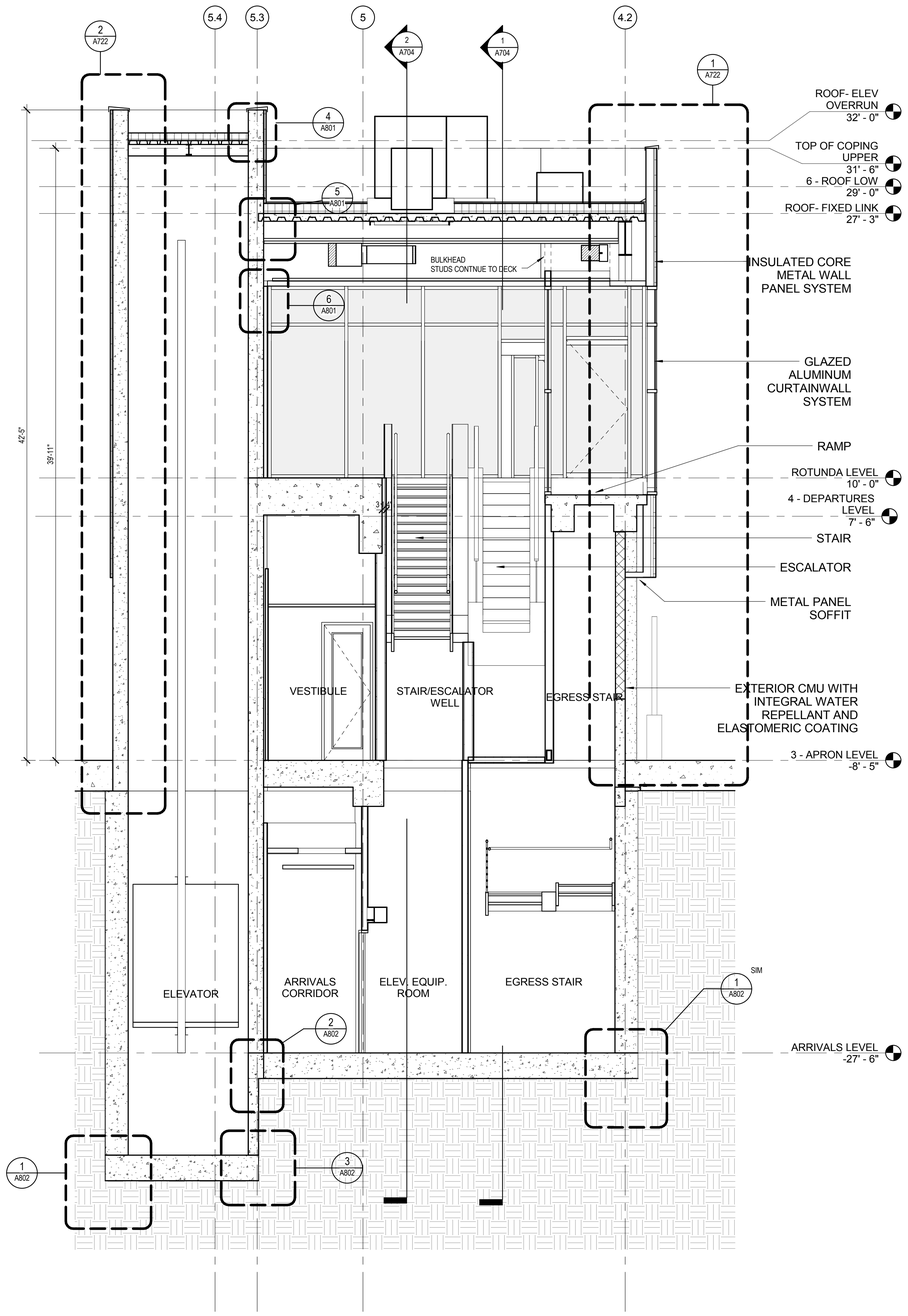
Sheet Number

A605



1 BUILDING CROSS SECTION- VIEW @ TERMINAL
1/4" = 1'-0"

0 4 8 16 32 FT.



2 BUILDING CROSS SECTION- VIEW @ NEW CORE
1/4" = 1'-0"

0 4 8 16 32 FT.

4/15/2015 10:58:21 PM

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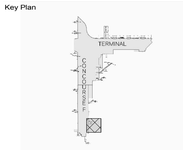
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

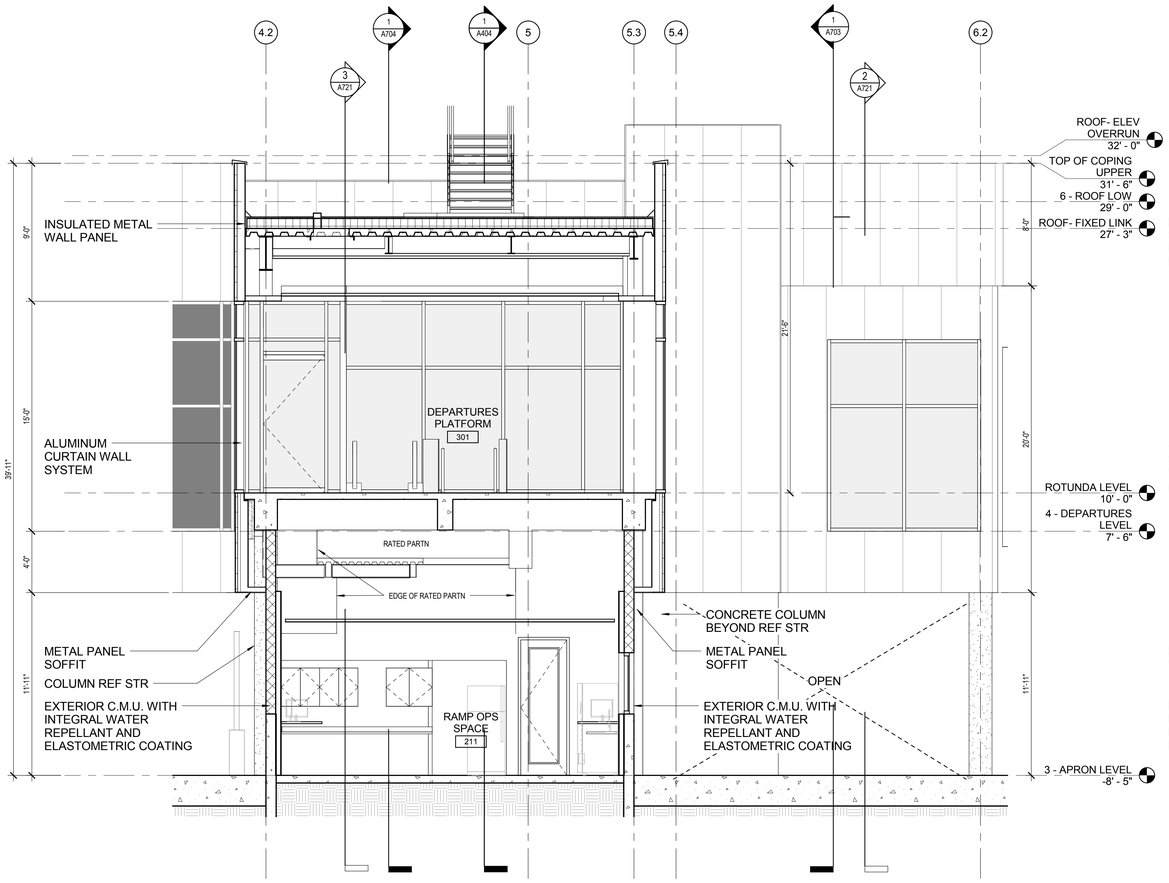
Sheet Title

BUILDING SECTIONS - EAST

Original drawing is 42 x 30. Do not scale contents of this drawing.

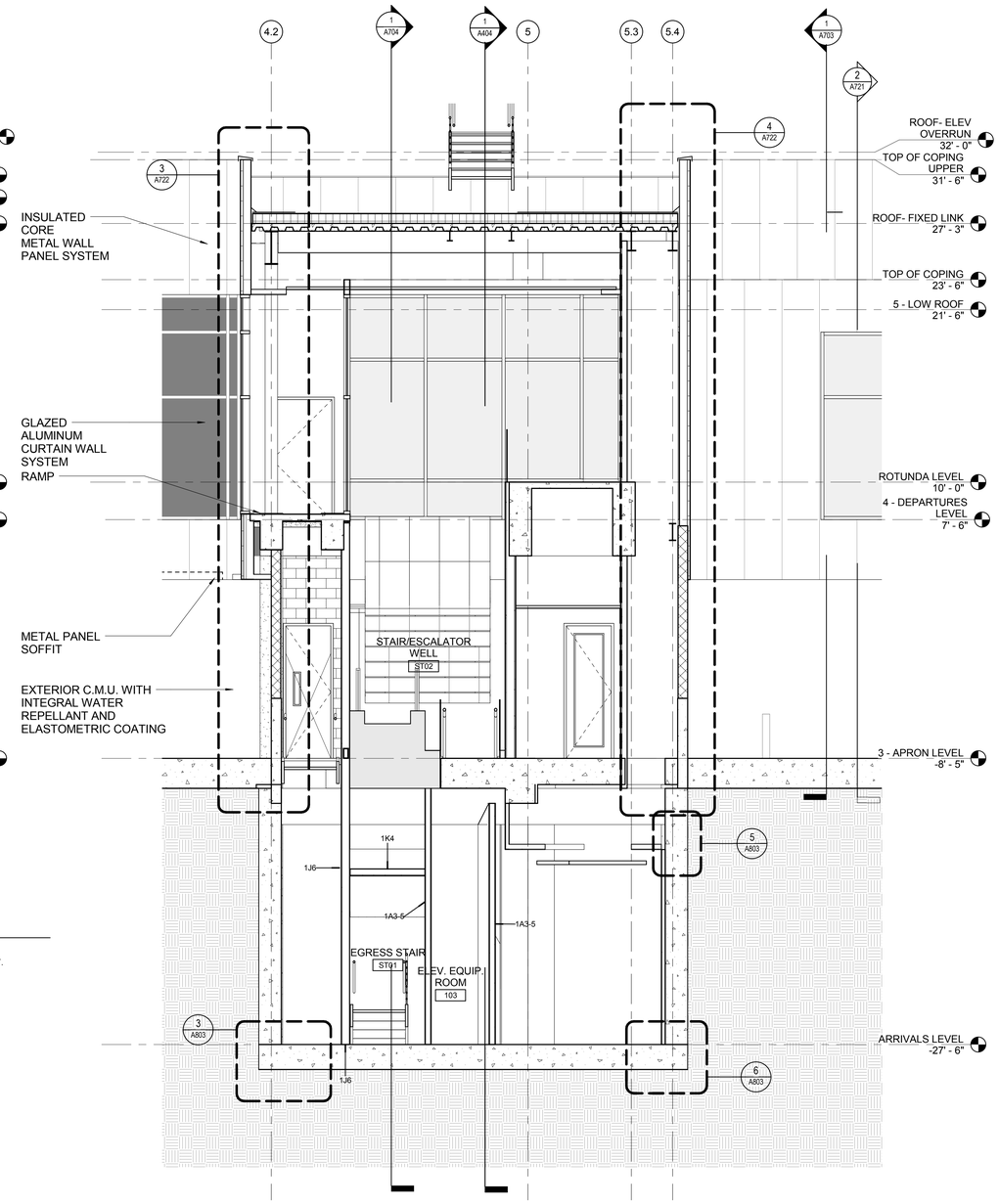
Sheet Number

A701



1 BUILDING CROSS SECTION- VIEW WEST @ TERMINAL
1/4" = 1'-0"

0 4 8 16 32 FT.



2 BUILDING CROSS SECTION- VIEW WEST @ NEW CORE
1/4" = 1'-0"

0 4 8 16 32 FT.

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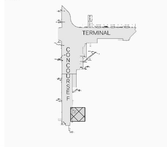
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

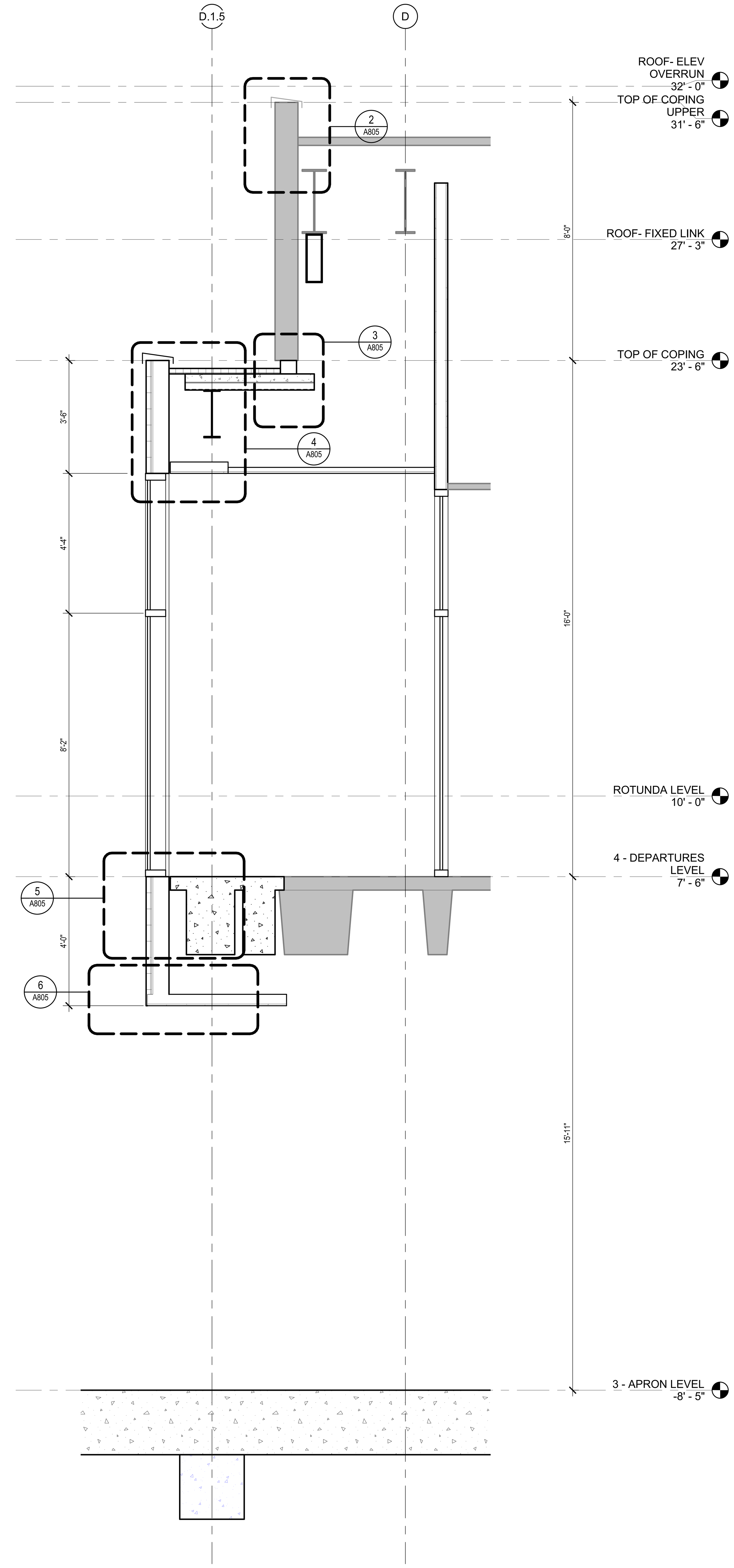
BUILDING SECTIONS - WEST

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A702

4/15/2015 10:58:31 PM



1 SECTION THROUGH CORRIDOR
1/2" = 1'-0"

4/15/2015 10:58:39 PM

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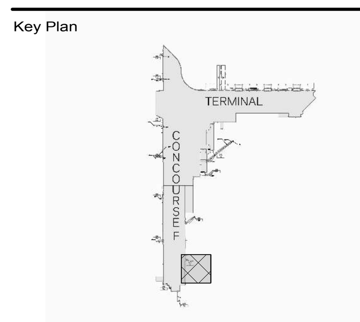
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

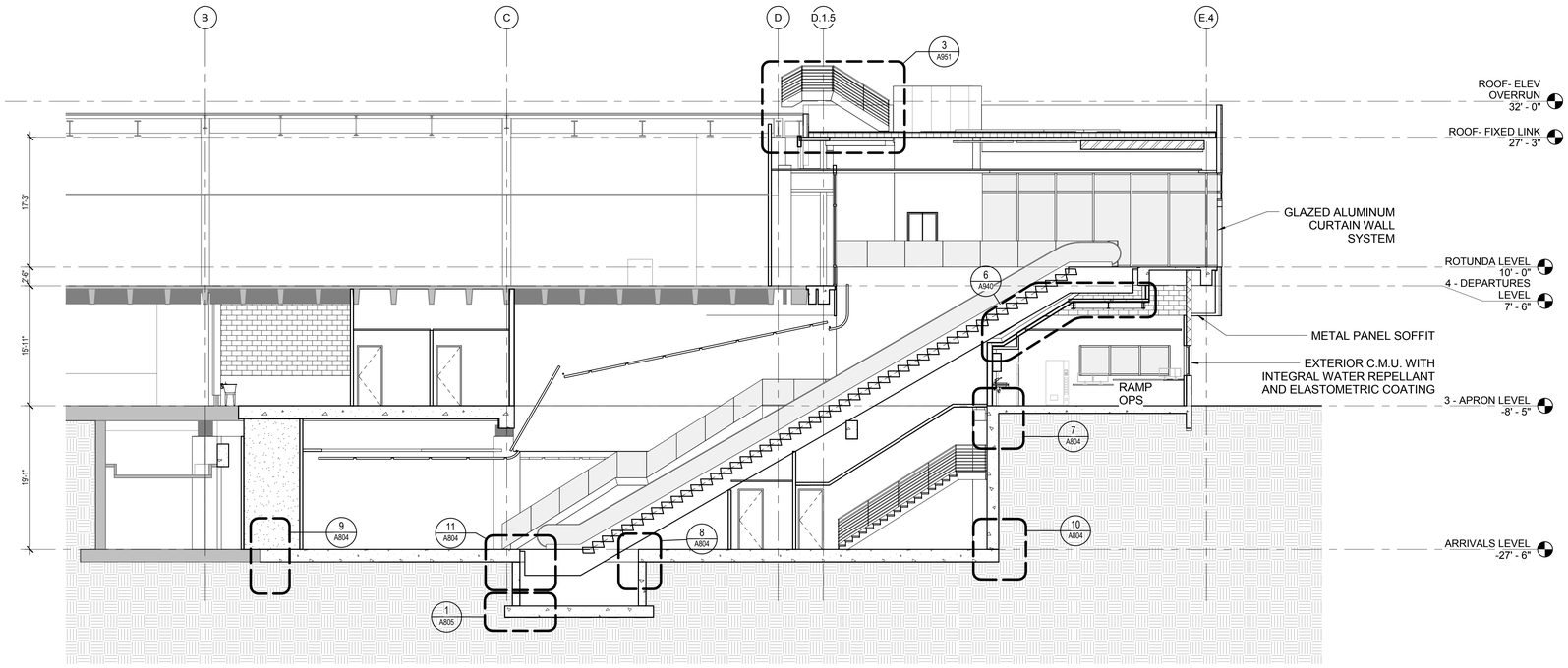
Sheet Title

BUILDING SECTION - NORTH

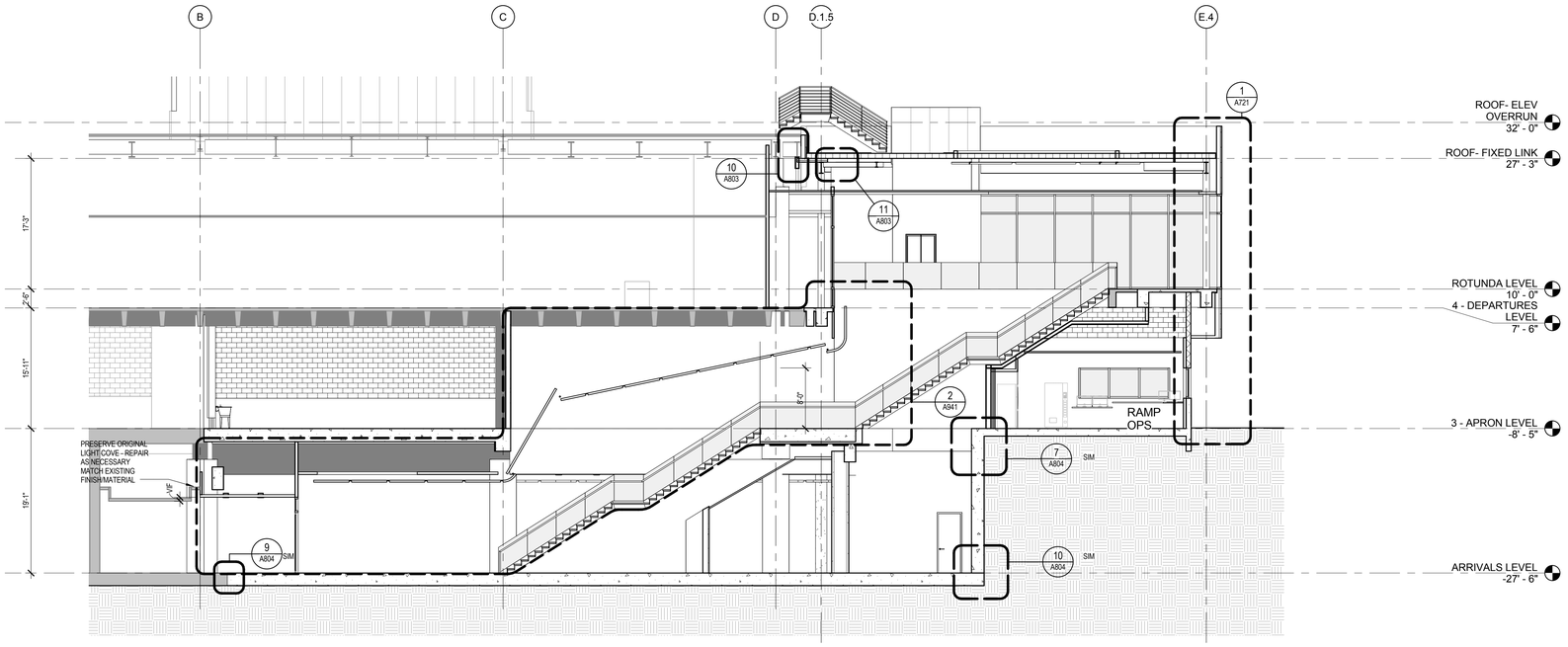
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A703



1 SECTION THROUGH ESCALATOR
1/8" = 1'-0"



2 SECTION THROUGH STAIR
1/8" = 1'-0"

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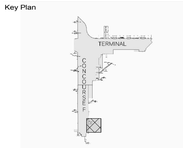
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

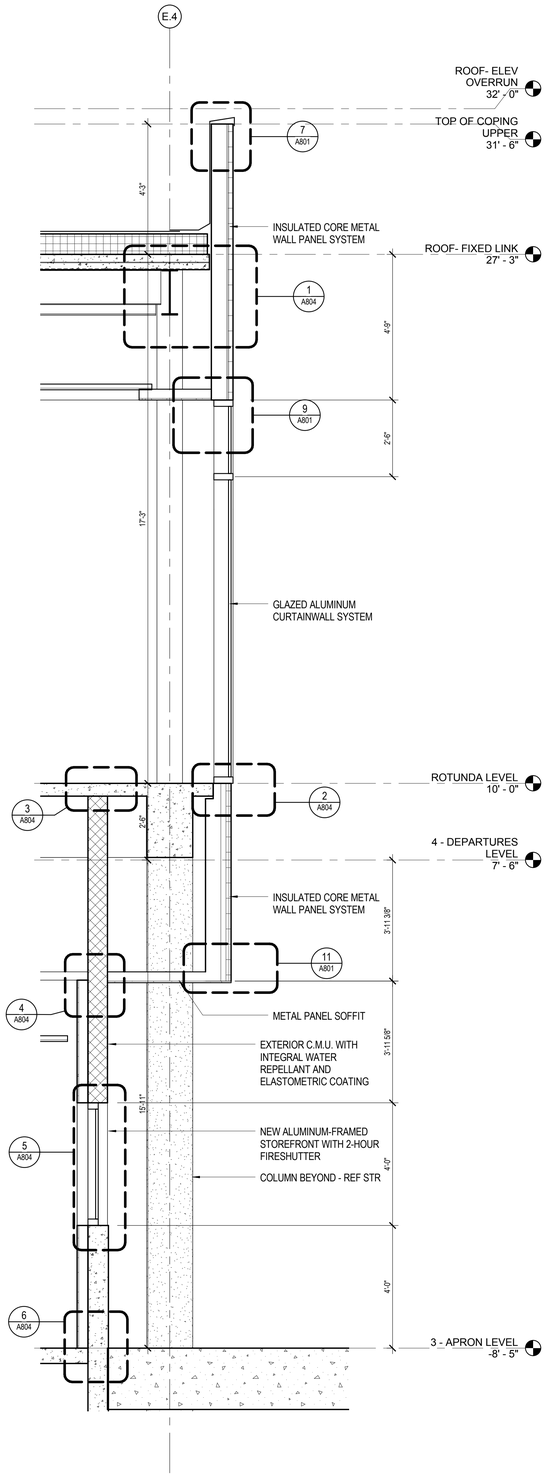
BUILDING SECTIONS - NORTH

Original drawing is 42 x 30. Do not scale contents of this drawing.

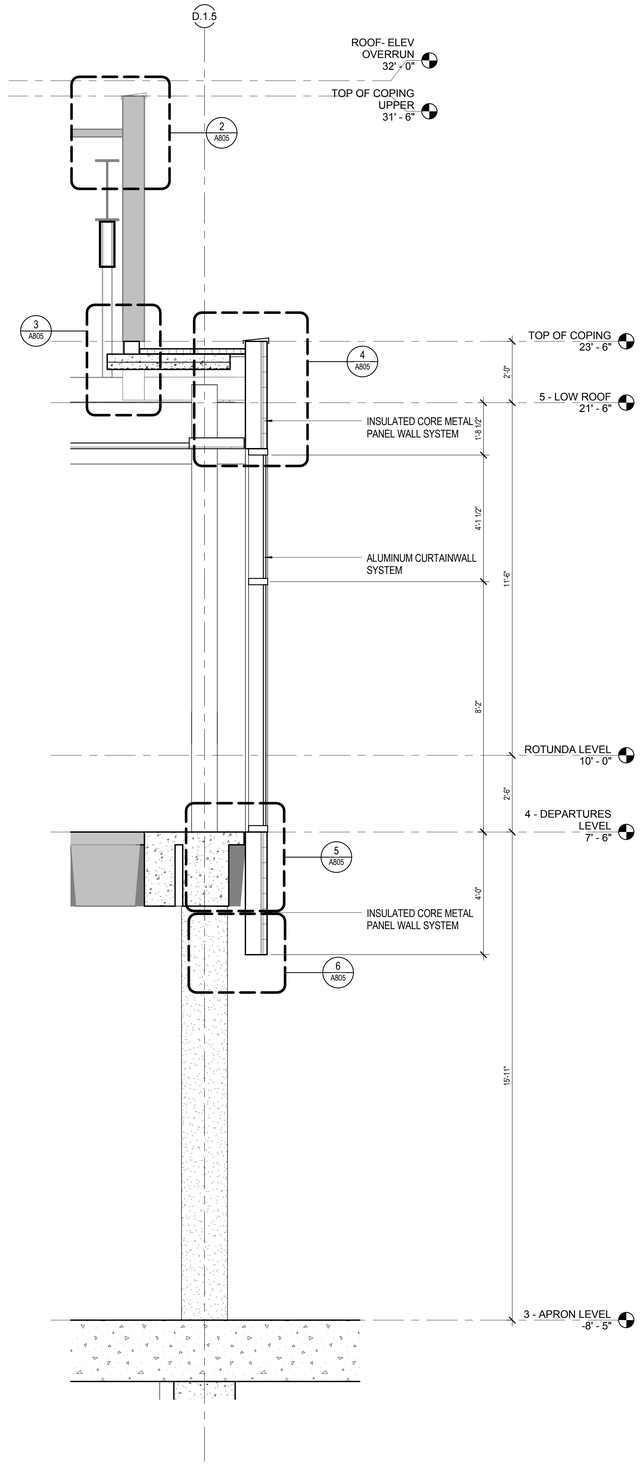
Sheet Number

A704

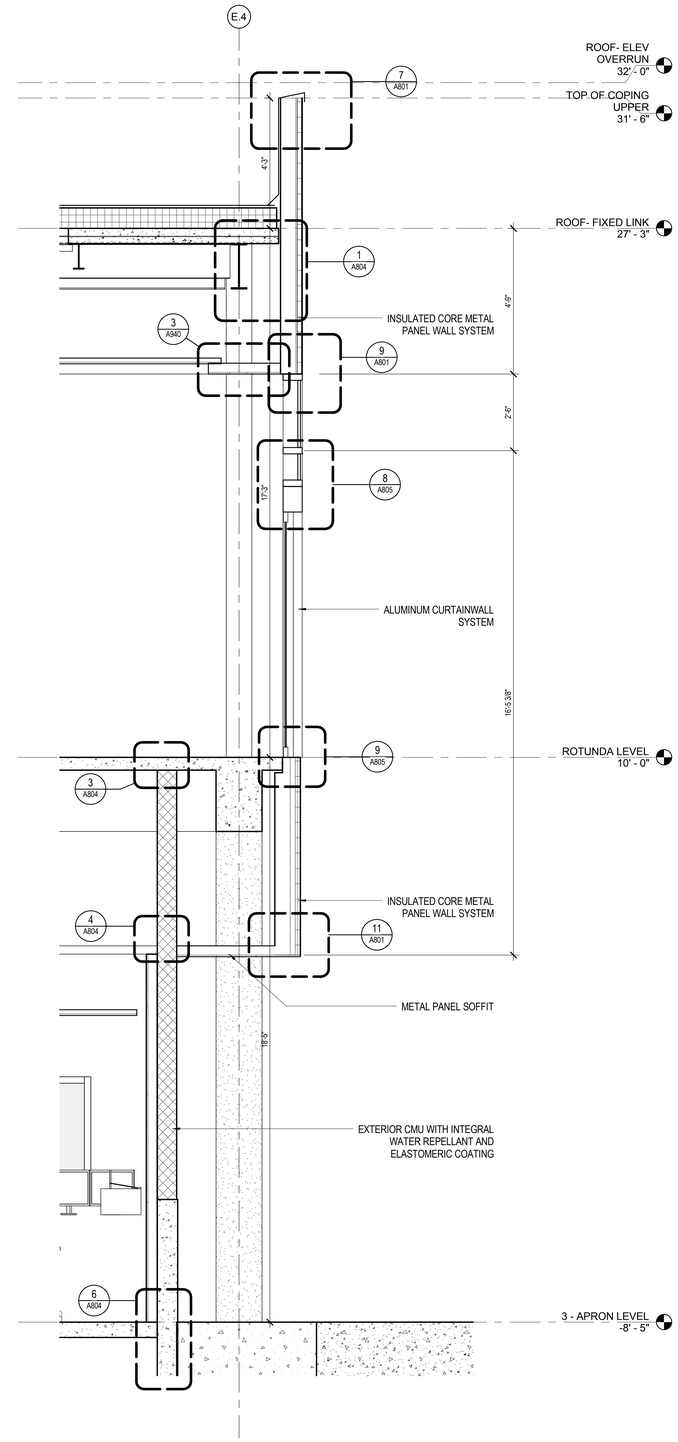
4/15/2015 10:58:50 PM



1 FIXED LINK - TYPICAL WALL SECTION
1/2" = 1'-0"



2 WALL SECTION AT STERILE CORRIDOR EXTENSION
1/2" = 1'-0"



3 SECTION THROUGH ROTUNDA CONNECTION
1/2" = 1'-0"

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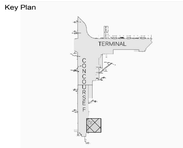
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

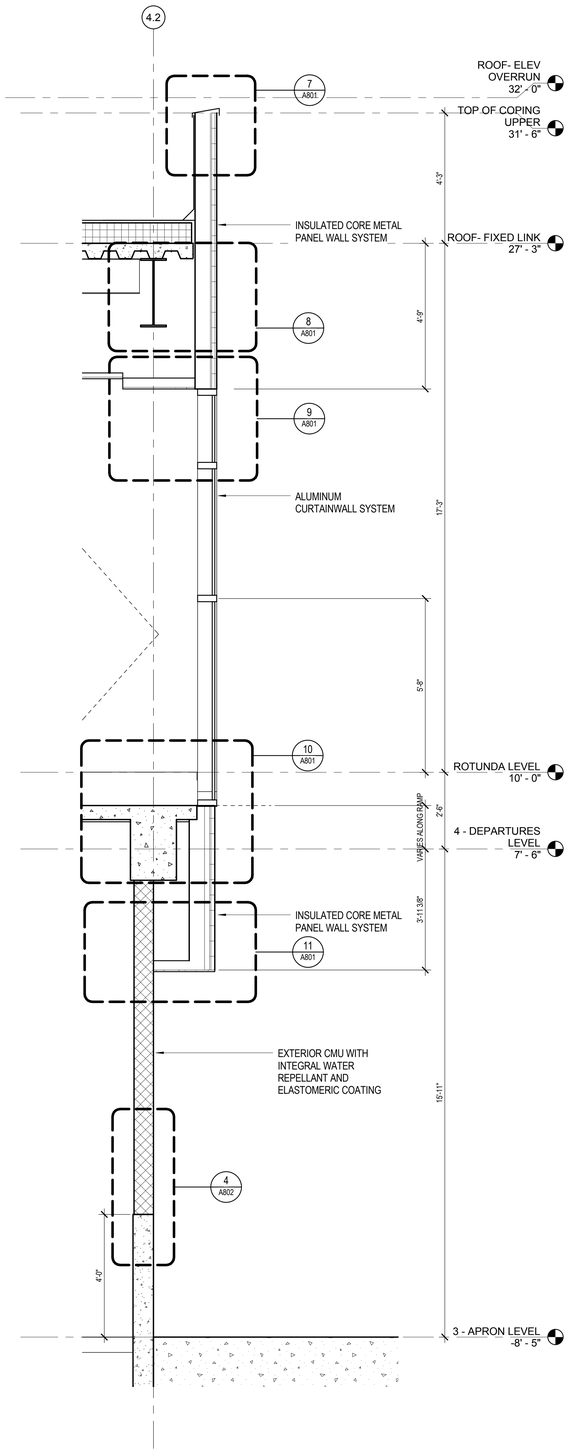
EXTERIOR WALL SECTIONS

Original drawing is 42 x 30. Do not scale contents of this drawing.

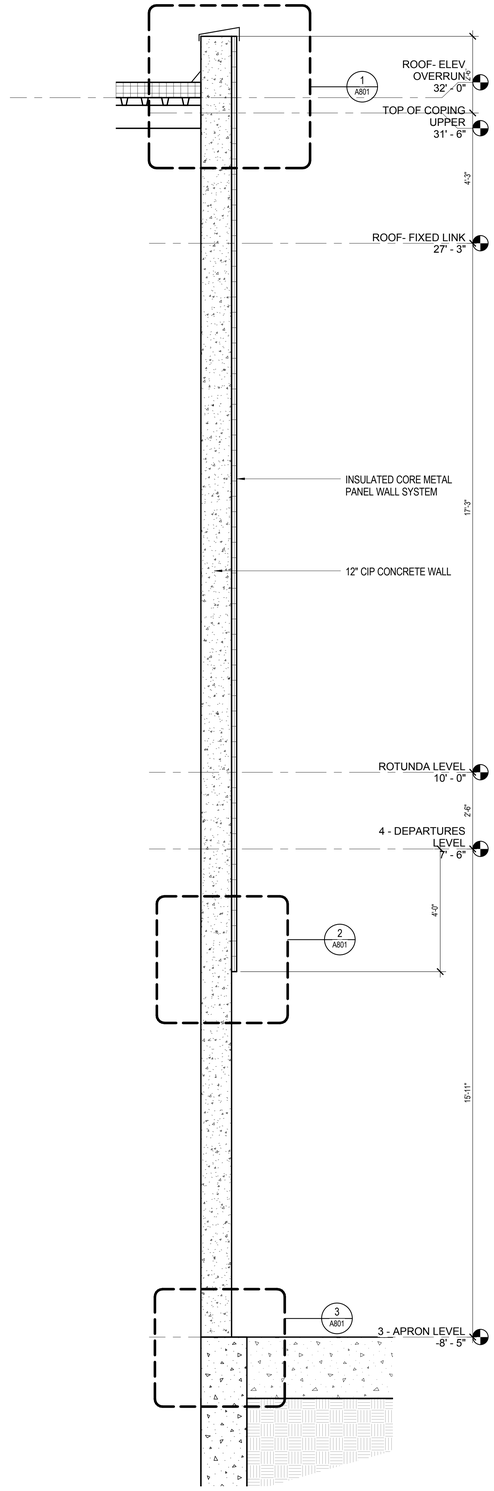
Sheet Number

A721

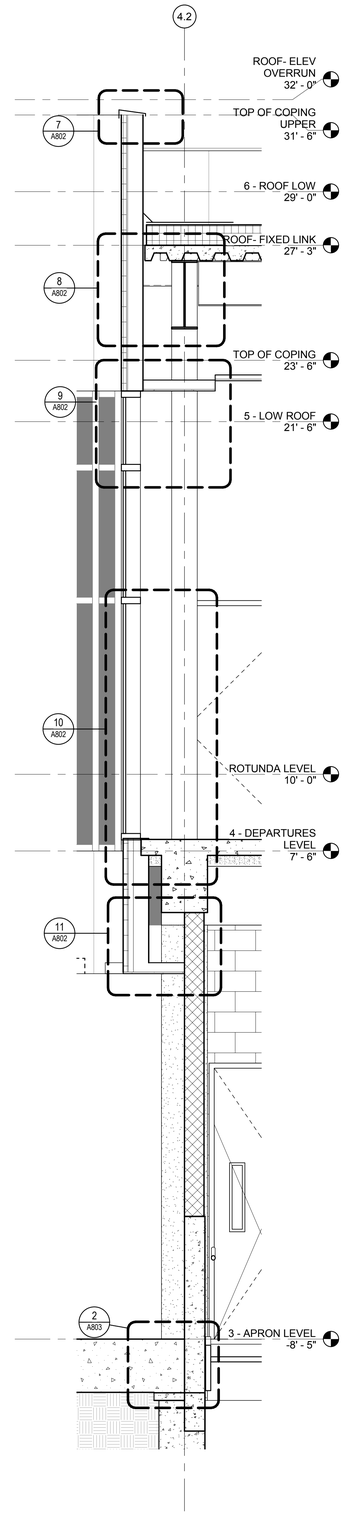
4/15/2015 10:59:00 PM



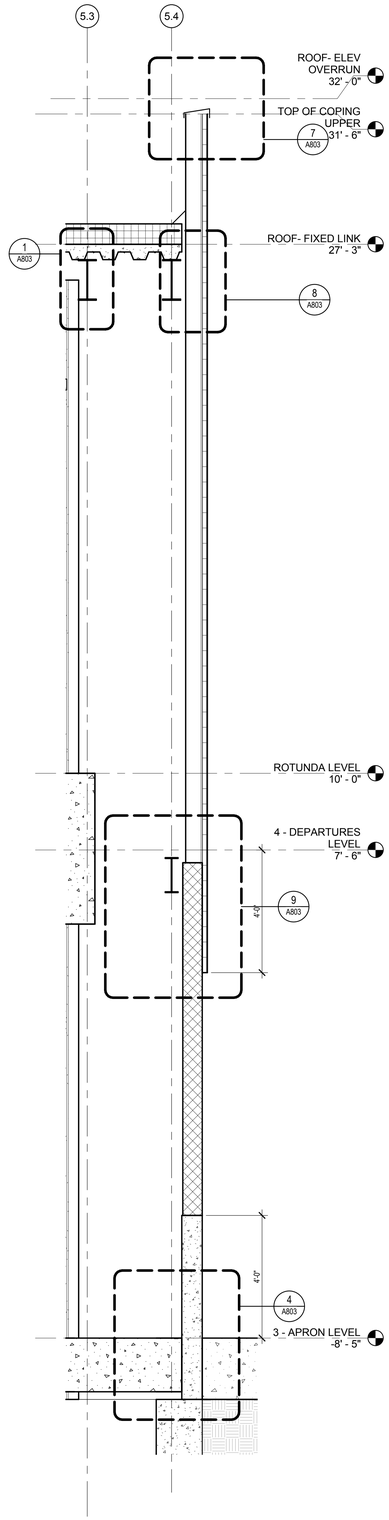
1 SECTION THROUGH FIXED LINK AT RAMP
1/2" = 1'-0"



2 ELEVATOR CORE - WALL SECTION
1/2" = 1'-0"



3 WALL SECTION AT NEW CORE
1/2" = 1'-0"



4 WALL SECTION @ SHAFT WALL
1/2" = 1'-0"

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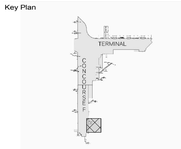


Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

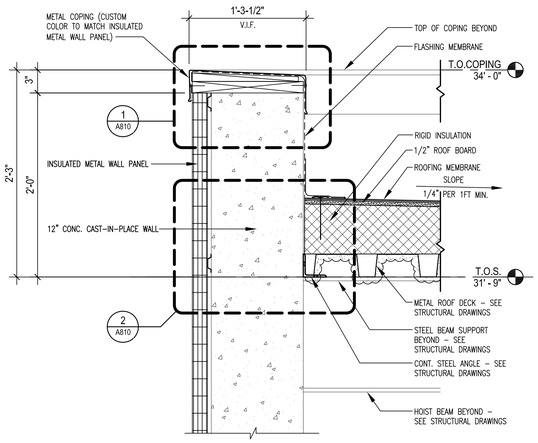
EXTERIOR WALL SECTIONS

Original drawing is 42 x 30. Do not scale contents of this drawing.

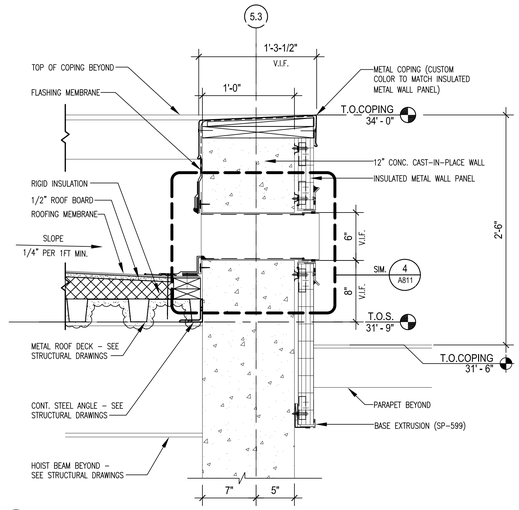
Sheet Number

A722

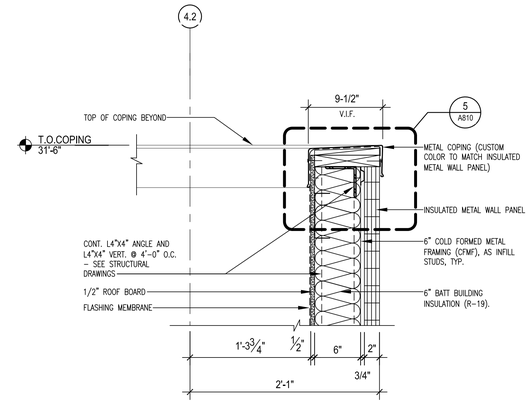
4/15/2015 10:59:09 PM



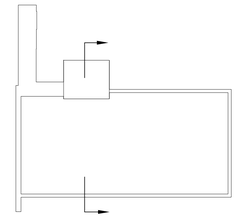
1 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



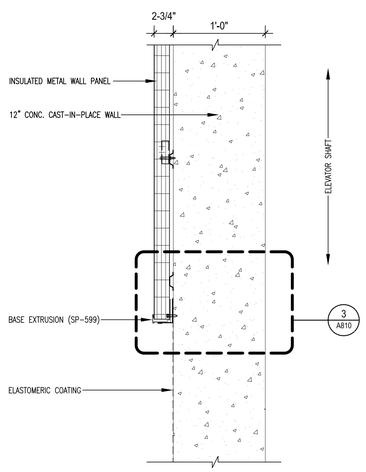
4 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



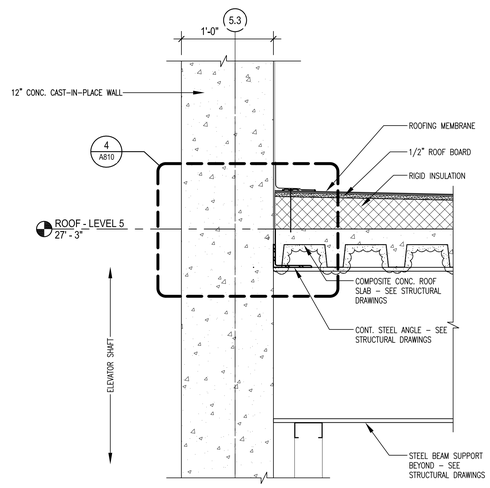
6 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



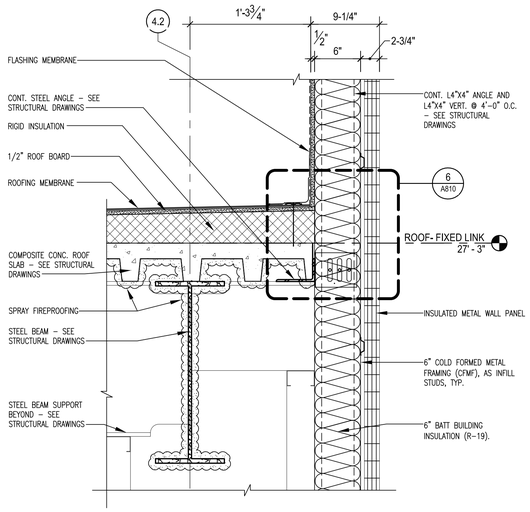
KEY PLAN



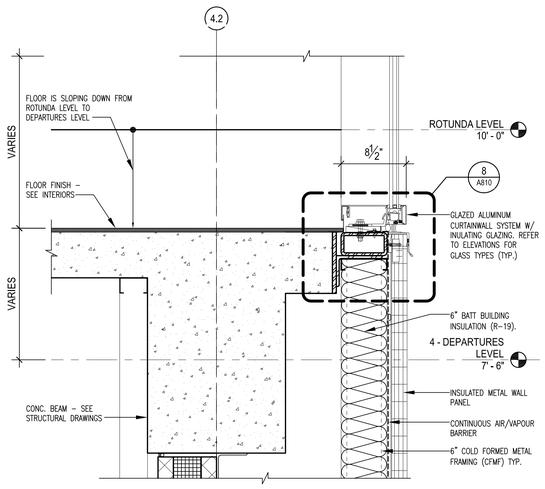
2 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



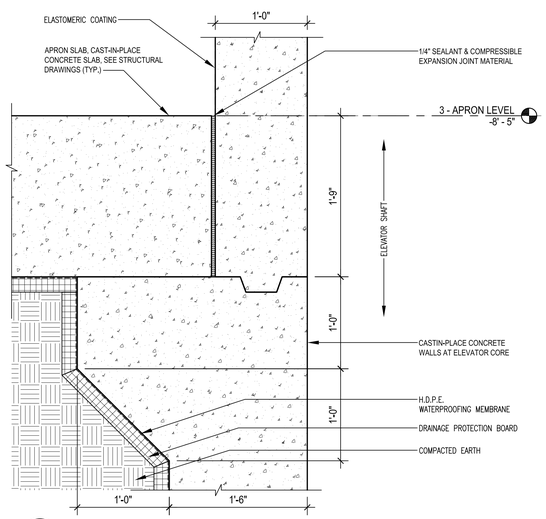
5 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



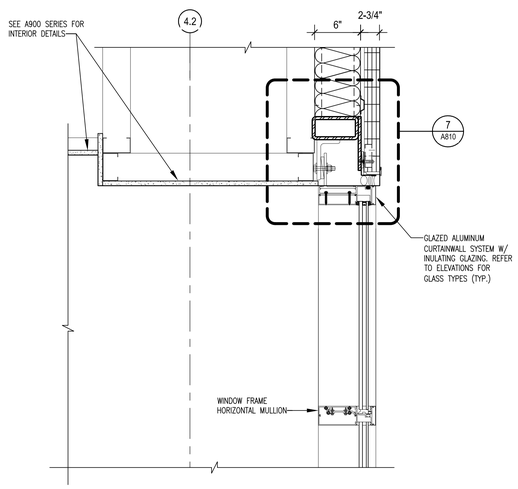
7 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



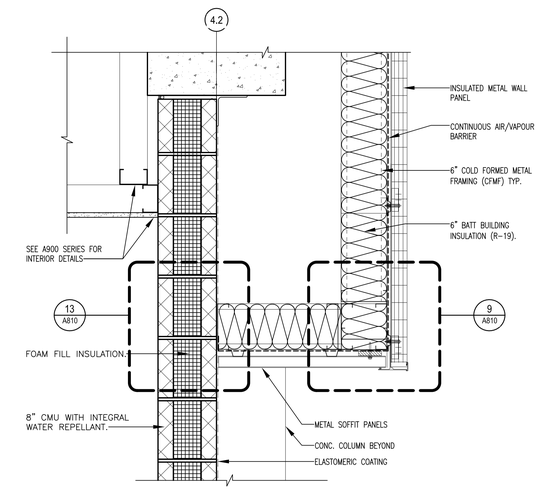
9 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



3 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



8 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



10 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"

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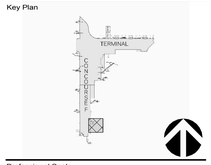
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: SLS Reviewed by: ILS

Project No:

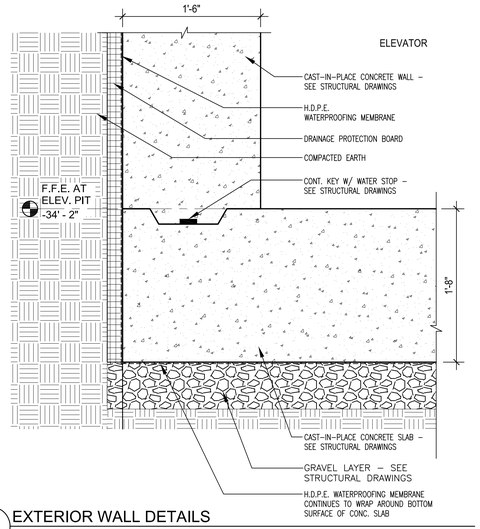
Sheet Title

EXTERIOR WALL SECTION DETAILS

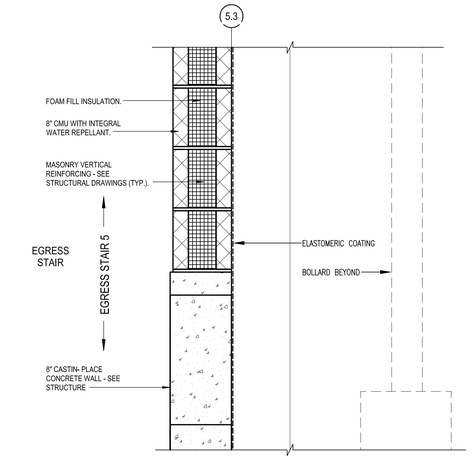
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

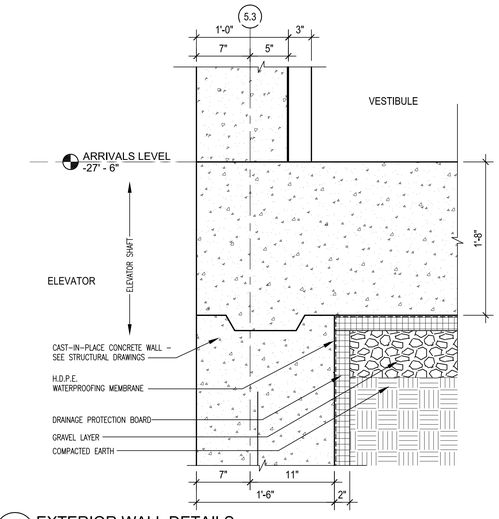
A801



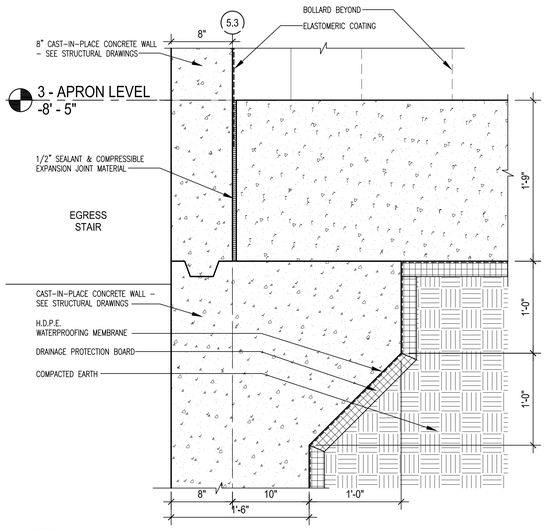
1 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



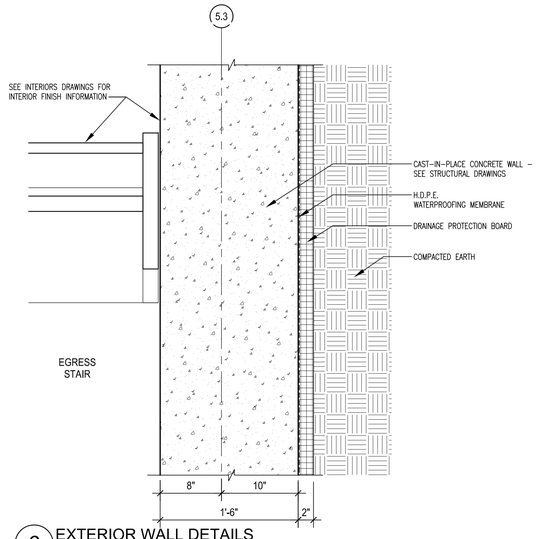
4 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



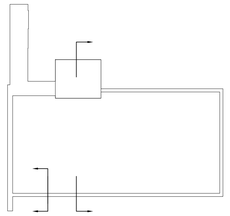
2 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



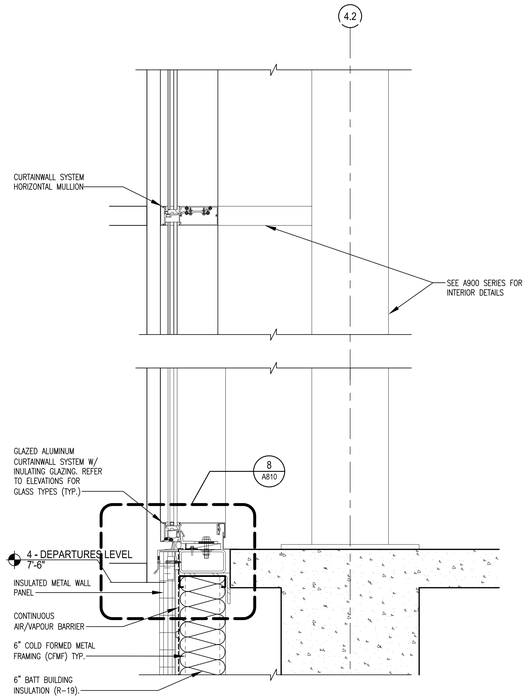
5 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



6 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



KEY PLAN



10 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"

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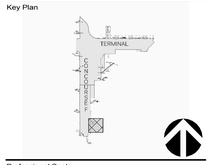
Key Plan



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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: SLS Reviewed by: ILS

Project No:

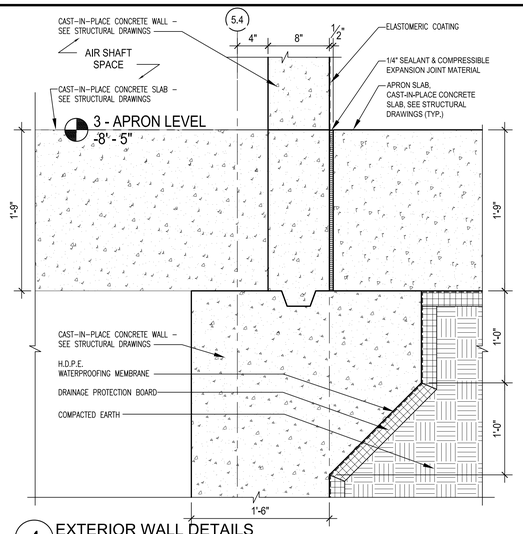
Sheet Title

EXTERIOR WALL SECTION DETAILS

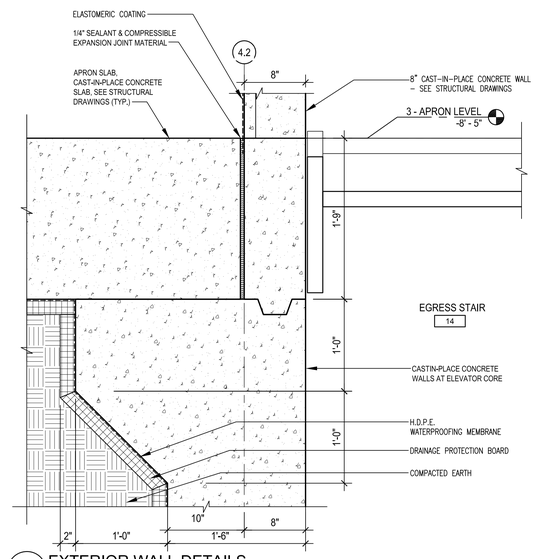
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A802



4 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



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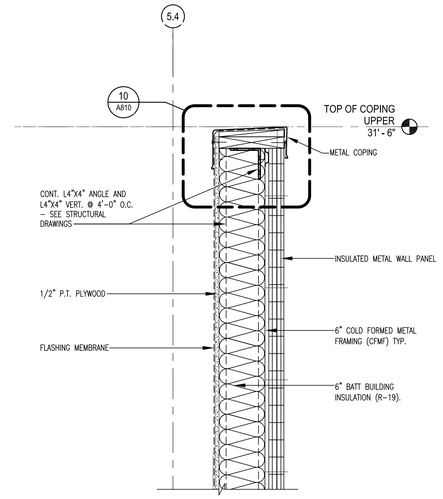
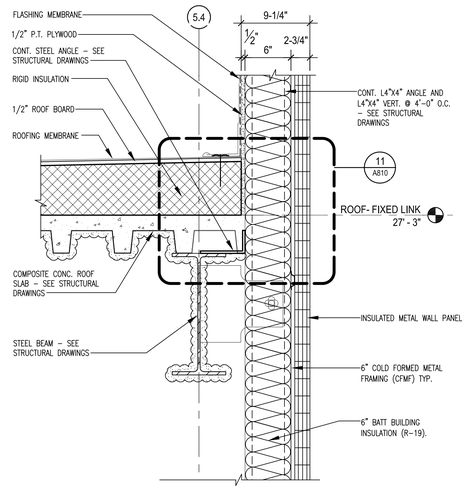
1-1/2" = 1'-0"



7 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



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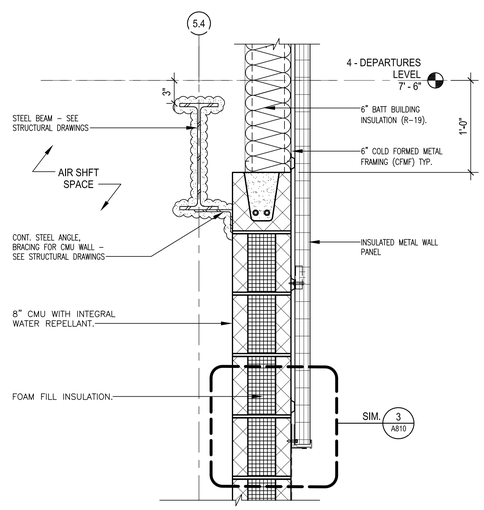
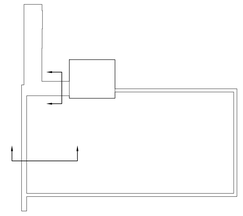
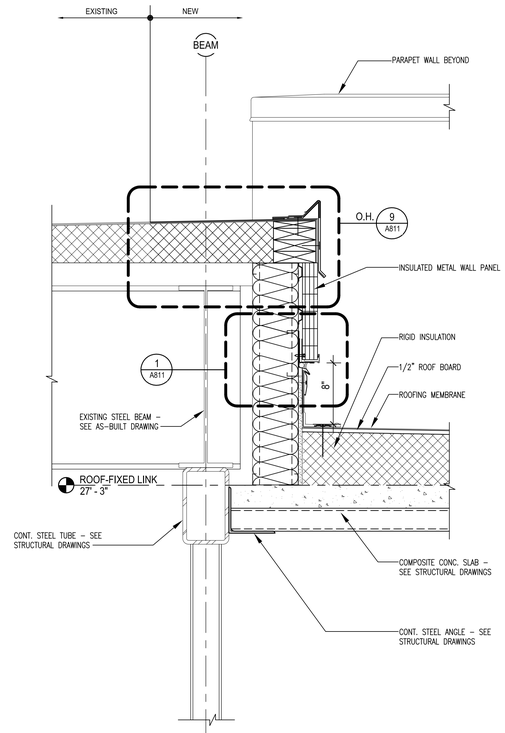
1-1/2" = 1'-0"



9 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



KEY PLAN



10 EXTERIOR WALL DETAILS
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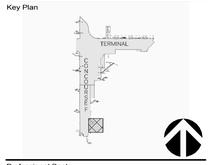

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Drawn by: SLS Reviewed by: ILS

Project No:

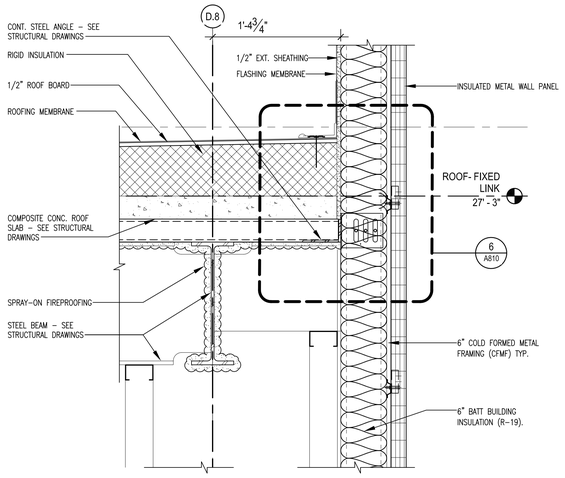
Sheet Title

EXTERIOR WALL SECTION DETAILS

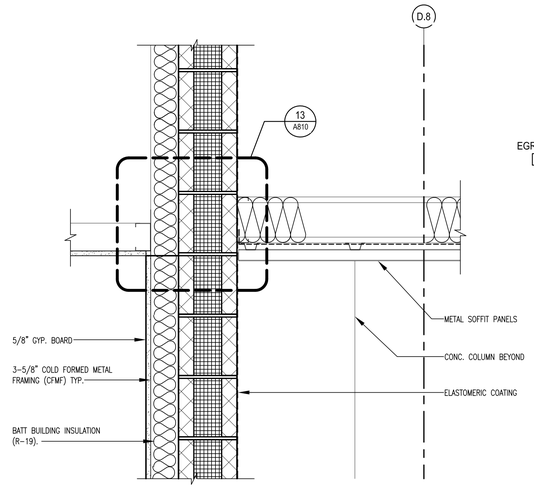
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

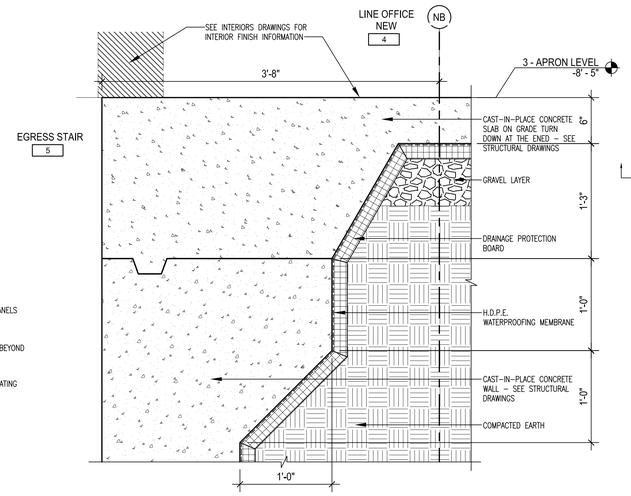
A803



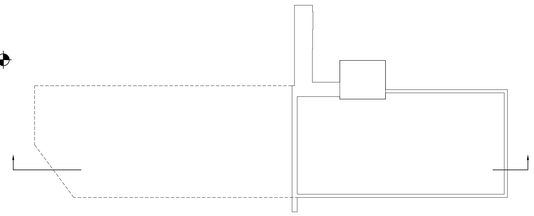
1 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



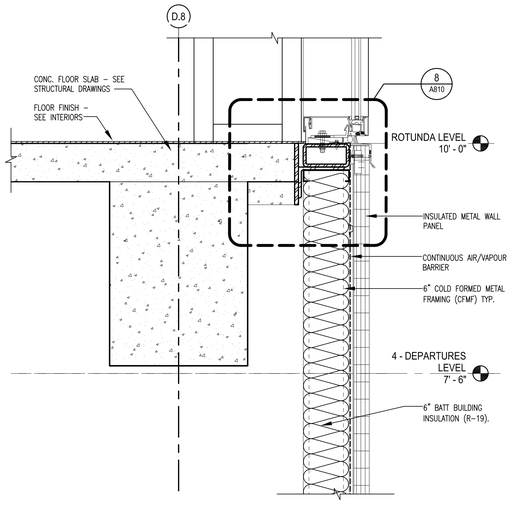
4 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



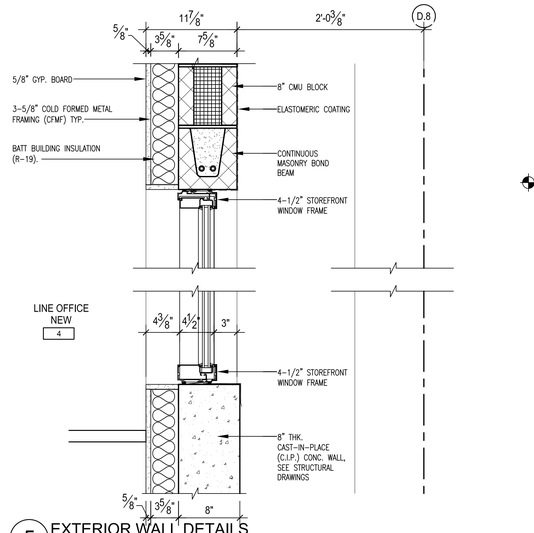
7 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



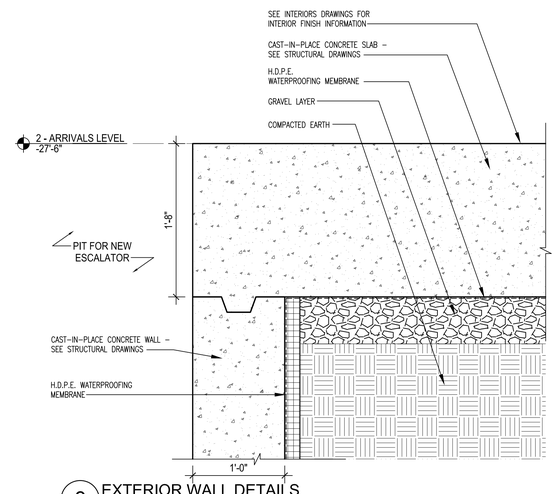
KEY PLAN



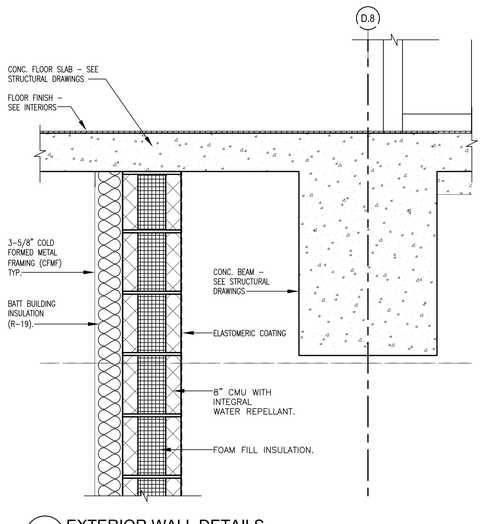
2 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



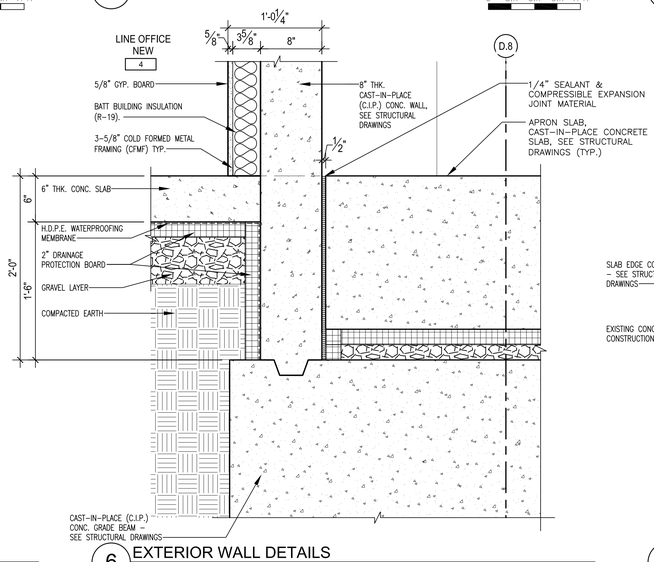
5 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



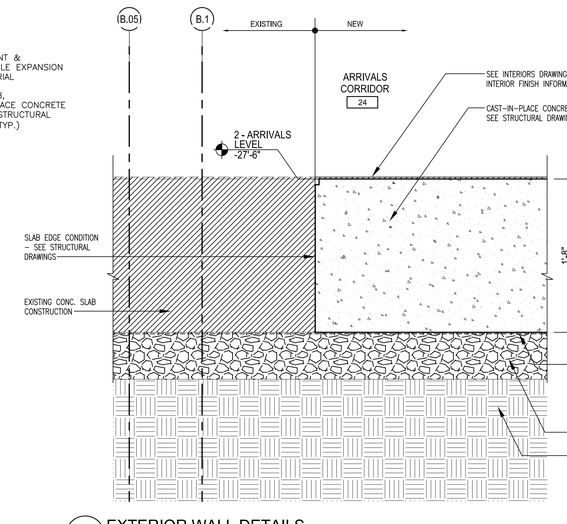
8 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



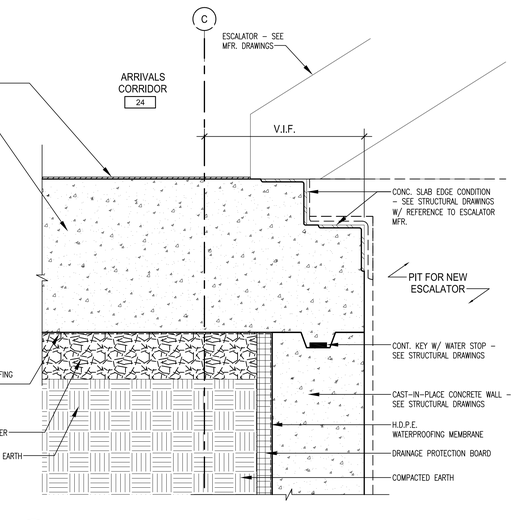
3 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



6 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



9 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



11 EXTERIOR WALL DETAILS
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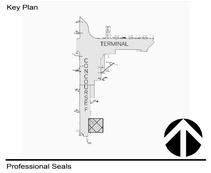

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Drawn by: SLS Reviewed by: ILS

Project No:

Sheet Title

EXTERIOR WALL SECTION DETAILS

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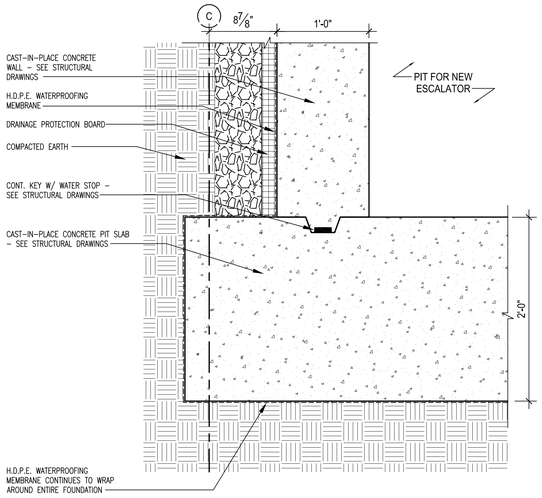
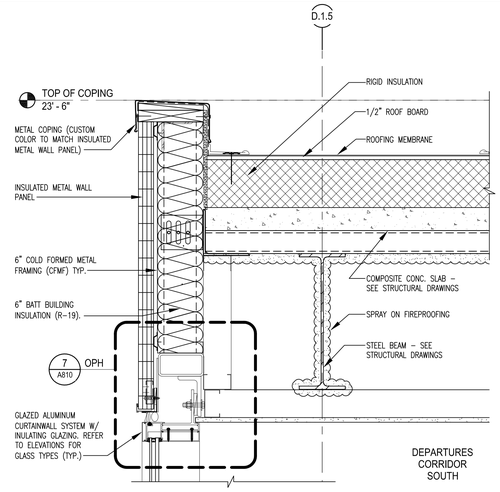
Sheet Number

A804



1 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



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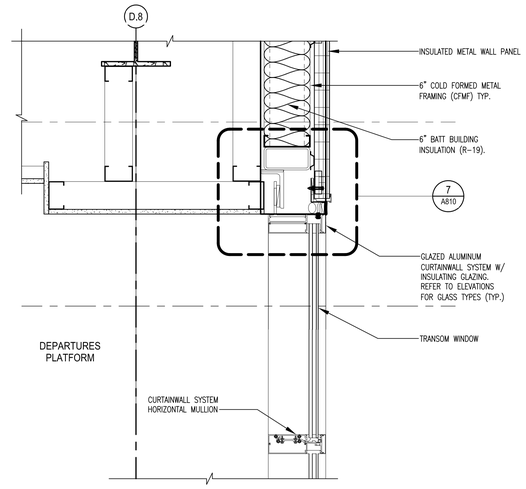
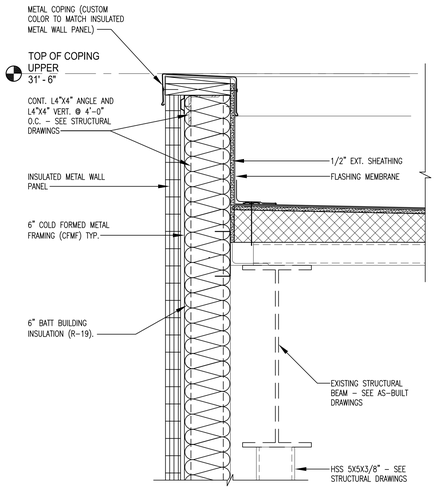
1-1/2" = 1'-0"



7 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



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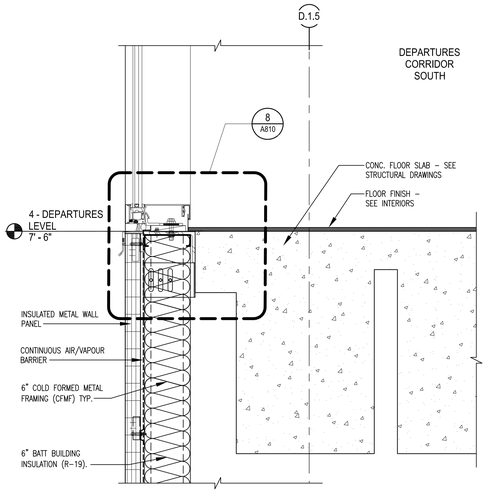
1-1/2" = 1'-0"



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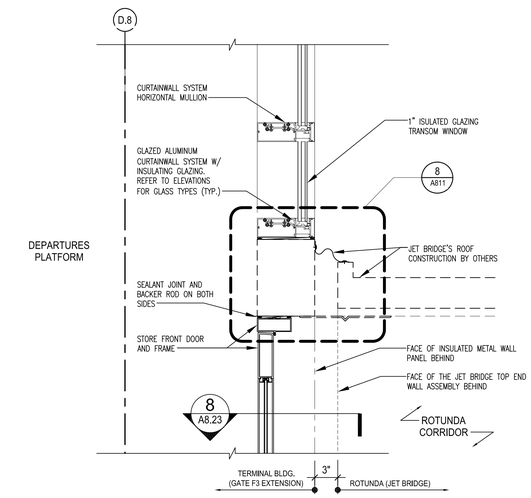
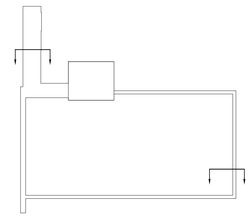
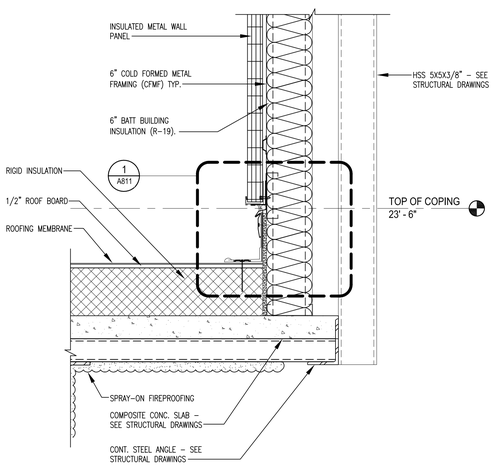
1-1/2" = 1'-0"



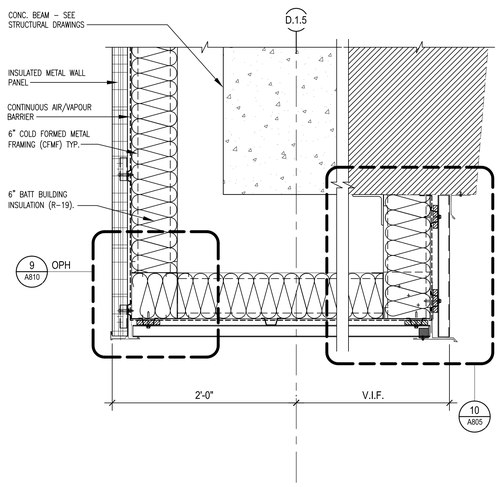
8 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



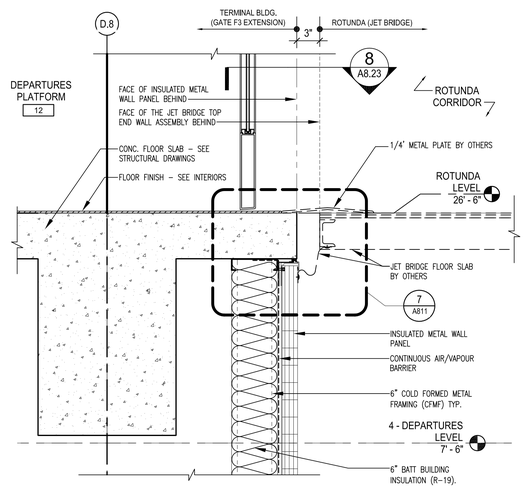
KEY PLAN



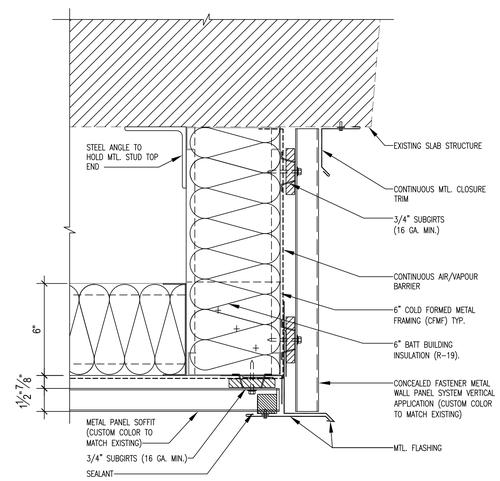
3 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



6 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



9 EXTERIOR WALL DETAILS
1-1/2" = 1'-0"



10 EXTERIOR WALL DETAILS
3" = 1'-0"

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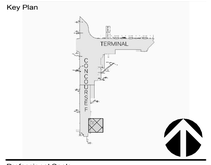
Key Plan



Professional Seals

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3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: SLS Reviewed by: ILS

Project No:

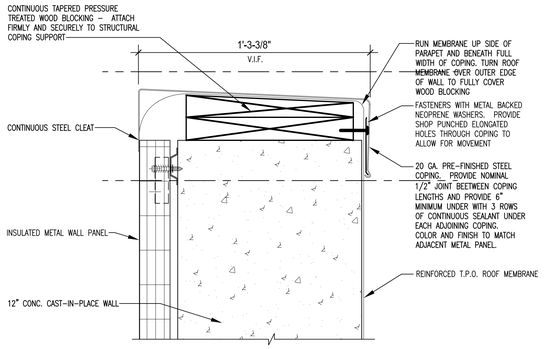
Sheet Title

EXTERIOR WALL SECTION DETAILS

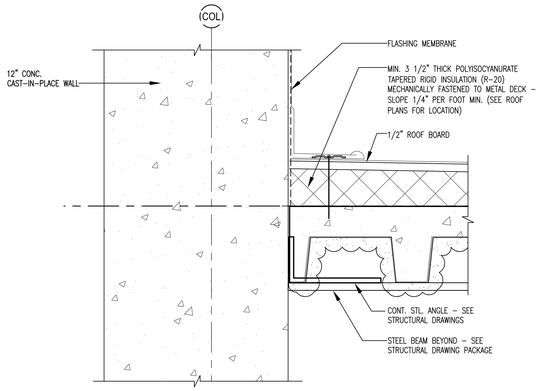
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A805



1 EXTERIOR WALL DETAILS
3" = 1'-0"



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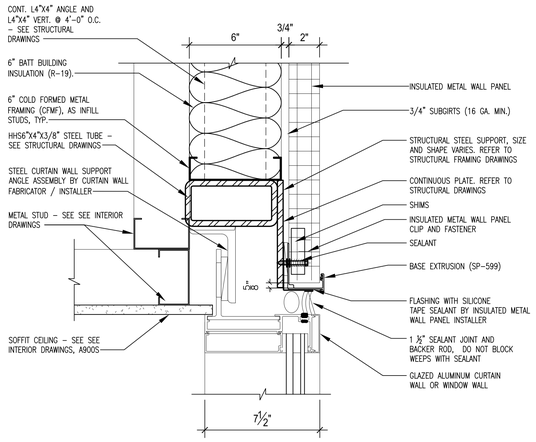

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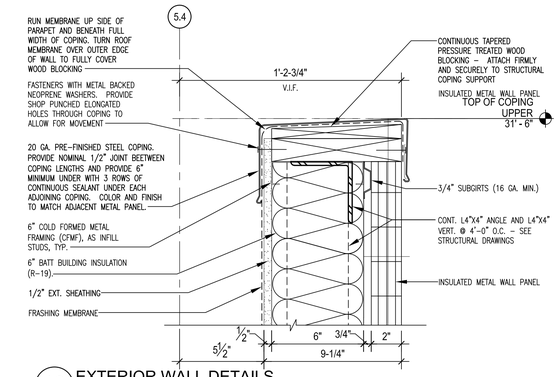
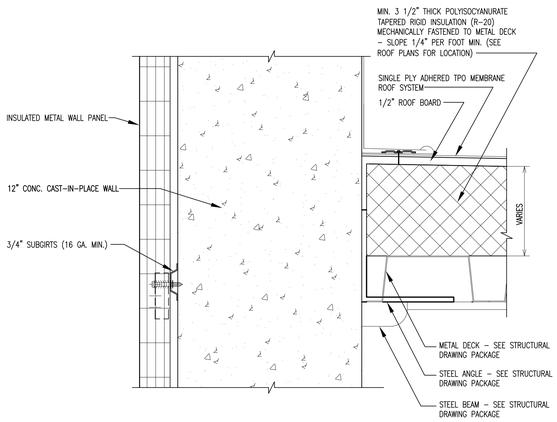
3" = 1'-0"



10 EXTERIOR WALL DETAILS
3" = 1'-0"



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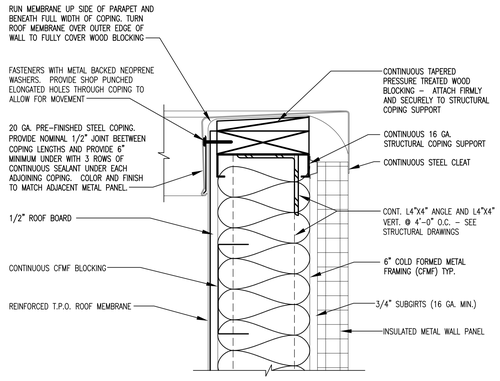
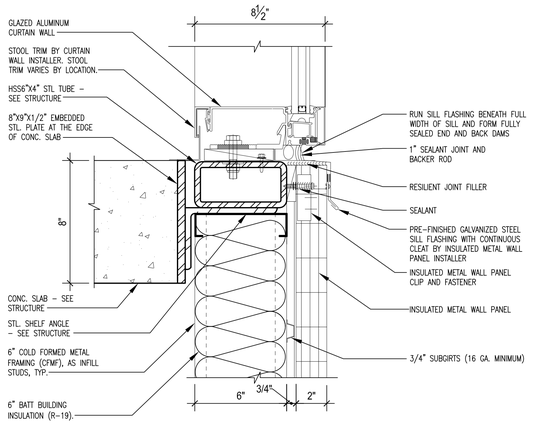
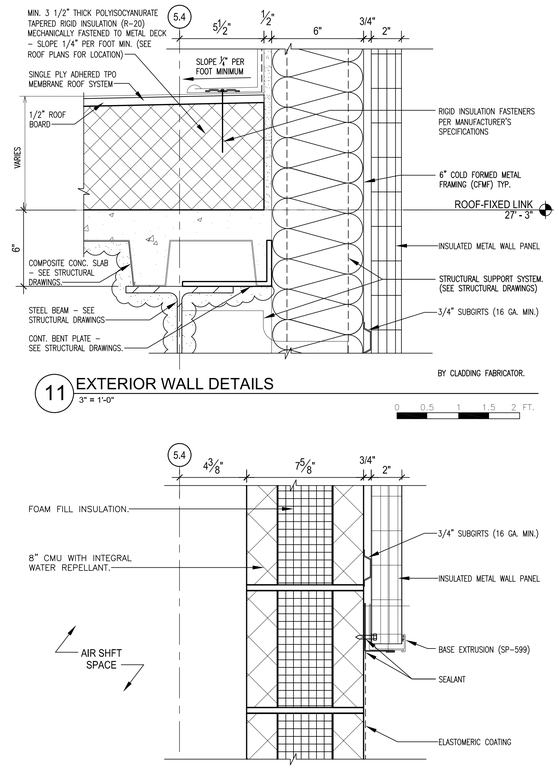
3" = 1'-0"



5 EXTERIOR WALL DETAILS
3" = 1'-0"

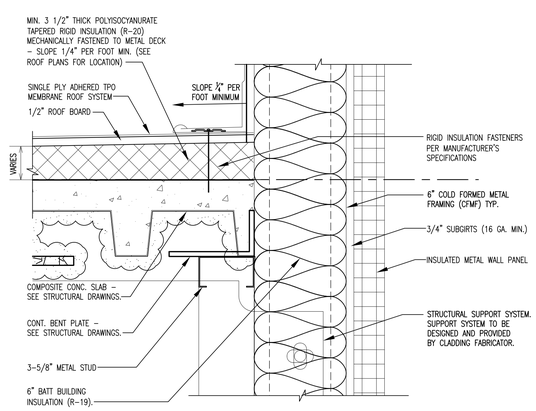


8 EXTERIOR WALL DETAILS
3" = 1'-0"

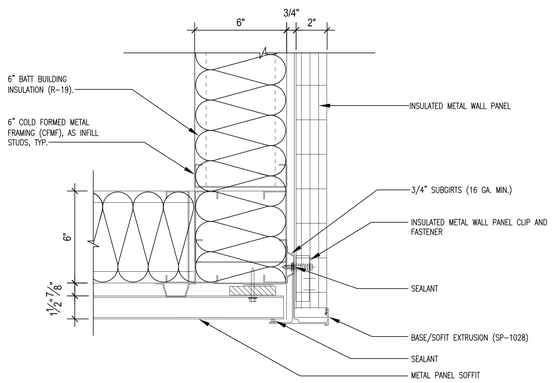


11 EXTERIOR WALL DETAILS
3" = 1'-0"

3 EXTERIOR WALL DETAILS
3" = 1'-0"

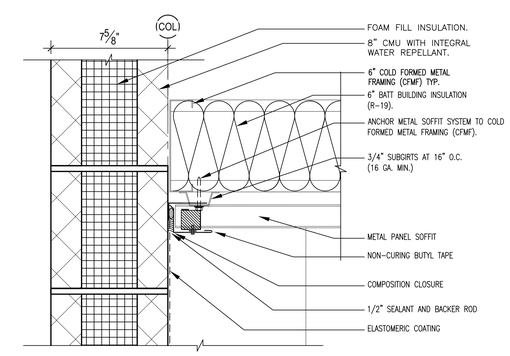


6 EXTERIOR WALL DETAILS
3" = 1'-0"



9 EXTERIOR WALL DETAILS
3" = 1'-0"

12 EXTERIOR WALL DETAILS
3" = 1'-0"



13 EXTERIOR WALL DETAILS
3" = 1'-0"

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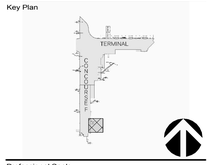

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: SLS Reviewed by: ILS

Project No:

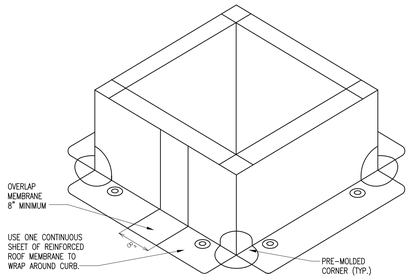
Sheet Title

EXTERIOR WALL SECTION DETAILS - BLOW UP

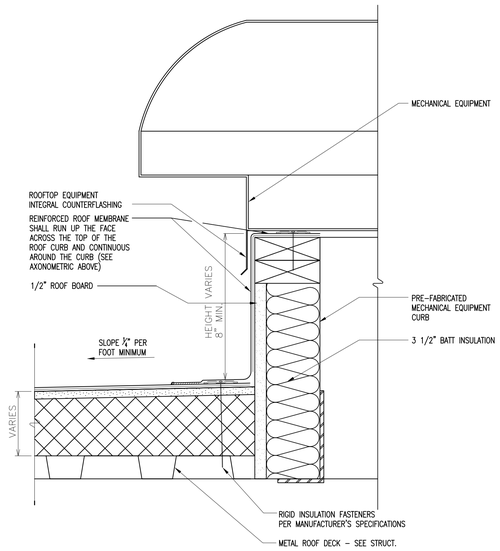
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A810

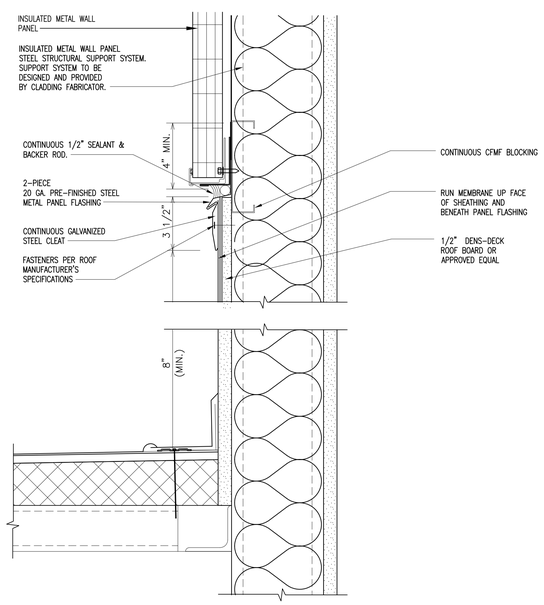


3 ROOF CURB AXONOMETRIC
N.T.S.



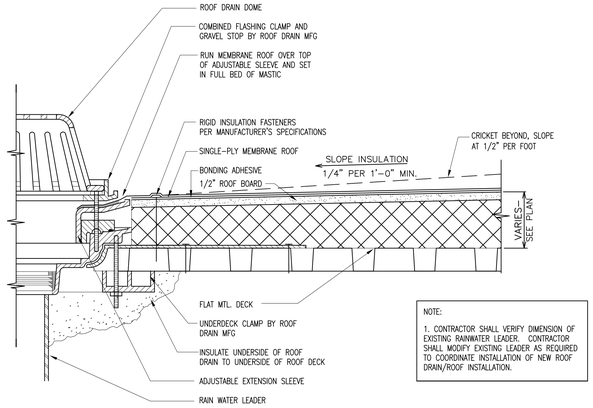
2 SECTION DETAIL
3" = 1'-0"

0 0.5 1 1.5 2 FT.



1 PANEL FLASHING DETAIL
3" = 1'-0"

0 0.5 1 1.5 2 FT.

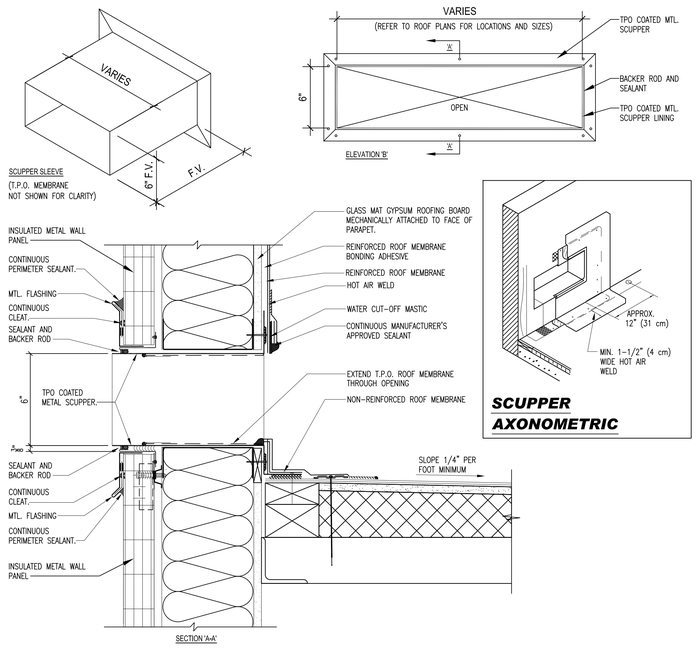


NOTE:

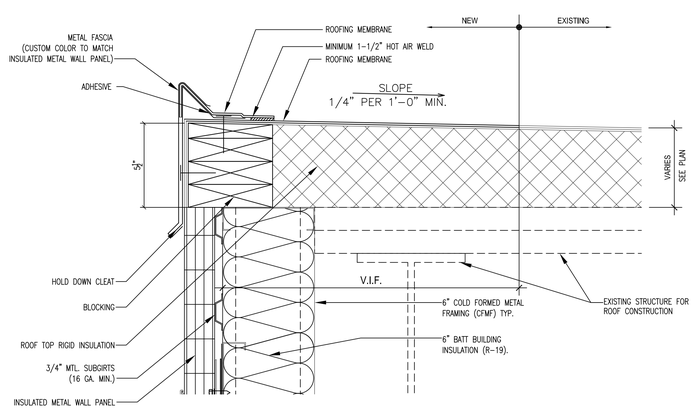
1. CONTRACTOR SHALL VERIFY DIMENSION OF EXISTING RAINWATER LEADER. CONTRACTOR SHALL MODIFY EXISTING LEADER AS REQUIRED TO COORDINATE INSTALLATION OF NEW ROOF DRAIN/ROOF INSTALLATION.

5 ROOF DRAIN DETAIL (NO SUMP)
3" = 1'-0"

0 0.5 1 1.5 2 FT.

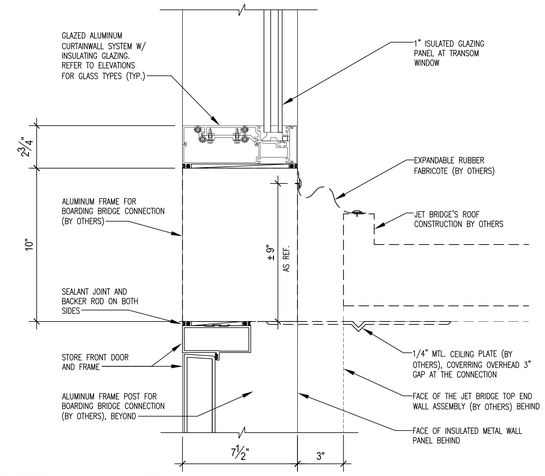


4 SCUPPER DETAIL
N.T.S.



9 ROOFING TERMINATION DETAIL
3" = 1'-0"

0 0.5 1 1.5 2 FT.



8 EXTERIOR WALL DETAILS
3" = 1'-0"

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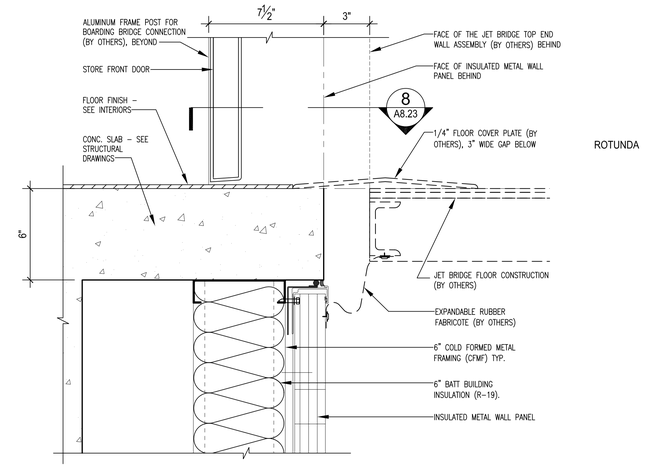

7 EXTERIOR WALL DETAILS
3" = 1'-0"

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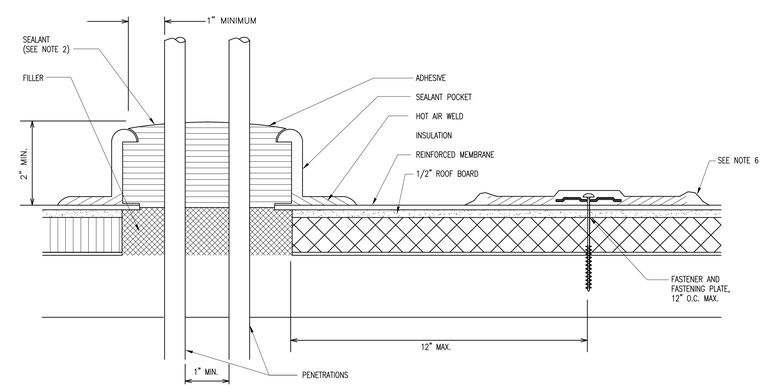

NOTES:

1. TEMPERATURE OF PIPE MUST NOT EXCEED 120 DEG FAHRENHEIT.
2. SEALANT MUST COMPLETELY FILL SEALANT POCKET AND MUST BE CROWNED TO PREVENT PONDING OF WATER.
3. SEALANT POCKET TO BE MINIMUM 1" (2.5 cm) FROM PENETRATION ON ANY SIDE.
4. INSTALL A MINIMUM OF 4 FASTENING PLATES AROUND SEALANT POCKETS WITH A DIAMETER UP TO 6". ADDITIONAL FASTENING PLATES WILL BE REQUIRED FOR SEALANT POCKETS GREATER THAN 6" IN DIAMETER AND SHALL BE SPACED 12" ON CENTER MAXIMUM.
5. REFER TO "ATTACHMENT I, MEMBRANE FASTENING CRITERIA" FOR PROPER FASTENERS AND PLATES.
6. APPROXIMATELY ?" DIAMETER BEAD OF CUT-EDGE SEALANT IS REQUIRED ON CUT EDGES OF SURE-WELD REINFORCED MEMBRANE.
7. APPLY HEAT TO BASE FLANGE OF SURE-WELD SEALANT POCKET AND FORM BY HAND PRIOR TO HOT AIR WELDING.

6 SEALANT (PITCH) POCKET DETAIL - TYPICAL
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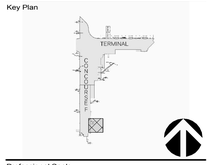

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

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TYPICAL ROOF DETAILS

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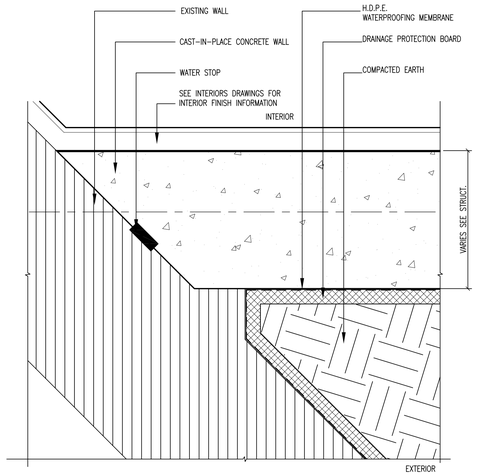
Sheet Number

A811



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1-1/2" = 1'-0"
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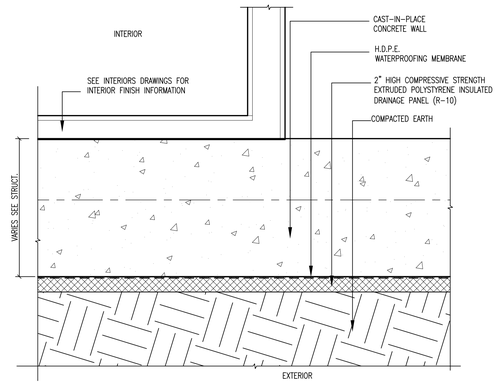

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1-1/2" = 1'-0"
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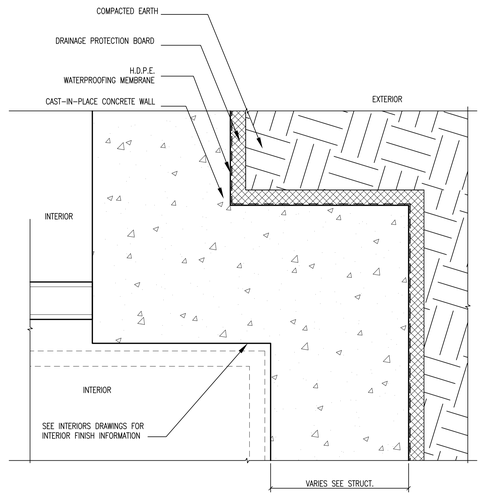

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1-1/2" = 1'-0"
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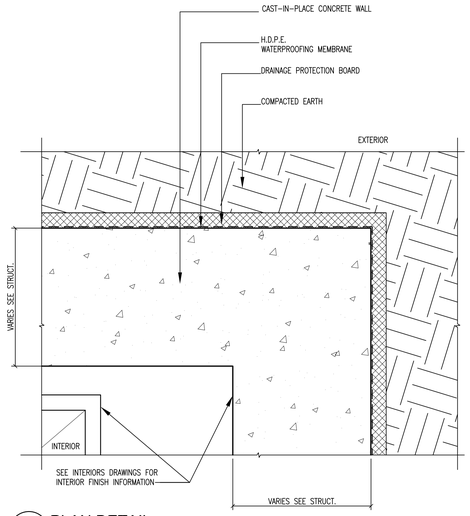
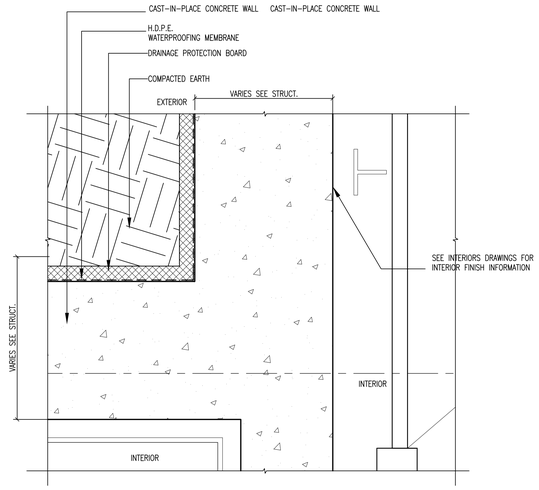


5 PLAN DETAIL
1-1/2" = 1'-0"
0 3in 6in 9in 1FT.



6 PLAN DETAIL
1-1/2" = 1'-0"
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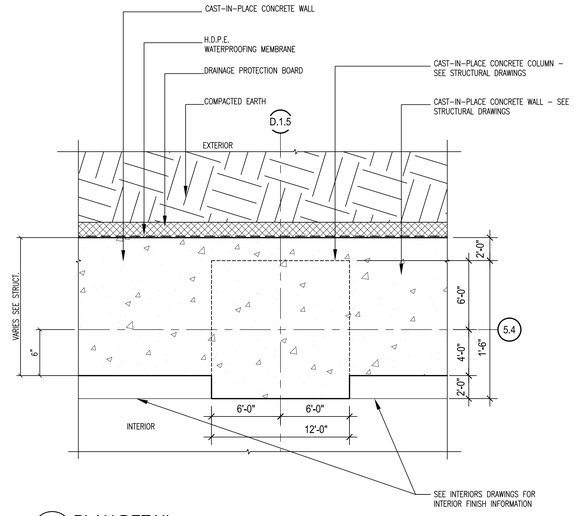
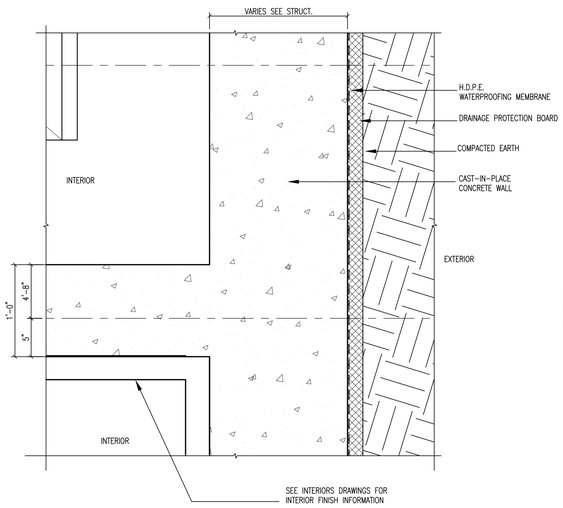
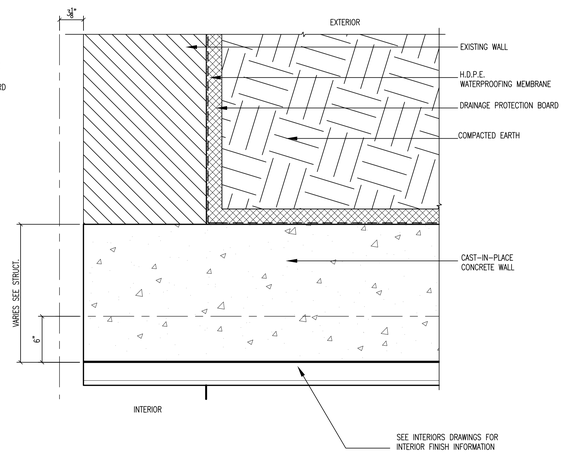


7 PLAN DETAIL
1-1/2" = 1'-0"
0 3in 6in 9in 1FT.



9 PLAN DETAIL
1-1/2" = 1'-0"
0 3in 6in 9in 1FT.



10 PLAN DETAIL
1-1/2" = 1'-0"
0 3in 6in 9in 1FT.

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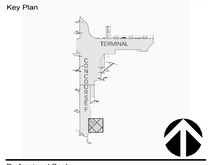

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: SLS Reviewed by: ILS

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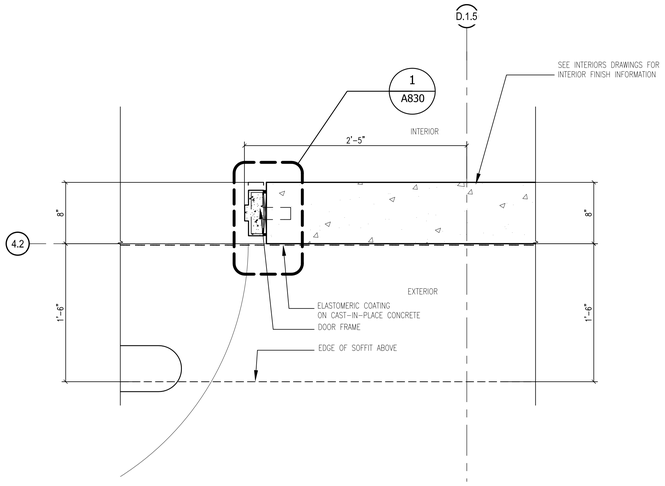
Sheet Title

EXTERIOR PLAN
DETAIL - ARRIVAL LEVEL

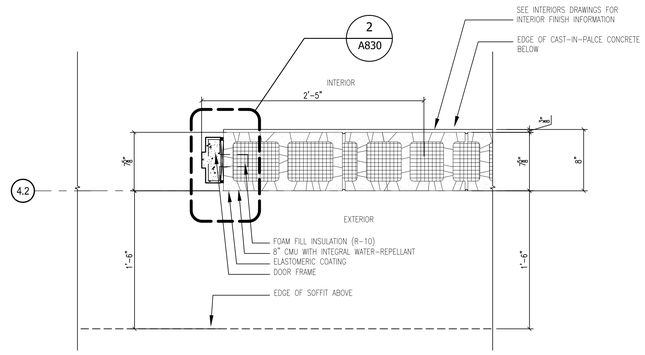
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A820



1 PLAN DETAIL @ CONCRETE
1-1/2" = 1'-0"



2 PLAN DETAIL @ BLOCK
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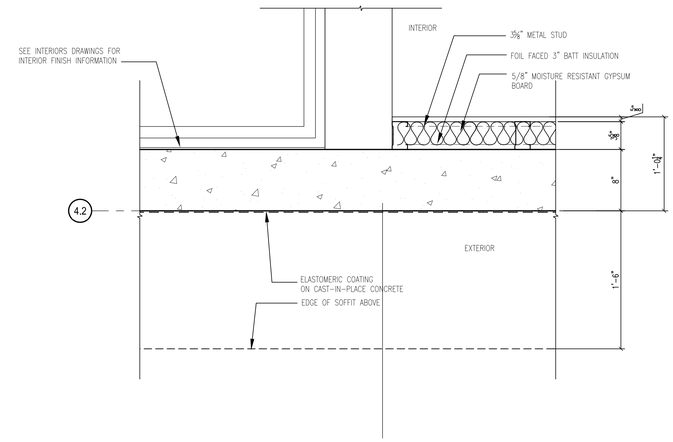
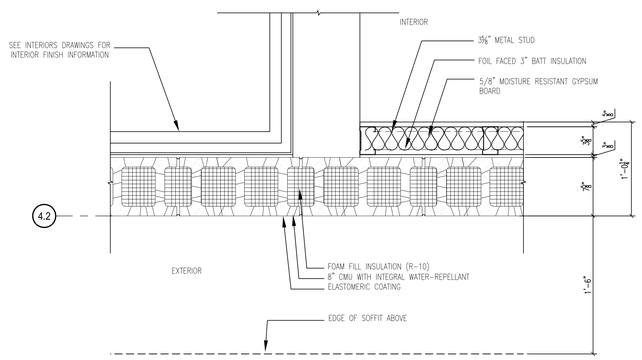
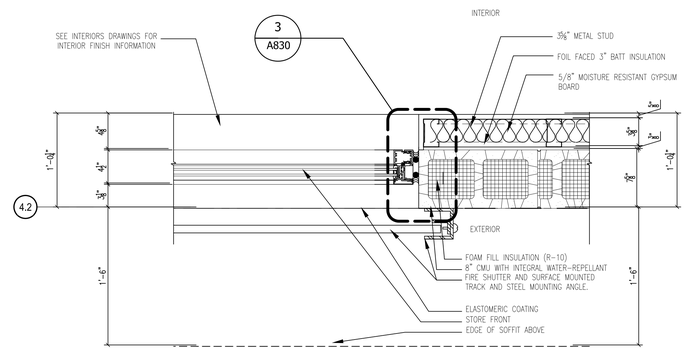


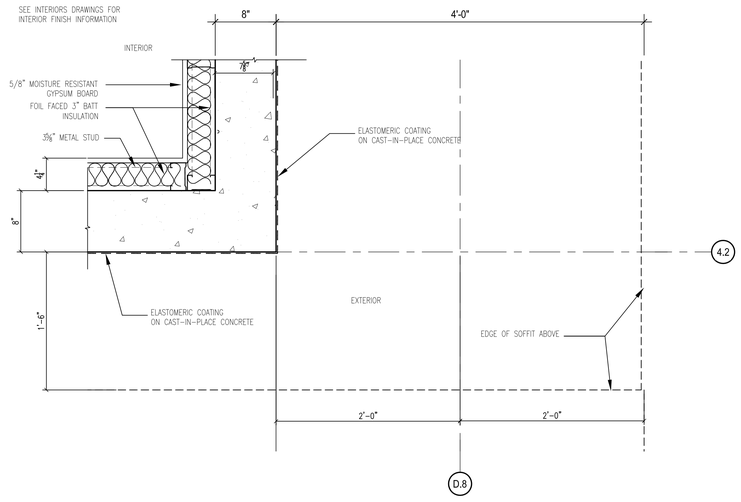
3 PLAN DETAIL @ CONCRETE
1-1/2" = 1'-0"



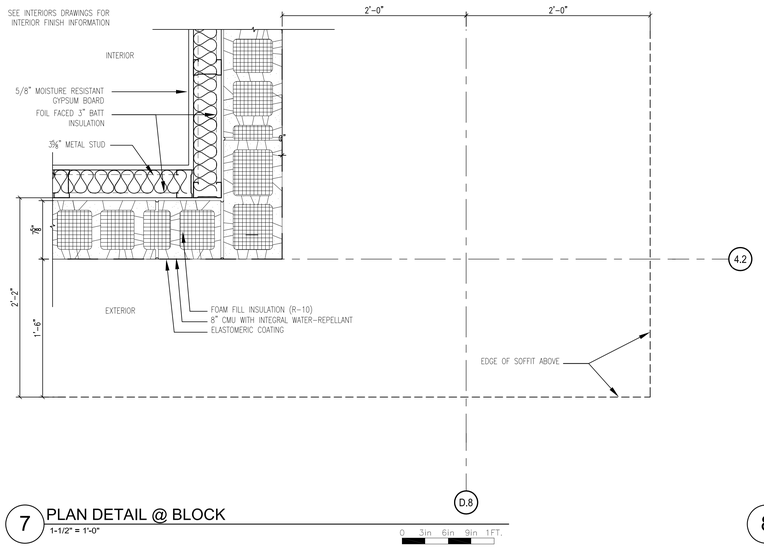
4 PLAN DETAIL @ BLOCK
1-1/2" = 1'-0"



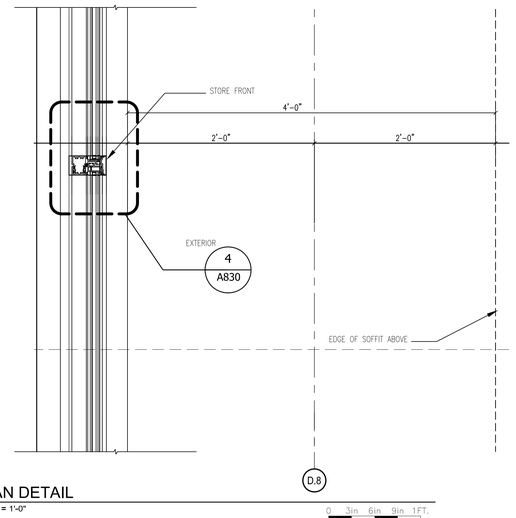
5 PLAN DETAIL @ BLOCK
1-1/2" = 1'-0"



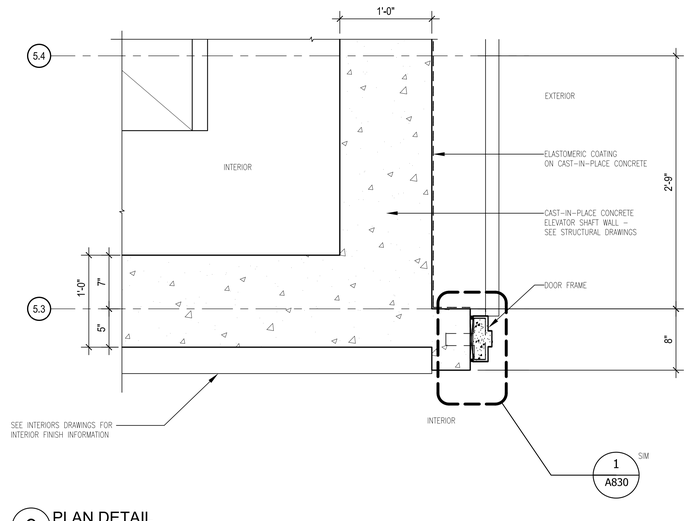
6 PLAN DETAIL @ CONCRETE
1-1/2" = 1'-0"



7 PLAN DETAIL @ BLOCK
1-1/2" = 1'-0"



8 PLAN DETAIL
1-1/2" = 1'-0"



9 PLAN DETAIL
1-1/2" = 1'-0"

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TASK ORDER No. : 001

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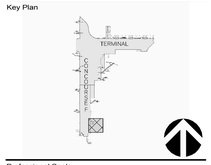
Key Plan



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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: SLS Reviewed by: ILS

Project No:

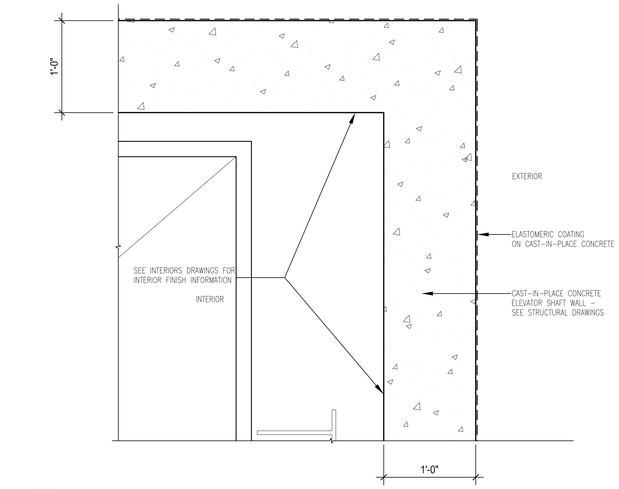
Sheet Title

EXTERIOR PLAN
DETAIL - APRON LEVEL

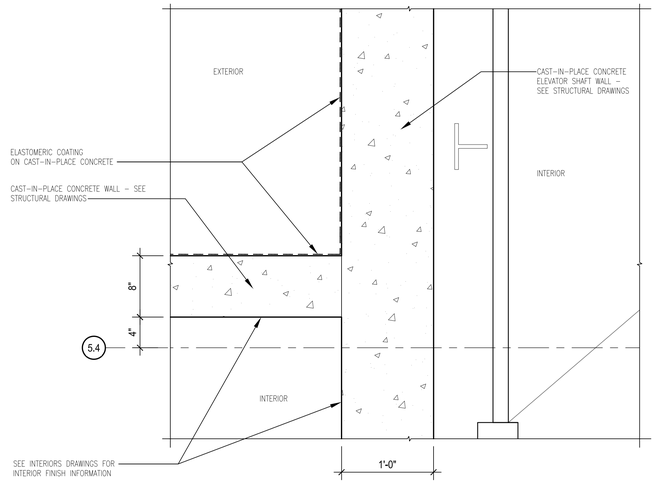
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A821



1 PLAN DETAILS
1-1/2" = 1'-0"
0 3in 6in 9in 1FT.



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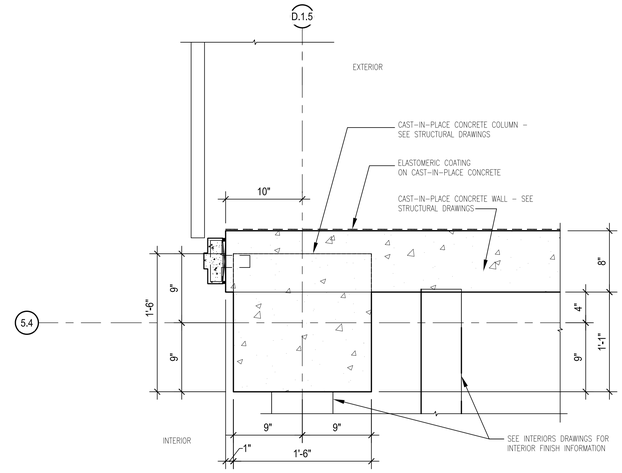
1-1/2" = 1'-0"
0 3in 6in 9in 1FT.



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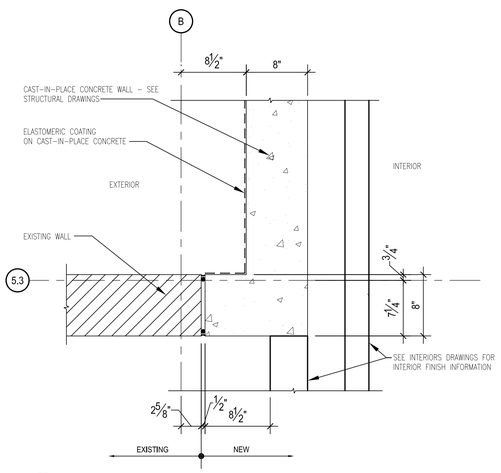
1-1/2" = 1'-0"
0 3in 6in 9in 1FT.



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1-1/2" = 1'-0"
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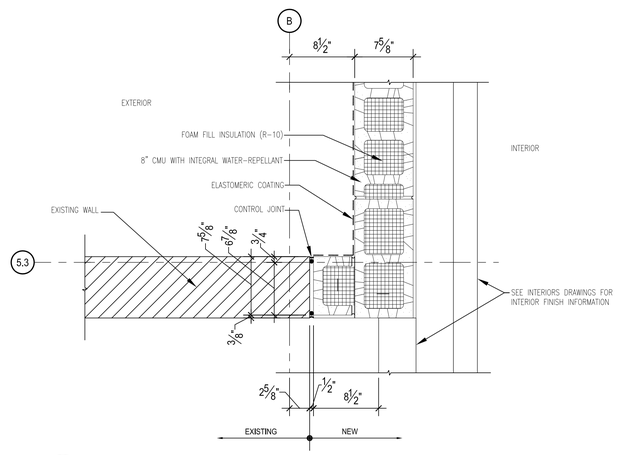
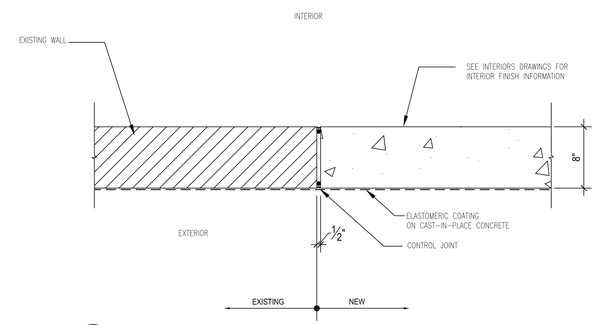


5 PLAN DETAILS
1-1/2" = 1'-0"
0 3in 6in 9in 1FT.



6 PLAN DETAILS
1-1/2" = 1'-0"
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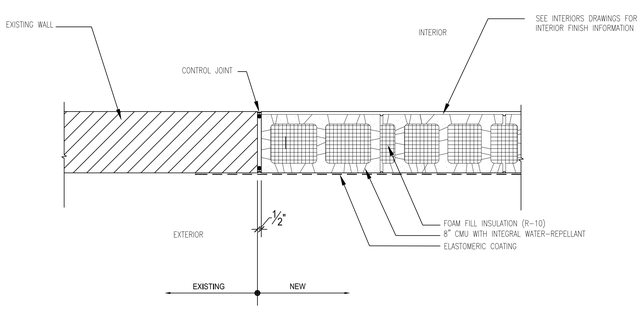
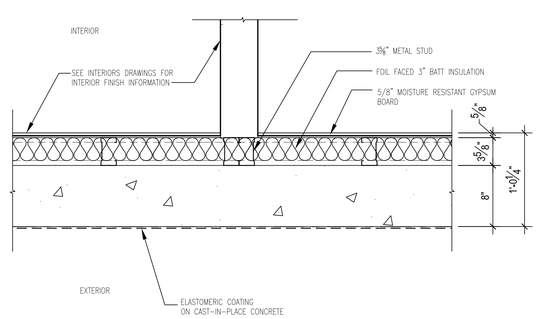
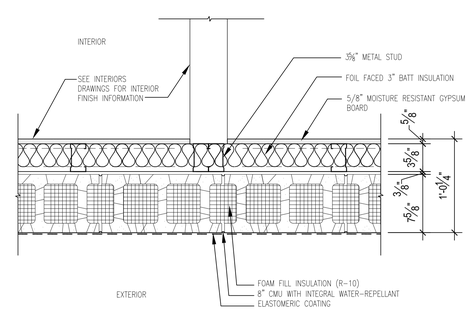


7 PLAN DETAILS
1-1/2" = 1'-0"
0 3in 6in 9in 1FT.



8 PLAN DETAILS
1-1/2" = 1'-0"
0 3in 6in 9in 1FT.



9 PLAN DETAILS
1-1/2" = 1'-0"
0 3in 6in 9in 1FT.

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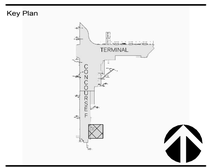


Professional Seals

No.	Description	Date
1. ISSUED FOR 35% CONSTRUCTION DOCUMENTS		06-23-14
2. ISSUED FOR 65% CONSTRUCTION DOCUMENTS		10-30-14
3. ISSUED FOR 95% CONSTRUCTION DOCUMENTS		01-23-15
4. ISSUED FOR 100% CONSTRUCTION DOCUMENTS		03-23-15
5. ISSUED FOR BID DOCUMENTS		04-17-15

Drawn by: SLS Reviewed by: ILS

Project No:

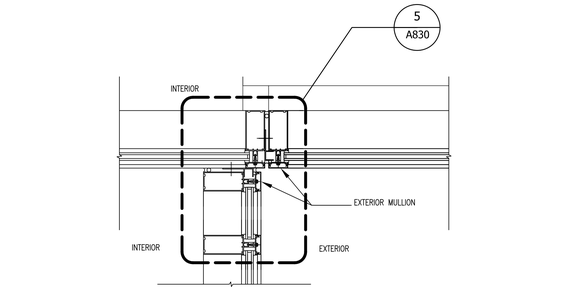
Sheet Title

EXTERIOR PLAN
DETAIL - APRON LEVEL

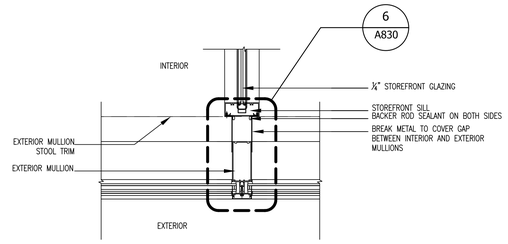
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

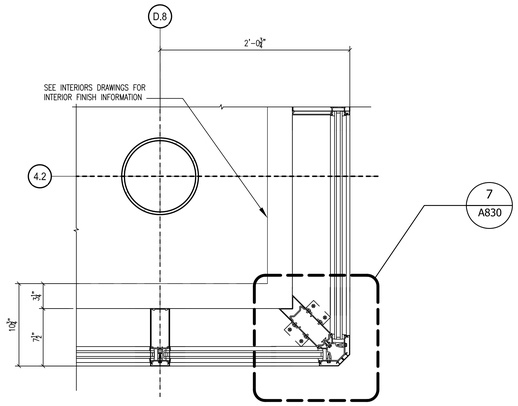
A822



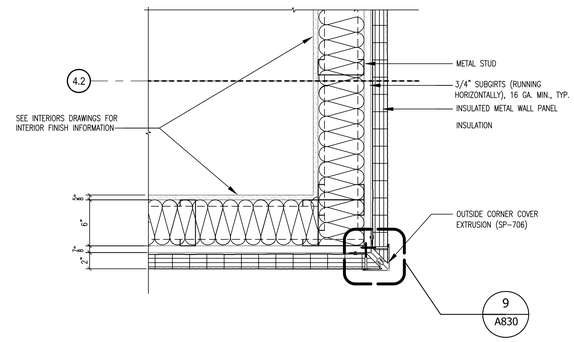
1 PLAN DETAIL
1-1/2" = 1'-0"



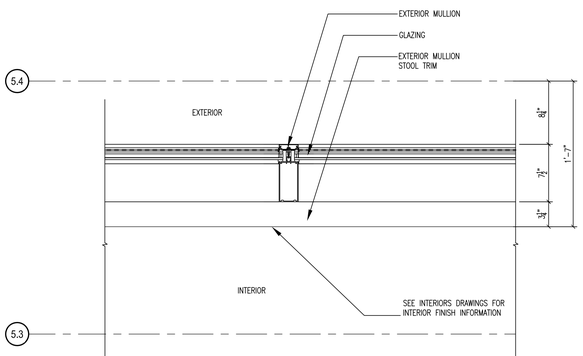
2 PLAN DETAIL
1-1/2" = 1'-0"



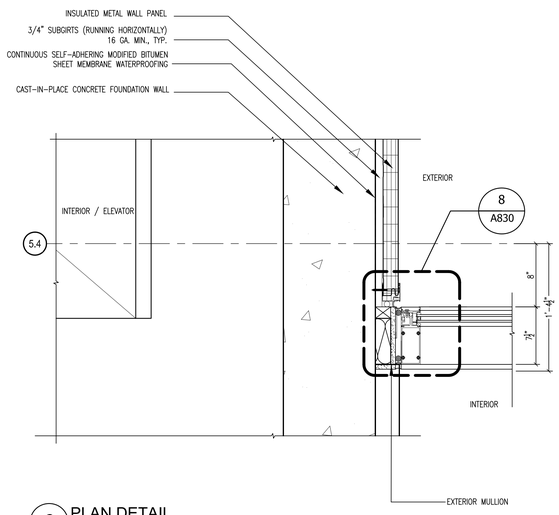
3 PLAN DETAIL @ CURTAIN WALL
1-1/2" = 1'-0"



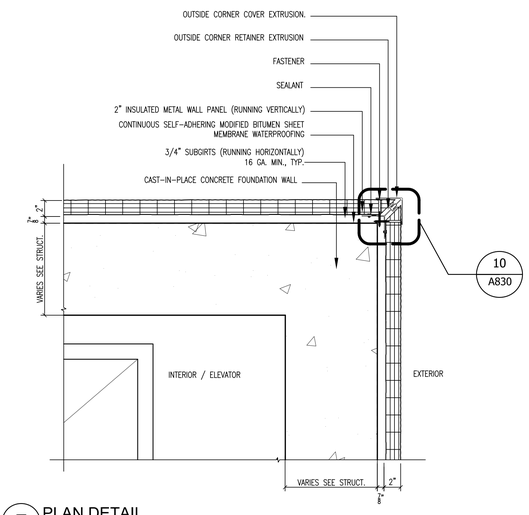
4 PLAN DETAIL @ METAL PANEL
1-1/2" = 1'-0"



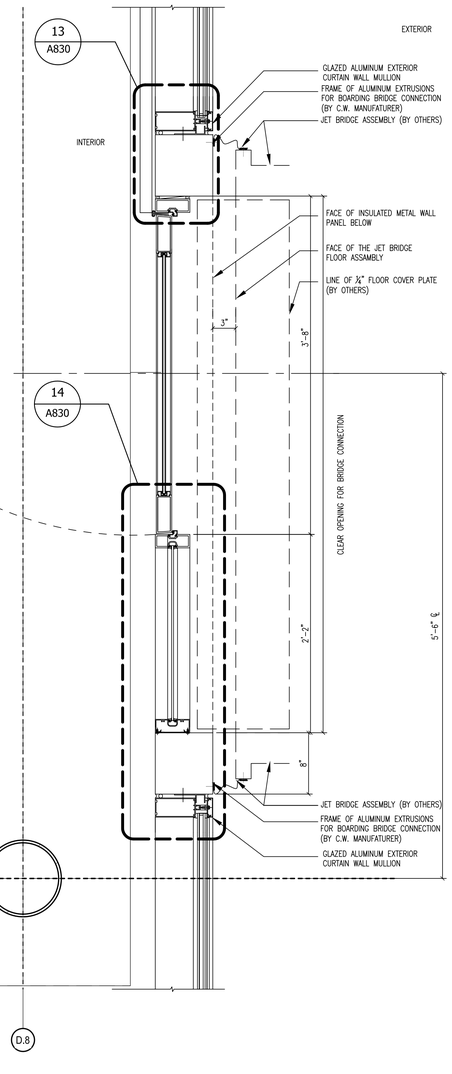
5 PLAN DETAIL
1-1/2" = 1'-0"



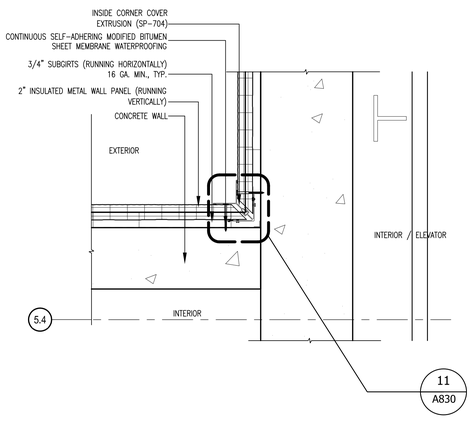
6 PLAN DETAIL
1-1/2" = 1'-0"



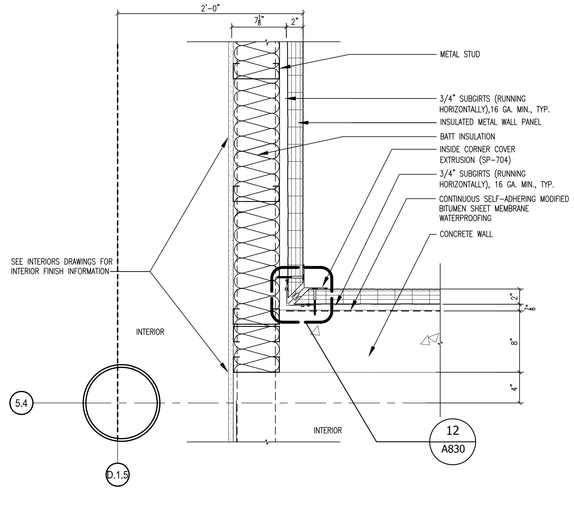
7 PLAN DETAIL
1-1/2" = 1'-0"



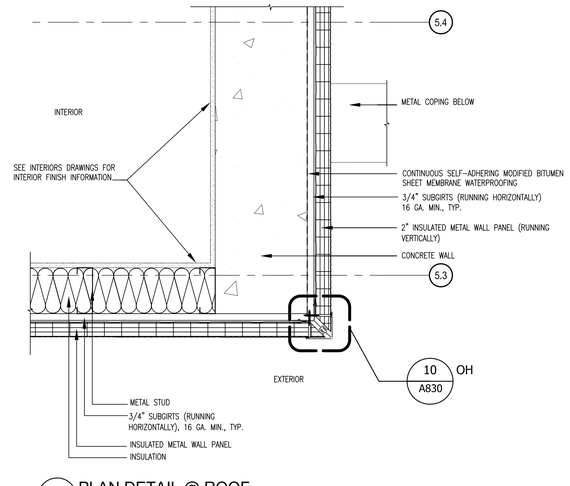
8 PLAN DETAIL OF JET BRIDGE OPENING
1-1/2" = 1'-0"



10 PLAN DETAIL
1-1/2" = 1'-0"



11 PLAN DETAIL
1-1/2" = 1'-0"



12 PLAN DETAIL @ ROOF
1-1/2" = 1'-0"

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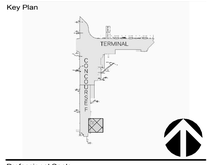

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: SLS Reviewed by: ILS

Project No:

Sheet Title

EXTERIOR PLAN
DETAIL - DEPARTURES LEVEL

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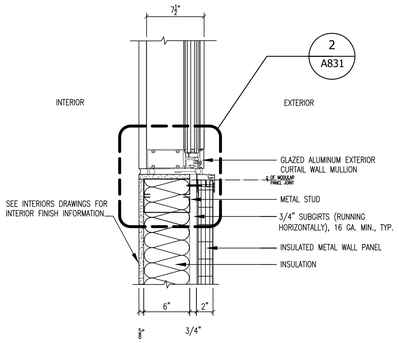
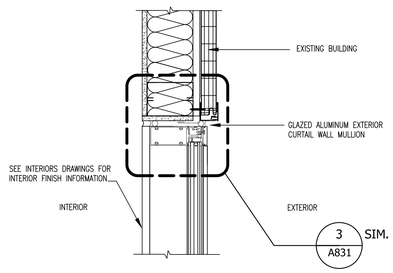
Sheet Number

A823



1 PLAN DETAIL
1-1/2" = 1'-0"

0 3in 6in 9in 1FT.



2 PLAN DETAIL
1-1/2" = 1'-0"

0 3in 6in 9in 1FT.

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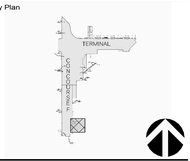
Key Plan



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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: SLS Reviewed by: ILS

Project No:

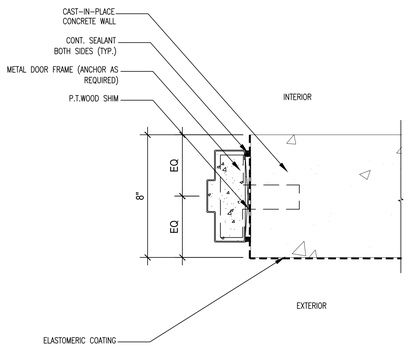
Sheet Title

EXTERIOR PLAN
DETAIL - DEPARTURES LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A824



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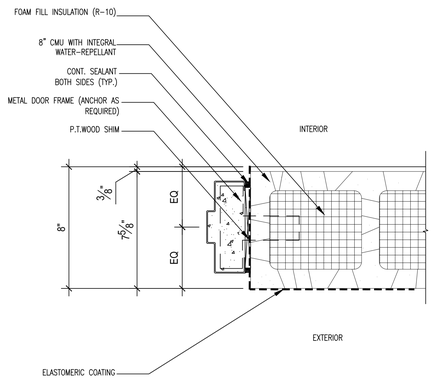
3" = 1'-0"
0 0.5 1 1.5 2 FT.



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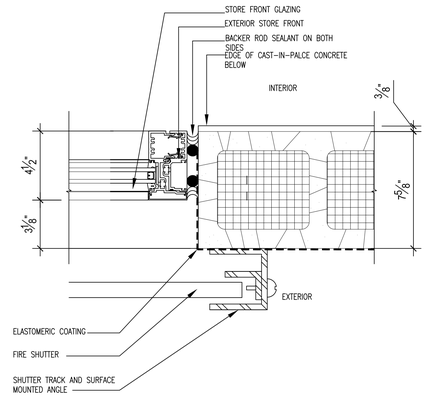

3 PLAN DETAIL
3" = 1'-0"
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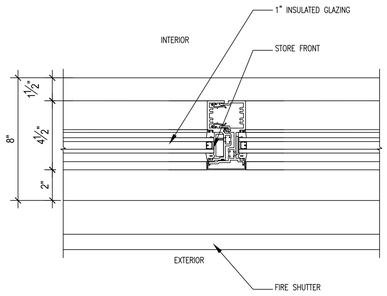
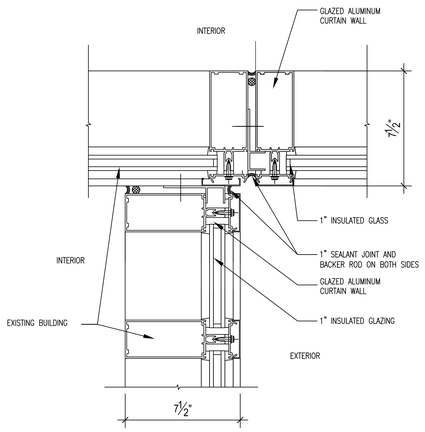
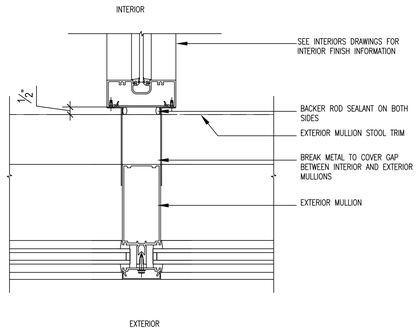


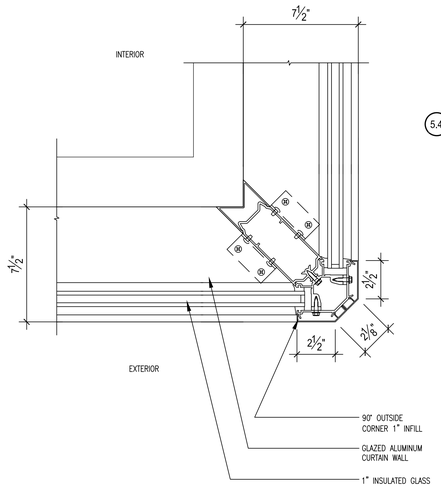
4 PLAN DETAIL
3" = 1'-0"
0 0.5 1 1.5 2 FT.



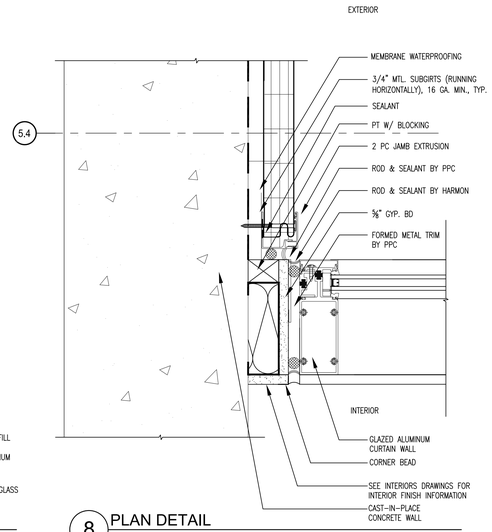
5 PLAN DETAIL
3" = 1'-0"
0 0.5 1 1.5 2 FT.



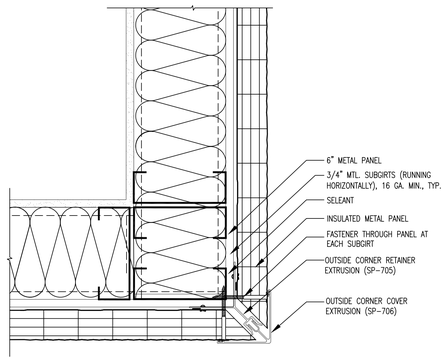
6 PLAN DETAIL
3" = 1'-0"
0 0.5 1 1.5 2 FT.



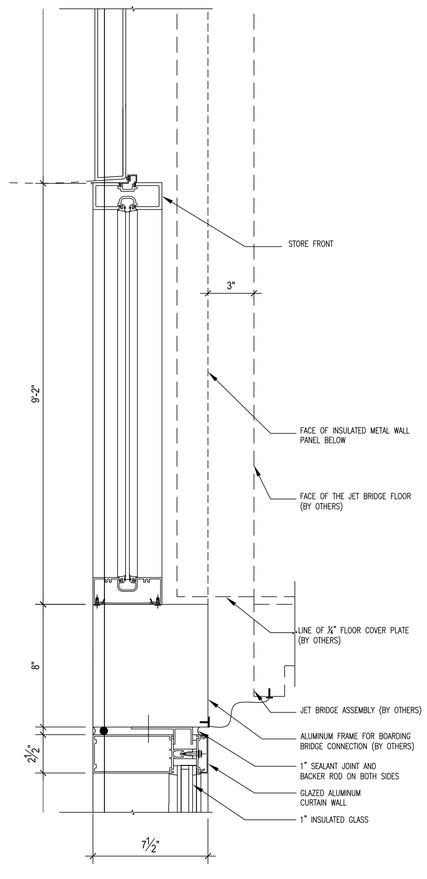
7 PLAN DETAIL
3" = 1'-0"
0 0.5 1 1.5 2 FT.



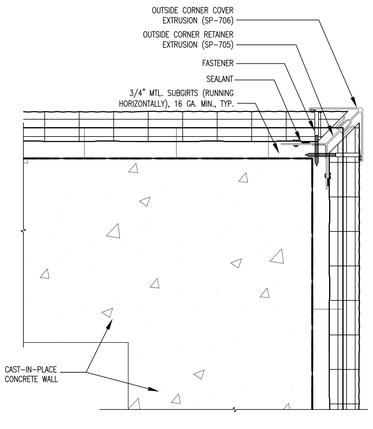
8 PLAN DETAIL
3" = 1'-0"
0 0.5 1 1.5 2 FT.



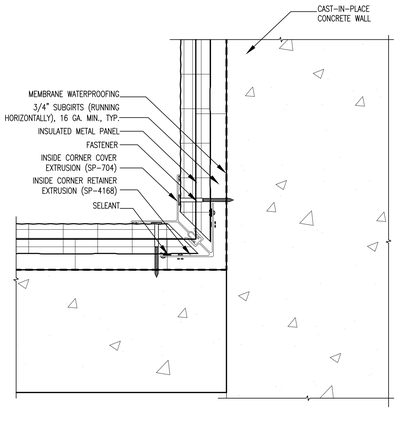
9 PLAN DETAIL
3" = 1'-0"
0 0.5 1 1.5 2 FT.



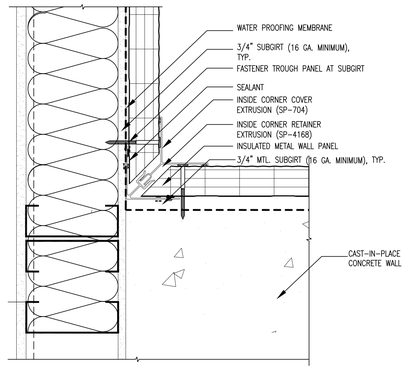
14 PLAN DETAIL
3" = 1'-0"
0 0.5 1 1.5 2 FT.



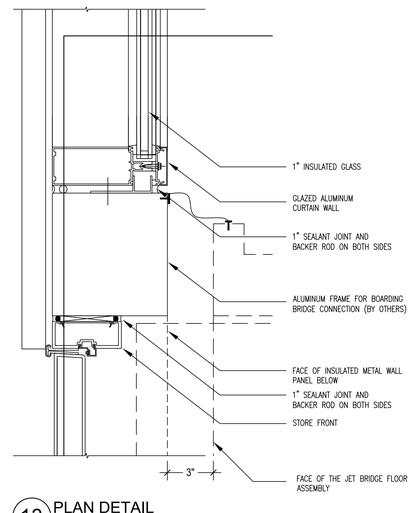
10 PLAN DETAIL
3" = 1'-0"
0 0.5 1 1.5 2 FT.



11 PLAN DETAIL
3" = 1'-0"
0 0.5 1 1.5 2 FT.



12 PLAN DETAIL
3" = 1'-0"
0 0.5 1 1.5 2 FT.



13 PLAN DETAIL
3" = 1'-0"
0 0.5 1 1.5 2 FT.

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Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p

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1056 SPRING STREET, N.W.
ATLANTA, GA 30309-3818
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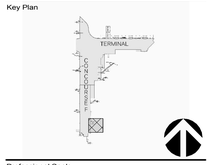
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: SLS Reviewed by: ILS

Project No:

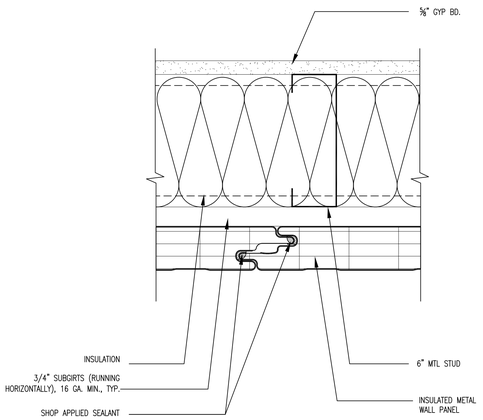
Sheet Title

EXTERIOR PLAN
DETAIL - BLOW UP

Original drawing is 42 x 30. Do not scale contents of this drawing.

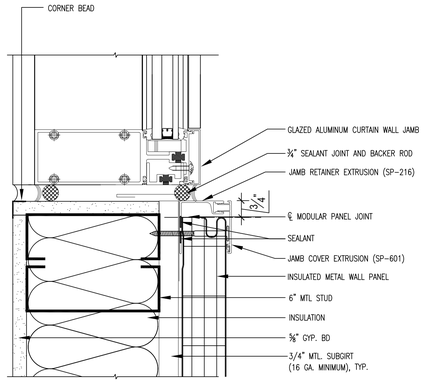
Sheet Number

A830



1 VERTICAL PANEL JOINT DETAIL
3" = 1'-0"

0 0.5 1 1.5 2 FT.



2 PLAN DETAIL
3" = 1'-0"

0 0.5 1 1.5 2 FT.

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

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A380 GATE F3 RECONFIGURATION
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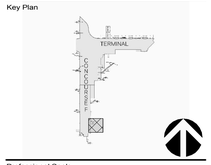
Key Plan



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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: SLS Reviewed by: ILS

Project No:

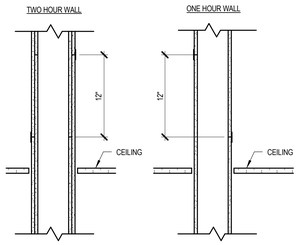
Sheet Title

EXTERIOR PLAN
DETAIL - BLOW UP

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

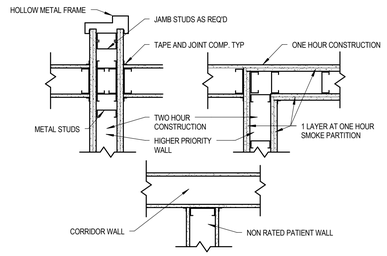
A831



JOINTS MAY BE OPPOSITE IF SAFING IS USED IN CAVITY REF: CEG 8-11-83 CEG 5-9-84

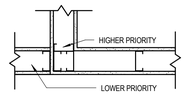
JOINTS IN FINISH LAYERS TO RECEIVE TAPE AND JOINT COMPOUND

1 JOINT REQUIREMENTS
1" = 1'-0"



NOT: MAINTAIN SHEATHING ON HIGHER PRIORITY WALL AT INTERSECTION WITH LOWER PRIORITY WALL AS INDICATED

2 PARTITION DETAIL
1" = 1'-0"

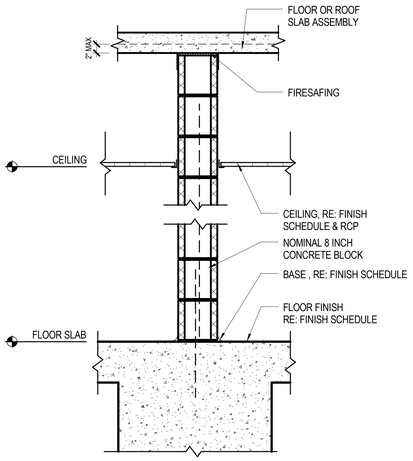


*WALL PRIORITY LEGEND	
TWO HOUR FIRE & SMOKE WALL	PRIORITY 1 HIGHEST
TWO HOUR FIRE WALL	PRIORITY 2
TWO HOUR SHAFT WALL	PRIORITY 2
ONE HOUR FIRE & SMOKE WALL	PRIORITY 3
ONE HOUR FIRE WALL	PRIORITY 4
NON-RATED WALL	PRIORITY 5 LOWEST

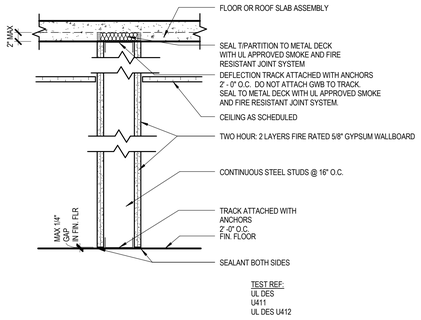
NOTE: MAINTAIN SHEATHING ON HIGHER PRIORITY WALL AT INTERSECTION WITH LOWER PRIORITY WALL AS INDICATED

*TABLE DOES NOT INCLUDE 3 AND 4 HOUR RATED WALLS

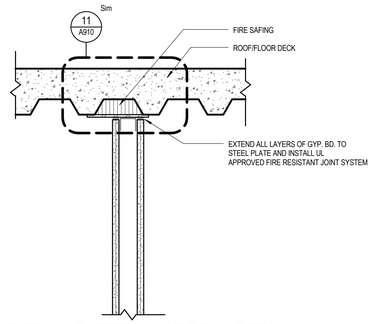
3 WALL PRIORITY LEGEND
1" = 1'-0"



4 PARTITION TYPE 1
1" = 1'-0"



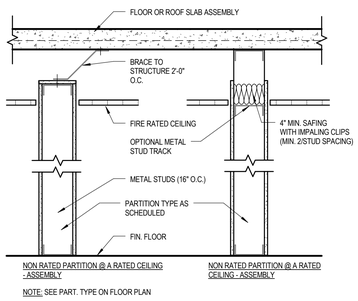
5 PARTITION DETAIL
1" = 1'-0"



6 TYPICAL PARTITION AT DECK DETAIL
1" = 1'-0"

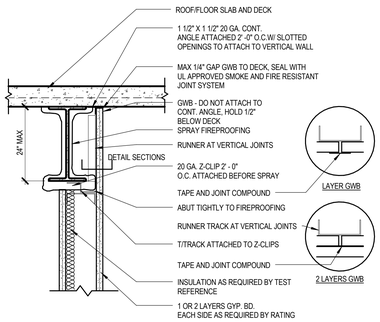
PARTITION NOTES:

1. EXTEND ALL INTERIOR PARTITIONS TO DECK UNLESS DETAILED OTHERWISE.
2. REFER TO PARTITION DETAILS FOR HEAD AND SILL CONSTRUCTION.

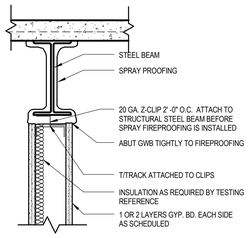


NOTE: SEE PART. TYPE ON FLOOR PLAN

7 PARTITION DETAIL
1" = 1'-0"



8 TYPICAL RATED PARTITION @ BEAM DETAIL
1" = 1'-0"



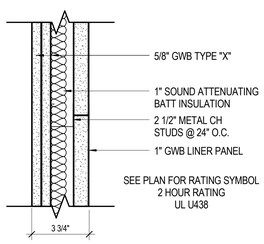
PARTITION UNDER BEAM

9 TYPICAL RATED PARTITION UNDER BEAM DETAIL
1" = 1'-0"

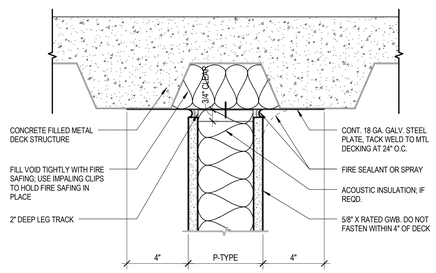
2 HR. RATING WALL SYSTEM UL DESIGN U411 — 2A6

1 HR. RATING WALL SYSTEM UL DESIGN U419 — 1A3

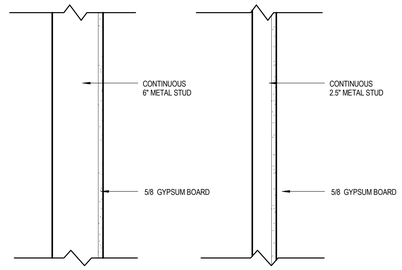
NON- RATED PARTITION — 0A3



10 J TYPE CH PARTITION
3" = 1'-0"



11 RATED PARTITION HEAD AT METAL DECKING
3" = 1'-0"



FURRING WALL

0G6 — 0G2

PARTITION TYPES
1 1/2" = 1'-0"

4/15/2015 11:01:34 PM

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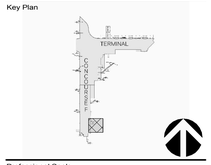
Key Plan



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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: CA Reviewed by: Checker

Project No:

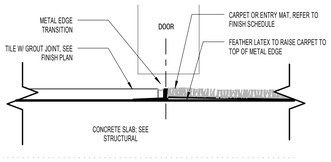
Sheet Title

INTERIOR PARTITION SYSTEM DETAILS

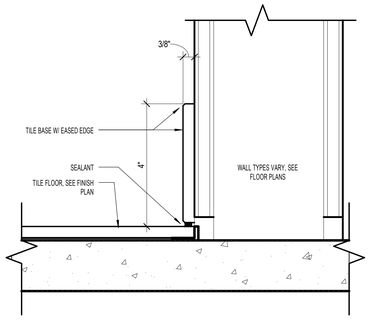
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

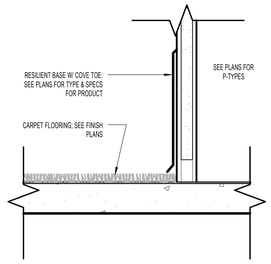
A910



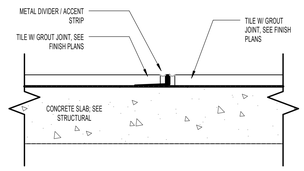
1 FLOOR TRANSITION DETAIL T1
6" = 1'-0"



2 TILE BASE CONDITION DETAIL B1
6" = 1'-0"



3 CARPET TILE BASE DETAIL B2
6" = 1'-0"



4 TILE ACCENT STRIP DETAIL
6" = 1'-0"

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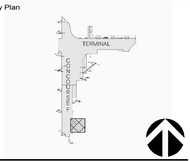
Key Plan



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Drawn by: CA Reviewed by: Checker

Project No:

Sheet Title

INTERIOR FLOORING SYSTEM DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A920

4/15/2015 11:01:41 PM

DOOR SCHEDULE

MARK	ROOM ID	ROOM NAME	DOOR PANEL TYPE	DOOR CONSTRUCTION TYPE	DOOR PANEL FINISH	DOOR GLASS TYPE	DOOR PANEL WIDTH 1	DOOR PANEL WIDTH 2	DOOR PANEL HEIGHT	FRAME TYPE	FRAME CONSTRUCTION TYPE	FRAME FINISH	FIRE RATING	HARDWARE GROUP	TYPE REMARKS	REVISION NUMBER	DoorDetail Head	DoorDetail Jamb	DoorDetail Mullion	DoorDetail Sill	REMARKS	Phase Created
ARRIVALS LEVEL																						
101A	101	ARRIVALS CORRIDOR	TG1	GL		GL-06	3' - 0"	3' - 0"	8' - 0"	00												New Construction
101B	101	ARRIVALS CORRIDOR	TG1	GL		GL-06	3' - 0"	3' - 0"	8' - 0"	00												New Construction
102	102	AIRPORT EQUIP. ROOM	F	HM			3' - 0"		7' - 10"	01							1/A931	7/A931				New Construction
103	103	ELEV. EQUIP. ROOM	F	HM			3' - 0"		7' - 10"	01							1/A931	7/A931				New Construction
108	101	ARRIVALS CORRIDOR	F	HM			3' - 0"		7' - 10"	01												New Construction
ST01	101	ARRIVALS CORRIDOR	F	HM			3' - 0"		7' - 10"	01			45				2/A931	8/A931				New Construction
3 - APRON LEVEL																						
202	202	OPS MANAGER	F	HM			3' - 0"		7' - 10"	01							1/A931	7/A931				New Construction
203	203	OPS MANAGER	F	HM			3' - 0"		7' - 10"	01							1/A931	7/A931				New Construction
204	201	LINE MAINTENANCE SHOP	F	HM			3' - 0"		7' - 10"	01							1/A931	7/A931				New Construction
205	205	SHOWER	N	HM		GL-02	3' - 0"		8' - 10"	01							1/A931	7/A931				New Construction
206	201	LINE MAINTENANCE SHOP	N	HM		GL-02	3' - 0"		8' - 10"	01							1/A931	7/A931				New Construction
210	201	LINE MAINTENANCE SHOP	FG	HM		GL-02	3' - 0"		8' - 10"	01			45				1/A931	7/A931				New Construction
211	211	RAMP OPS SPACE	FG	HM		GL-02	3' - 0"		8' - 10"	01			45				1/A931	7/A931				New Construction
213	213	EQUIPMENT RM	F	HM			3' - 0"		7' - 10"	01												New Construction
216	216	SWING SPACE EAST B	F	HM			3' - 0"		7' - 10"	01							1/A931	7/A931				New Construction
X208	208	ELEC CLOSET					4' - 0"	4' - 0"	8' - 10"								24/A931	27/A931				New Construction
X210	210	VESTIBULE	V	HM		GL-02	3' - 0"		8' - 10"	01							24/A931	27/A931				New Construction
XST01	ST01	EGRESS STAIR	N	HM		GL-02	3' - 0"		8' - 10"	01			45				24/A931	27/A931				New Construction
4 - DEPARTURES LEVEL																						
303	303	DEPARTURES CORRIDOR-SOUTH	F	HM			4' - 0"		8' - 0"	01												New Construction
304	304	RAMP CORRIDOR	TG1	GL		GL-06	4' - 0"		9' - 0"												RAMP CORRIDOR	New Construction
ROTUNDA LEVEL																						
X301			TG1	GL		GL-06	4' - 0"		8' - 0"												DEPARTURES PLATFORM	New Construction

ROOM FINISH SCHEDULE

Room Number	Level	Room Name	Floor Finish	Base Finish	Wall Finish North	Wall Finish South	Wall Finish East	Wall Finish West	Ceiling Finish	Ceiling Height	Comments
ARRIVALS LEVEL											
102	ARRIVALS LEVEL	AIRPORT EQUIP. ROOM	SC-01	RB-01	P-01	P-01	P-01	P-01	ACT-02	9' - 0"	
101	ARRIVALS LEVEL	ARRIVALS CORRIDOR	CPT-02	SSB-01	P-02	P-02	P-02	P-02	MC-01, GYP. WALL BOARD - SEE RCP		MODULAR MTL CEILING TILE - SEE SPECIFICATIONS
ST01	ARRIVALS LEVEL	EGRESS STAIR	SC-01	RB-01	P-01	P-01	P-01	P-01			
103	ARRIVALS LEVEL	ELEV. EQUIP. ROOM	SC-01	RB-01	P-01	P-01	P-01	P-01			
E01	ARRIVALS LEVEL	ELEVATOR									
-	ARRIVALS LEVEL	EXISTING ARRIVALS CORRIDOR									MATCH ALL EXISTING FINISHES
ST02	ARRIVALS LEVEL	STAIR/ESCALATOR WELL							MC-01, SEE SPECIFICATIONS		HEIGHT VARIES, SEE RCP & SECTION DRAWINGS
108	ARRIVALS LEVEL	STORAGE	SC-01	RB-01	P-01	P-01	P-01	P-01			
3 - APRON LEVEL											
212	3 - APRON LEVEL	EGRESS ALCOVE									EXTERIOR SPACE NO FINISHES
ST01	3 - APRON LEVEL	EGRESS STAIR	SC-01	RB-01	P-01	P-01	P-01	P-01			
208	3 - APRON LEVEL	ELEC CLOSET	SC-01	RB-01	P-01	P-01	P-01	P-01			
213	3 - APRON LEVEL	EQUIPMENT RM									
-	3 - APRON LEVEL	EXISTING LINE MAINTENANCE SHOP									
204	3 - APRON LEVEL	JANITOR	SC-01	RB-01	P-01	P-01	P-01	P-01	ACT-02		
201	3 - APRON LEVEL	LINE MAINTENANCE SHOP	SC-01	RB-01	P-01	P-01	P-01	P-01	ACT-02		
203	3 - APRON LEVEL	OPS MANAGER	SC-01	RB-01	P-01	P-01	P-01	P-01	ACT-01, GYP. WALL BOARD - SEE RCP		
202	3 - APRON LEVEL	OPS MANAGER	SC-01	RB-01	P-01	P-01	P-01	P-01	ACT-02		
211	3 - APRON LEVEL	RAMP OPS SPACE	SC-01	RB-01	P-01	P-01	P-01	P-01	ACT-02		
206	3 - APRON LEVEL	RESTROOM	SC-01	RB-01	P-01	P-01	P-01	P-01	ACT-02		
205	3 - APRON LEVEL	SHOWER	SC-01	RB-01	P-01	P-01	P-01	P-01	ACT-02		
ST02	3 - APRON LEVEL	STAIR/ESCALATOR WELL							MC-01, SEE SPECIFICATIONS		HEIGHT VARIES, SEE RCP & SECTION DRAWINGS
216	3 - APRON LEVEL	SWING SPACE EAST B									MATCH ALL EXISTING FINISHES
215	3 - APRON LEVEL	SWING SPACE EAST A									MATCH ALL EXISTING FINISHES
217	3 - APRON LEVEL	SWING SPACE WEST									MATCH ALL EXISTING FINISHES
210	3 - APRON LEVEL	VESTIBULE	SC-01	RB-01	P-01	P-01	P-01	P-01	ACT-02		
4 - DEPARTURES LEVEL											
305	4 - DEPARTURES LEVEL	DEPARTURES CORRIDOR - NORTH	CPT-01	SSB-01	P-02	P-02	P-02	P-02	ACT-01, GYP. WALL BOARD - SEE RCP	12' - 6"	HEIGHT VARIES, SEE RCP - MATCH ALL EXISTING FINSHES
303	4 - DEPARTURES LEVEL	DEPARTURES CORRIDOR- SOUTH	CPT-01	SSB-01	P-02	P-02	P-02	P-02	ACT-01, GYP. WALL BOARD - SEE RCP	15' - 4"	HEIGHT VARIES, SEE RCP - MATCH ALL EXISTING FINSHES
301	4 - DEPARTURES LEVEL	DEPARTURES PLATFORM	CPT-01	SSB-01	P-02	P-02	P-02	P-02	ACT-01, GYP. WALL BOARD - SEE RCP	12' - 10"	HEIGHT VARIES, SEE RCP - MATCH ALL EXISTING FINSHES
304	4 - DEPARTURES LEVEL	RAMP CORRIDOR	CPT-01	SSB-01	P-02	P-02	P-02	P-02	ACT-01, GYP. WALL BOARD - SEE RCP		HEIGHT VARIES, SEE RCP - MATCH ALL EXISTING FINSHES
ST02	4 - DEPARTURES LEVEL	STAIR/ESCALATOR WELL							MC-01, SEE SPECIFICATIONS		HEIGHT VARIES, SEE RCP & SECTION DRAWINGS
306	4 - DEPARTURES LEVEL	TICKETING PODIUM	ST-01	SSB-01	P-02	P-02	P-02	P-02	ACT-01, GYP. WALL BOARD - SEE RCP		HEIGHT VARIES, SEE RCP - MATCH ALL EXISTING FINSHES

GENERAL NOTES

1. ALL WALL PAINT TO BE P-01, UNO.
2. ALL CEILING PAINT TO BE P-01, WHERE NEW CEILING OCCURS UNO.
3. SCOPE OF WORK IS LIMITED TO WHAT IS SHOWN WITHIN AREA OF WORK LINES ONLY.
4. FABRIC WRAPPED PANELS SHALL BE INSTALLED USING STRETCH WALL SYSTEM. SUBMIT FOR ARCHITECT'S APPROVAL PRIOR TO ORDERING.
5. LEVEL 5 FINISH PAINT REQUIRED ON ALL NEW WALLS.

FINISH LEGEND

PAINT

P 01 — COLOR: SOFT CHAMOIS OC-13
MFR: BENJAMIN MOORE
FINISH: SATIN
TYPE: LATEX ENAMEL

P 02 — COLOR: ANTIQUE WHITE #43YY 78/053
MFR: ICI PAINTS
FINISH: SATIN

WALL BASE

RB 01 — RUBBER BASE
MFR: JOHNSONITE
HEIGHT: 6"
COLOR: BURNT UMBER 63

SSB 01 — STAINLESS STEEL BASE
MFR: FORMS & SURFACES
GAUGE: 16
FINISH: SANDSTONE
HEIGHT: VARIES, SEE DETAILS

FLOORING

CPT 01 — CARPET TILE
MFR: INTERFACE
PATT/COLOR: 292530-140
SIZE: 1M X 1M
BACKING: HARD BACKED

CPT 02 — CARPET TILE
MFR: INTERFACE
PATT/COLOR: 292530-150
SIZE: 1M X 1M
BACKING: CUSHION BACKED

ST 01 — STONE TILE - GRANITE
COLOR: LUNA PEARL
FINISH: POLISHED
MODULE SIZE: 18" X 18"
THICKNESS: SEE SPECIFICATIONS
GROUT: CUSTOM BUILDING PRODUCTS WINTER GRAY 335

SC 01 — CONCRETE SEALER COATING
MFR: SHERWIN WILLIAMS
TYPE: H&C SILICONE ACRYLIC CONCRETE SEALER

CEILING

ACT 01 — ACOUSTICAL CEILING TILE
MFR: ARMSTRONG
PATT/COLOR: CE, WHITE
SIZE: 24" x 48"

ACT 02 — ACOUSTICAL CEILING TILE
MFR: ARMSTRONG
PATT/COLOR: CE, WHITE
SIZE: 24" x 24"

MC 01 — MODULAR METAL CEILING SYSTEM
MFR: CEILINGS PLUS
TYPE: ILLUSIONS, PERFORATED
FINISH: ANODIZED
SIZE: PER DRAWINGS

COLUMN COVERS

CC 01 — MATERIAL: STAINLESS STEEL
MFR: FORMS AND SURFACES
FINISH: SANDSTONE RANDOM SWIRL
GAUGE: 16

CC 02 — MATERIAL: STAINLESS STEEL
MFR: FORMS AND SURFACES
FINISH: SANDSTONE
GAUGE: 16

CC 03 — MATERIAL: SPRAYED COATING ON GFRG
MFR: ZOLATONE COUNTERPOINTE
COLOR: PFX-C3020

CC 04 — MATERIAL: STAINLESS STEEL TRIM RING

STAIRS

ST1 01 — TYPE: GRANITE
COLOR: LUNA PEARL
FINISH: HONED
SIZE: VARIES - SEE STAIR DETAILS
THICKNESS: 3 CM
NOTE: SINGLE TAB TREAD

STR 01 — TYPE: GRNAITE
COLOR: LUNA PEARL
FINISH: POLISHED
SIZE: VARIES - SEE STAIR DETAILS
THICKNESS: 1/2"
NOTE: SINGLE SLAB RISER

METALS

SST1 01 — MATERIAL: STAINLESS STEEL
MFR: FORMS AND SURFACES
FINISH: SANDSTONE
GAUGE: 16

SST2 02 — MATERIAL: STAINLESS STEEL
MFR: FORMS AND SURFACES
FINISH: BRUSHED #4
GAUGE: 20

4/15/2015 11:01:51 PM

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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Hartsfield Jackson + Partnership
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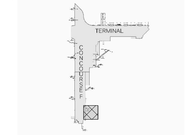
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: CA
Reviewed by: Checker

Project No:

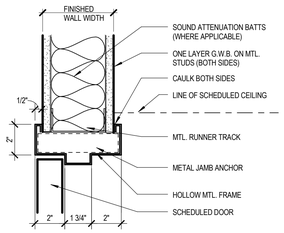
Sheet Title

DOOR AND ROOM FINISH SCHEDULE

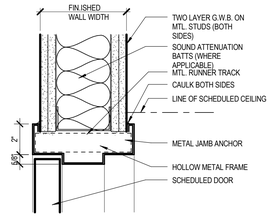
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

A930



1 HEAD DETAIL H-1
3" = 1'-0"



2 HEAD DETAIL H-2
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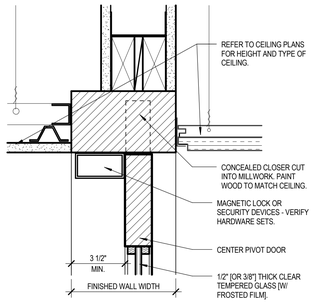

3 HEAD DETAIL H-3
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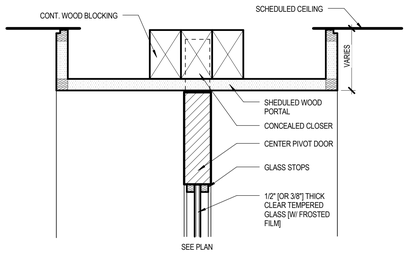
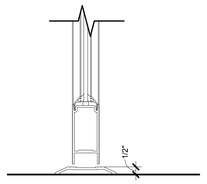
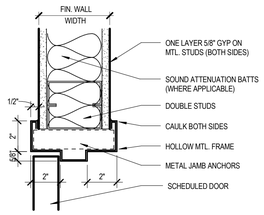


4 HEAD DETAIL H-4
3" = 1'-0"

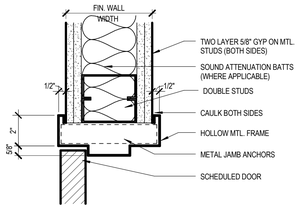


5 DOOR SILL DETAIL
3" = 1'-0"

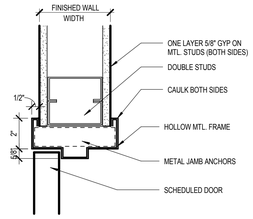
6 MULLION @ PARTITION DETAIL 1
3" = 1'-0"



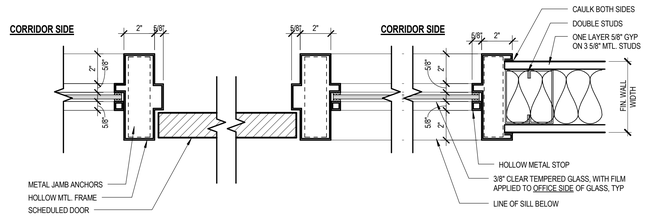
7 JAMB DETAIL J-1
3" = 1'-0"



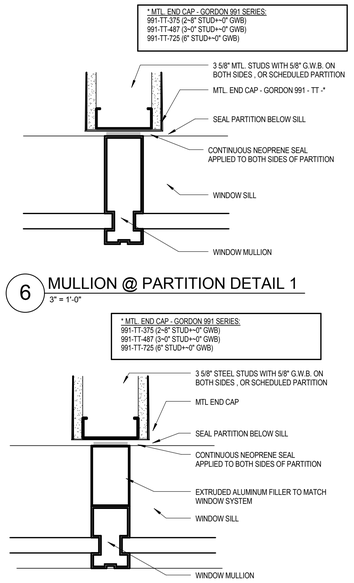
8 JAMB DETAIL J-2
3" = 1'-0"



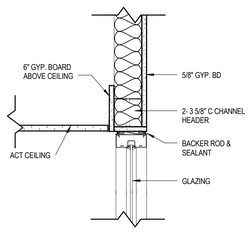
9 JAMB DETAIL J-3
3" = 1'-0"



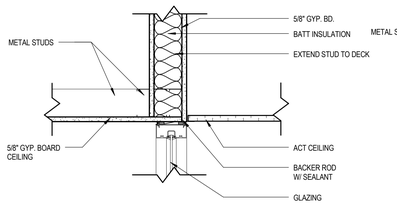
10 JAMB DETAIL DOOR W/ SIDELITE J-4
3" = 1'-0"



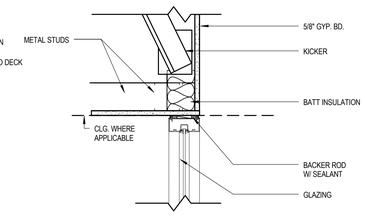
11 MULLION @ PARTITION DETAIL 2
3" = 1'-0"



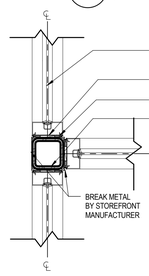
12 INTERIOR HEADER
1 1/2" = 1'-0"



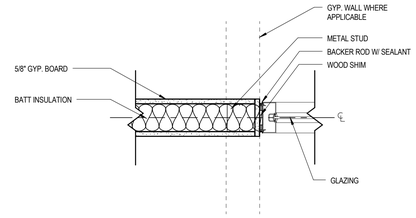
13 INTERIOR HEADER
1 1/2" = 1'-0"



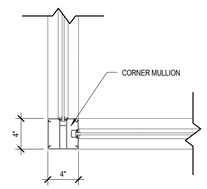
14 INTERIOR HEADER
1 1/2" = 1'-0"



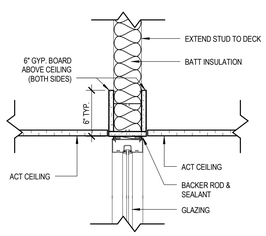
15 INTERIOR JAMB
1 1/2" = 1'-0"



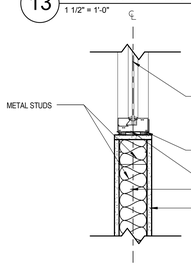
16 INTERIOR JAMB
1 1/2" = 1'-0"



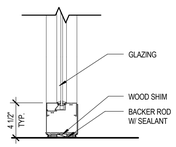
17 INTERIOR CORNER JAMB
1 1/2" = 1'-0"



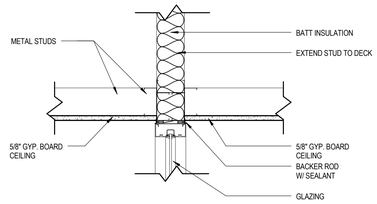
18 INTERIOR HEADER
1 1/2" = 1'-0"



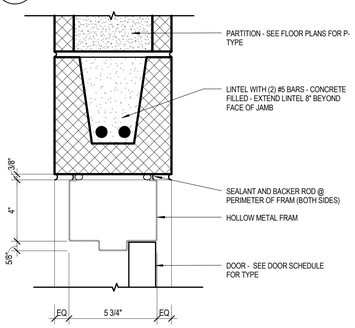
19 INTERIOR SILL
1 1/2" = 1'-0"



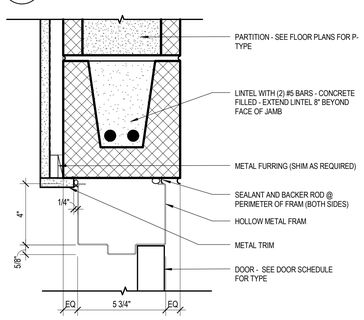
20 INTERIOR SILL TYP.
1 1/2" = 1'-0"



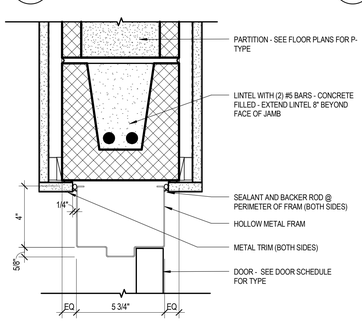
21 INTERIOR HEADER
1 1/2" = 1'-0"



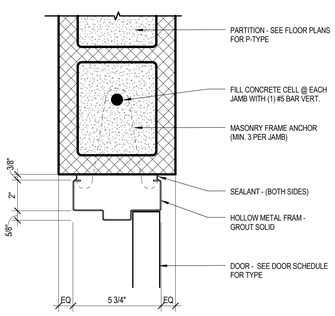
24 HOLLOW METAL DOOR HEAD @ CMU
3" = 1'-0"



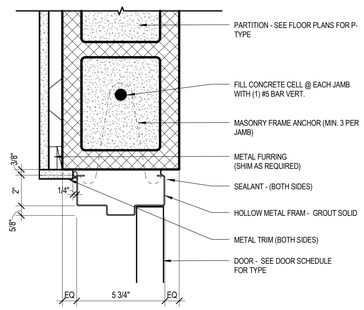
25 HOLLOW METAL DOOR HEAD @ CMU & GYP WALL
3" = 1'-0"



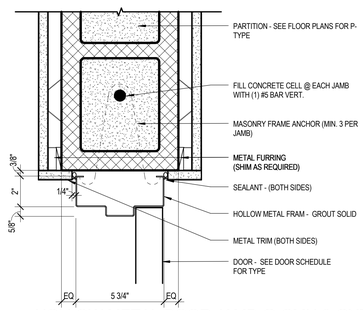
26 HOLLOW METAL DOOR HEAD @ CMU & GYP BOTH SIDES
3" = 1'-0"



27 HOLLOW METAL DOOR JAMB @ CMU
3" = 1'-0"



28 HOLLOW METAL DOOR JAMB @ CMU & GYP
3" = 1'-0"



29 HOLLOW METAL DOOR JAMB @ CMU & GYP BOTH SIDES
3" = 1'-0"

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Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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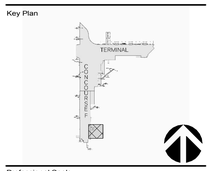
1056 SPRING STREET, N.W.
ATLANTA, GA 30309-3818
P: (404) 876-3055
F: (404) 876-6841

Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: CA Reviewed by: Checker

Project No:

Sheet Title

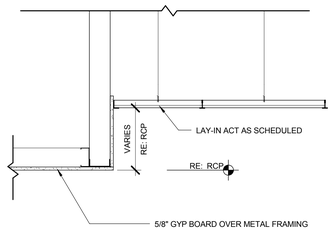
INTERIOR OPENING SYSTEM DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

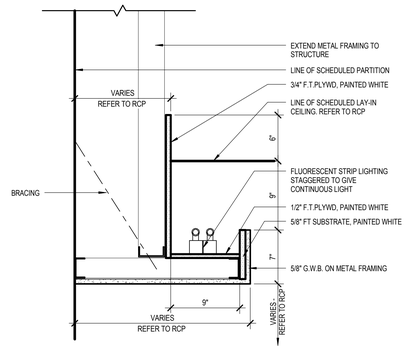
Sheet Number

A931

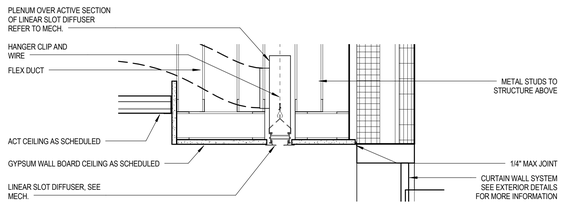
4/15/2015 11:02:03 PM



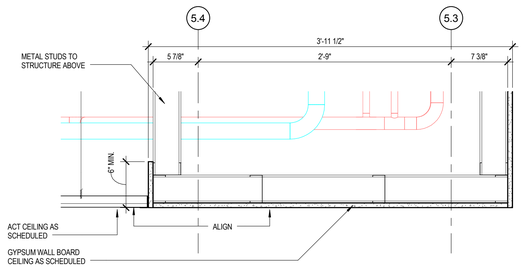
1 ACT TRANSITION TO GYP SOFFIT DTL
1" = 1'-0"



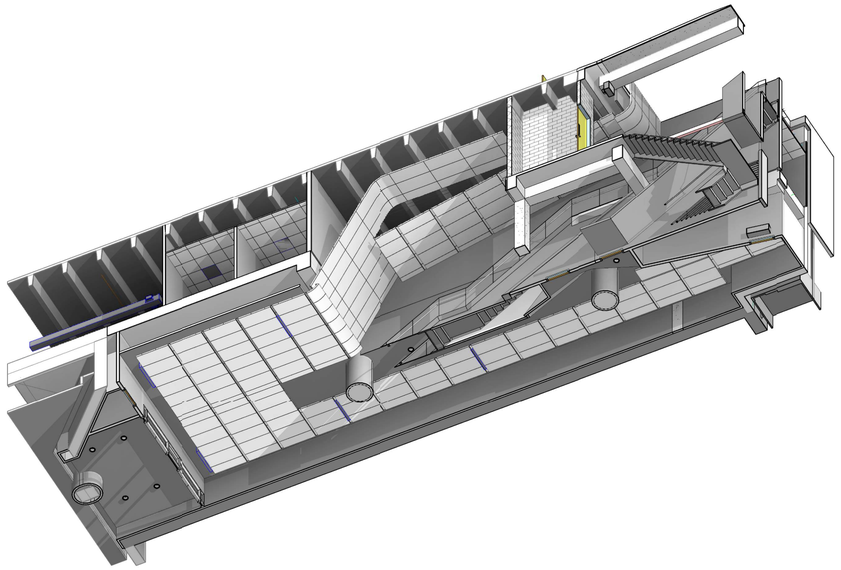
2 LIGHT COVE
1 1/2" = 1'-0"



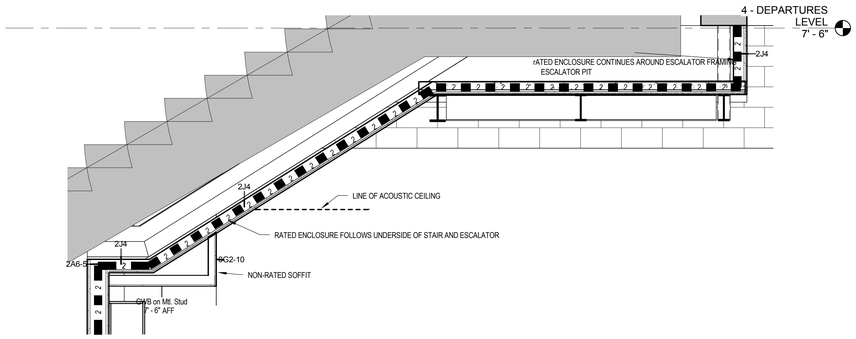
3 CEILING DIFFUSER @ CURTAIN WALL
1 1/2" = 1'-0"



4 GYP CEILING @ DEPARTURES CORRIDOR DETAIL
1 1/2" = 1'-0"



5 3D - CEILING VIEW-2



6 SECTION THROUGH RATED SOFFIT
1/2" = 1'-0"

4/15/2015 11:04:04 PM

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Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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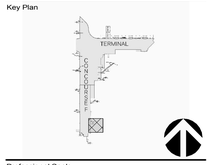
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: CA Reviewed by: Checker

Project No:

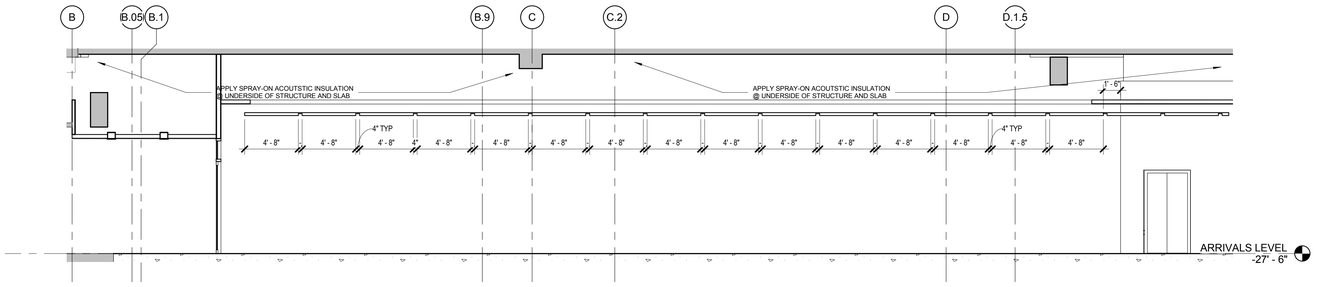
Sheet Title

INTERIOR CEILING SYSTEM DETAILS

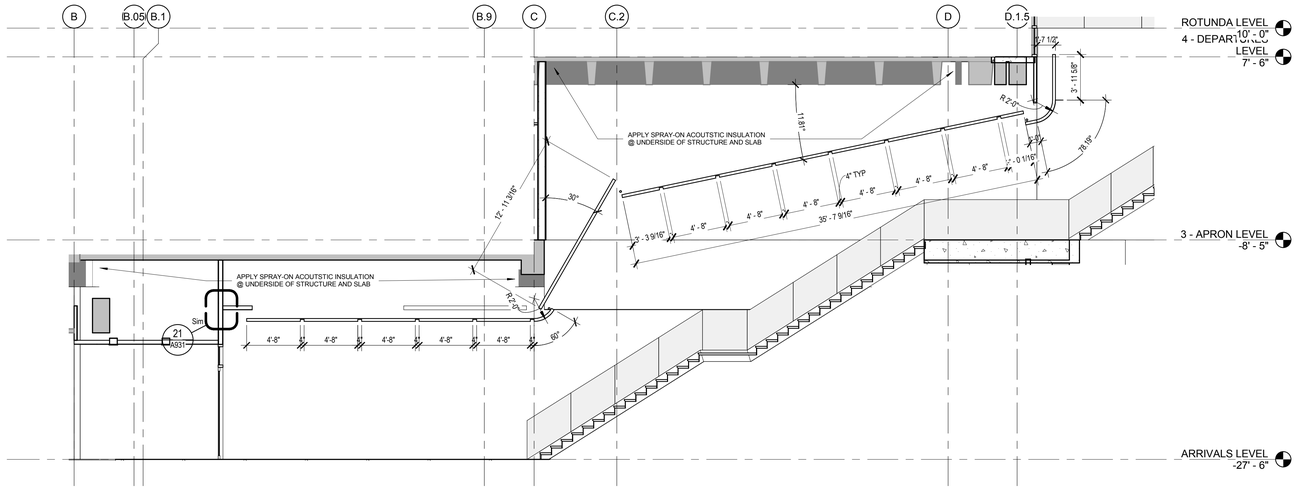
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

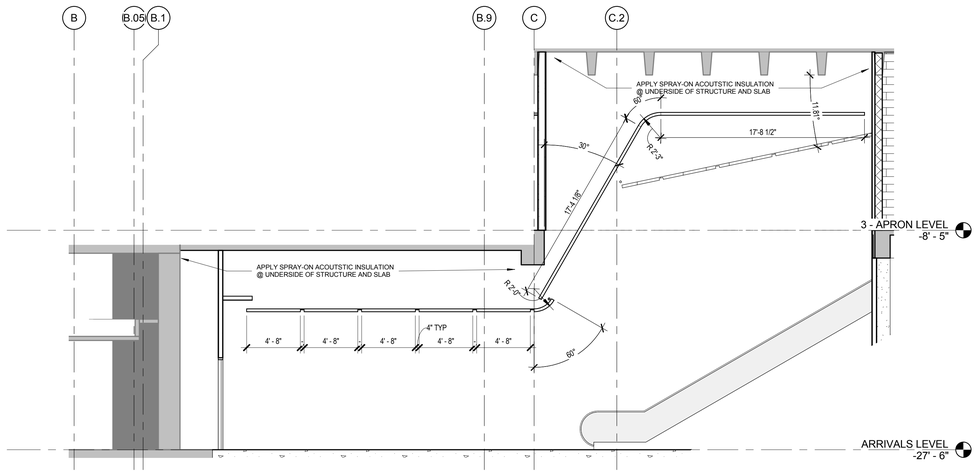
A940



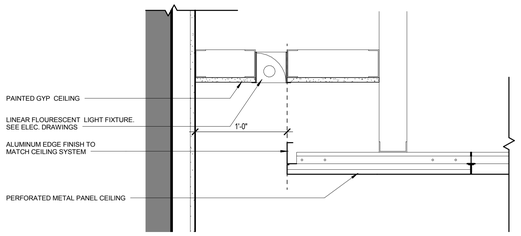
1 METAL PANEL CEILING SECTION
3/16" = 1'-0"



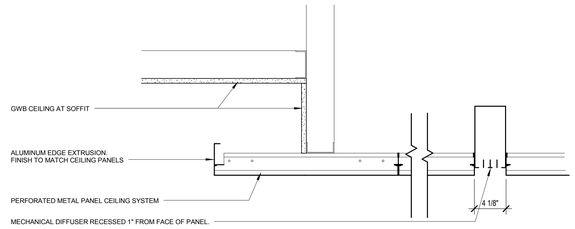
2 METAL PANEL CEILING SYSTEM
3/16" = 1'-0"



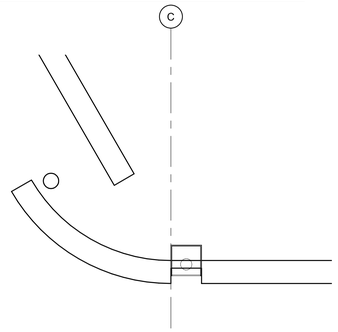
3 METAL PANEL CEILING SYSTEM
3/16" = 1'-0"



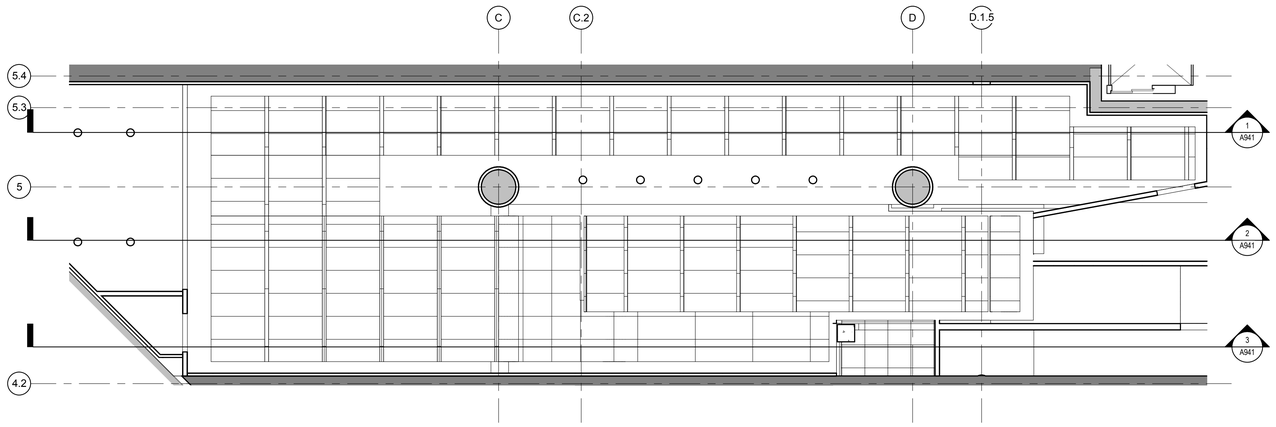
5 MTL PANEL CEILING @ PERIMETER LIGHT COVE
1 1/2" = 1'-0"



6 SECTION THROUGH METAL PANEL CEILING
1 1/2" = 1'-0"



7 METAL PANEL CEILING AT UPTURN
1 1/2" = 1'-0"



4 METAL PANEL CEILING RCP
3/16" = 1'-0"

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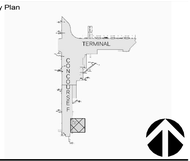

Professional Seals

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: HOK Reviewed by: DLS

Project No:

Sheet Title

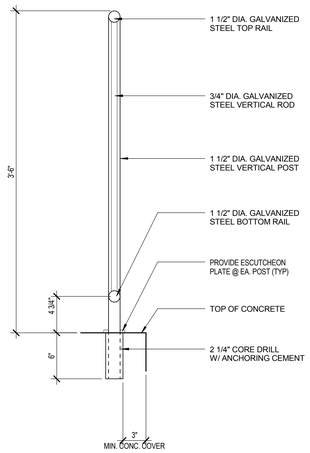
METAL PANEL CEILING SYSTEM

Original drawing is 42 x 30. Do not scale contents of this drawing.

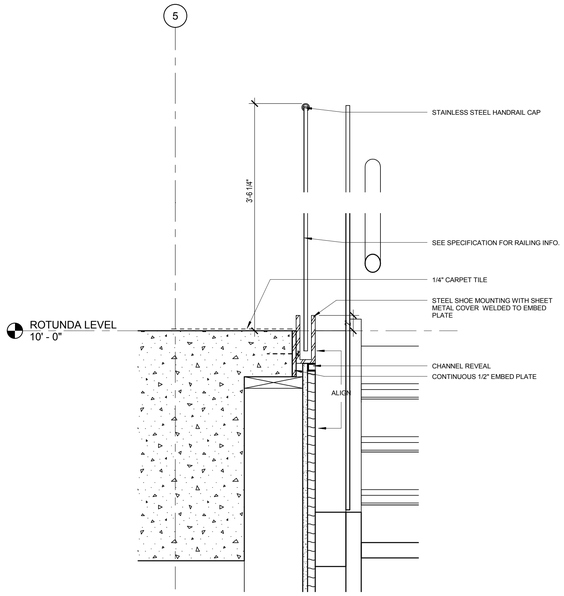
Sheet Number

A941

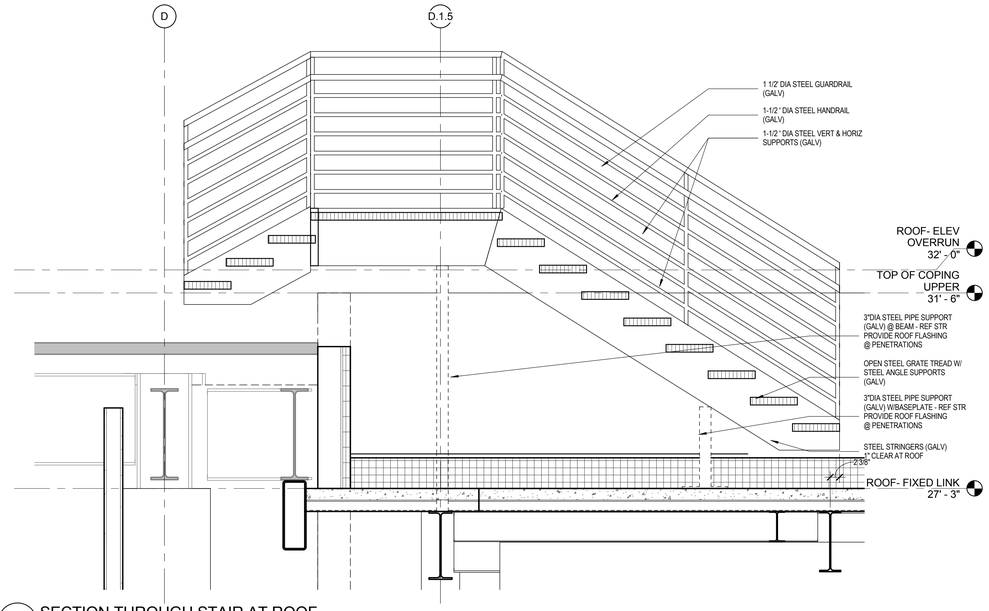
4/15/2015 11:34:52 PM



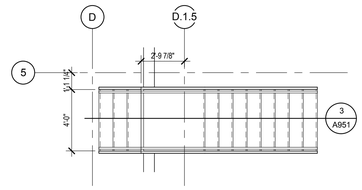
1 RAIL R1, DETAIL
1 1/2" = 1'-0"



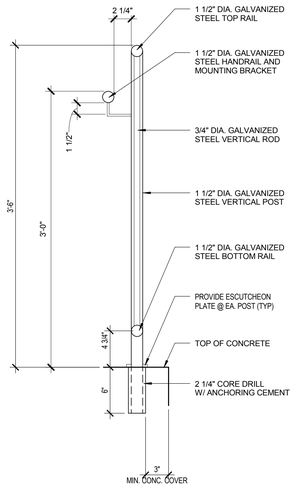
2 SECTION THRU GLASS HANDRAIL
1 1/2" = 1'-0"



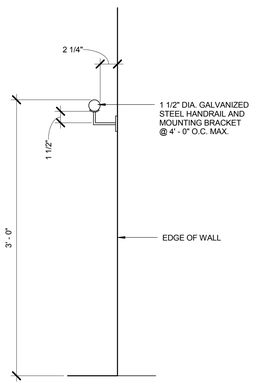
3 SECTION THROUGH STAIR AT ROOF
3/4" = 1'-0"



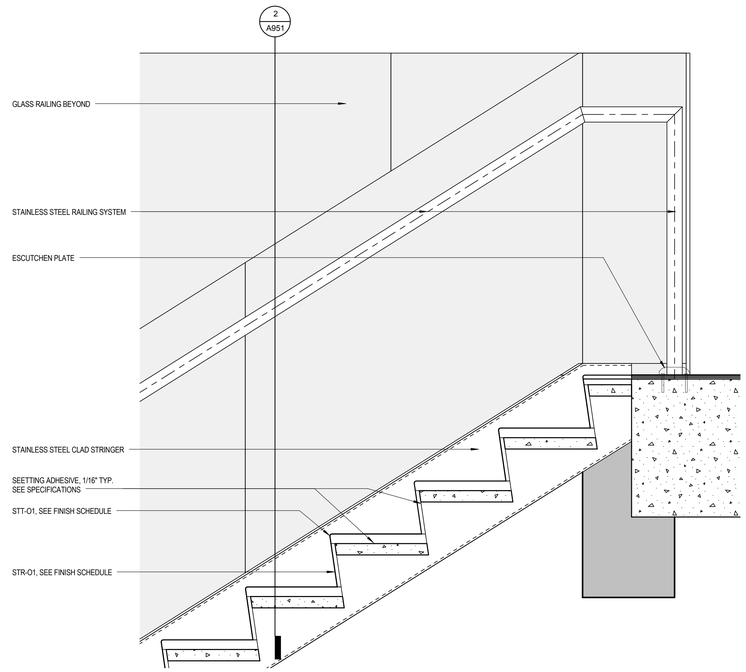
7 STAIR PLAN
1/4" = 1'-0"



4 RAIL R1, DETAIL
1 1/2" = 1'-0"



5 RAIL R4, DETAIL
1 1/2" = 1'-0"



6 SECTION THRU TOP OF MONUMENTAL STAIR
1 1/2" = 1'-0"

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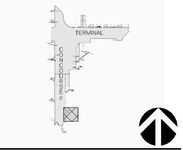

Professional Seals

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1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: CA Reviewed by: Checker

Project No:

Sheet Title

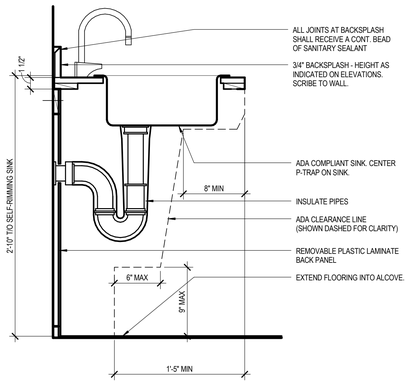
STAIR & RAILING SYSTEM DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

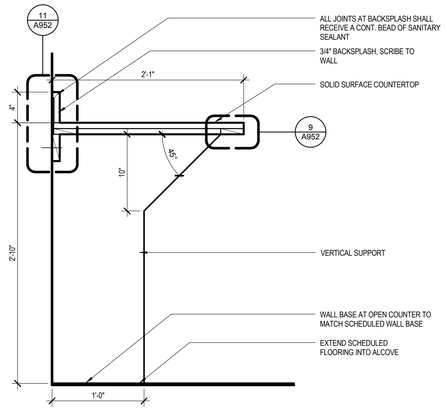
Sheet Number

A951

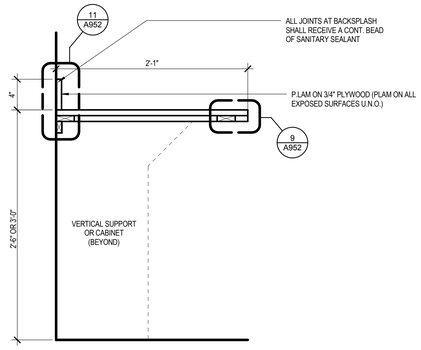
4/15/2015 11:05:13 PM



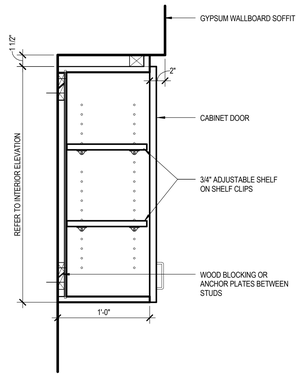
1 SECTION THRU BASE CABINET AT SINK
1 1/2" = 1'-0"



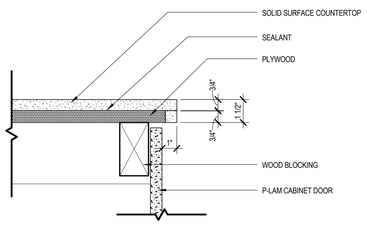
5 SECTION THRU OPEN COUNTERTOP W/ P.LAM. SUPPORT
1 1/2" = 1'-0"



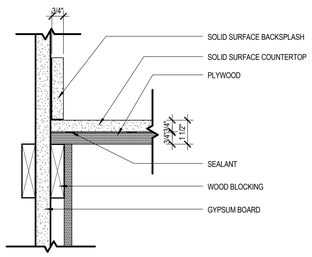
6 SECTION THRU COUNTERTOP AT WORK SURFACE
1 1/2" = 1'-0"



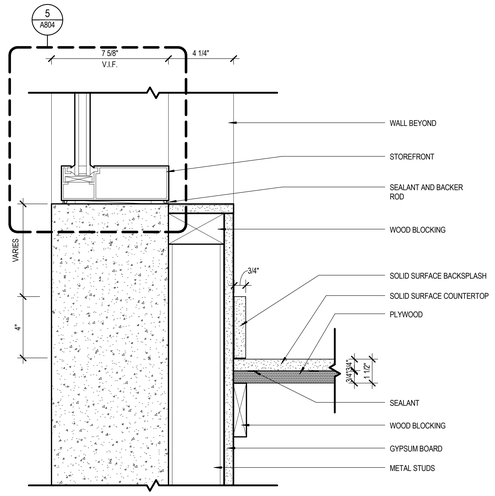
7 SECTION THRU UPPER CABINET
1 1/2" = 1'-0"



9 SECTION THRU EDGE OF COUNTERTOP
3" = 1'-0"



10 SECTION THRU SPLASH OF COUNTERTOP
3" = 1'-0"



11 SECTION THRU SPLASH OF COUNTERTOP AT STOREFRONT
3" = 1'-0"

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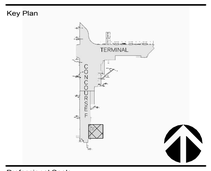

Professional Seals

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: CA Reviewed by: Checker

Project No:

Sheet Title

INTERIOR MILLWORK DETAILS

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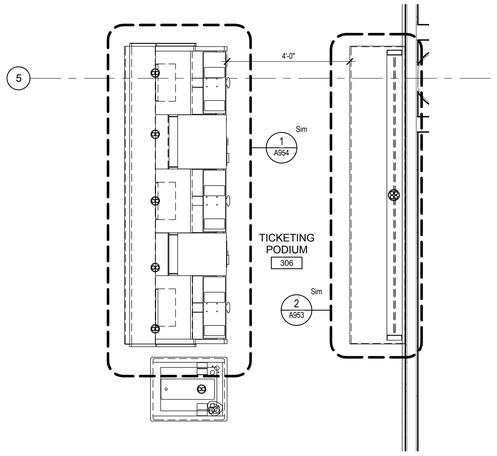
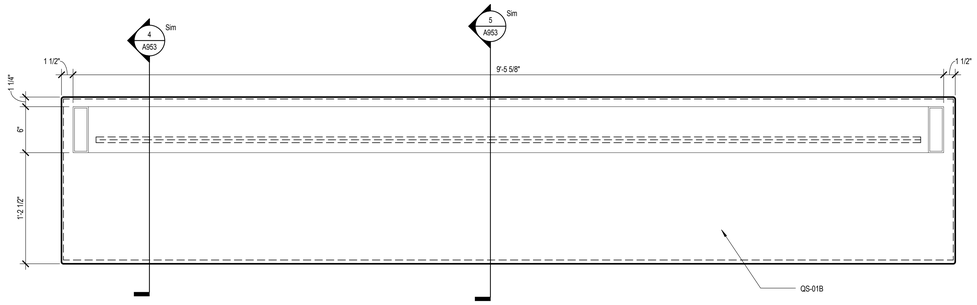
Sheet Number

A952

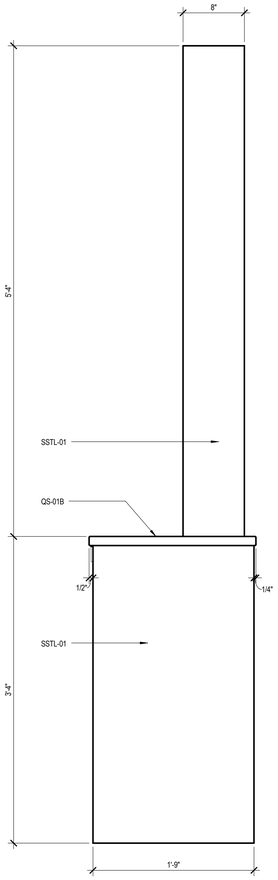
4/15/2015 11:05:21 PM



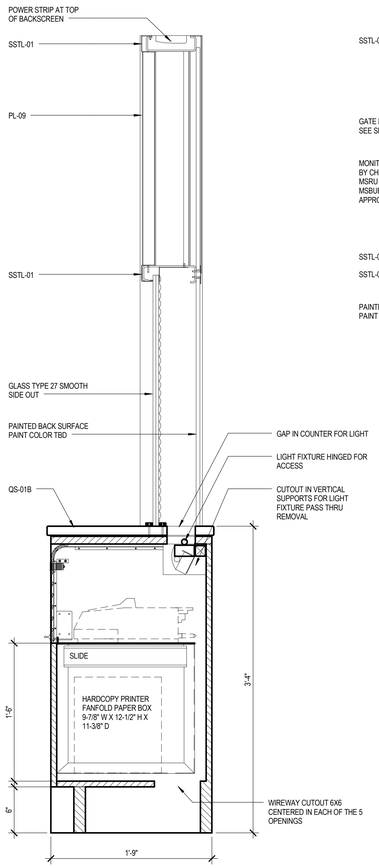
1 GATE COUNTER PLAN DETAIL
1/2" = 1'-0"



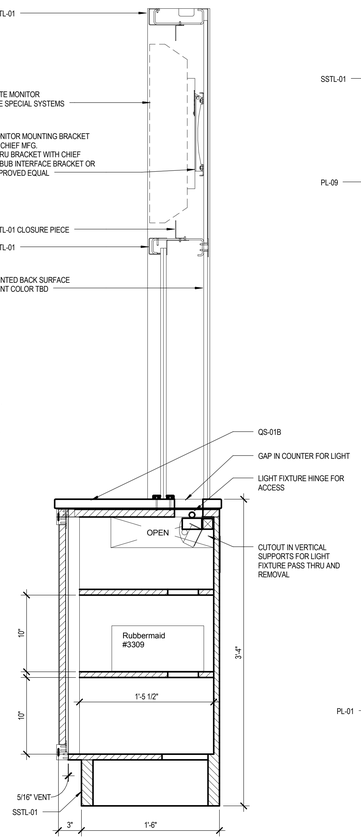
2 GATE BACK COUNTER PLAN
1 1/2" = 1'-0"



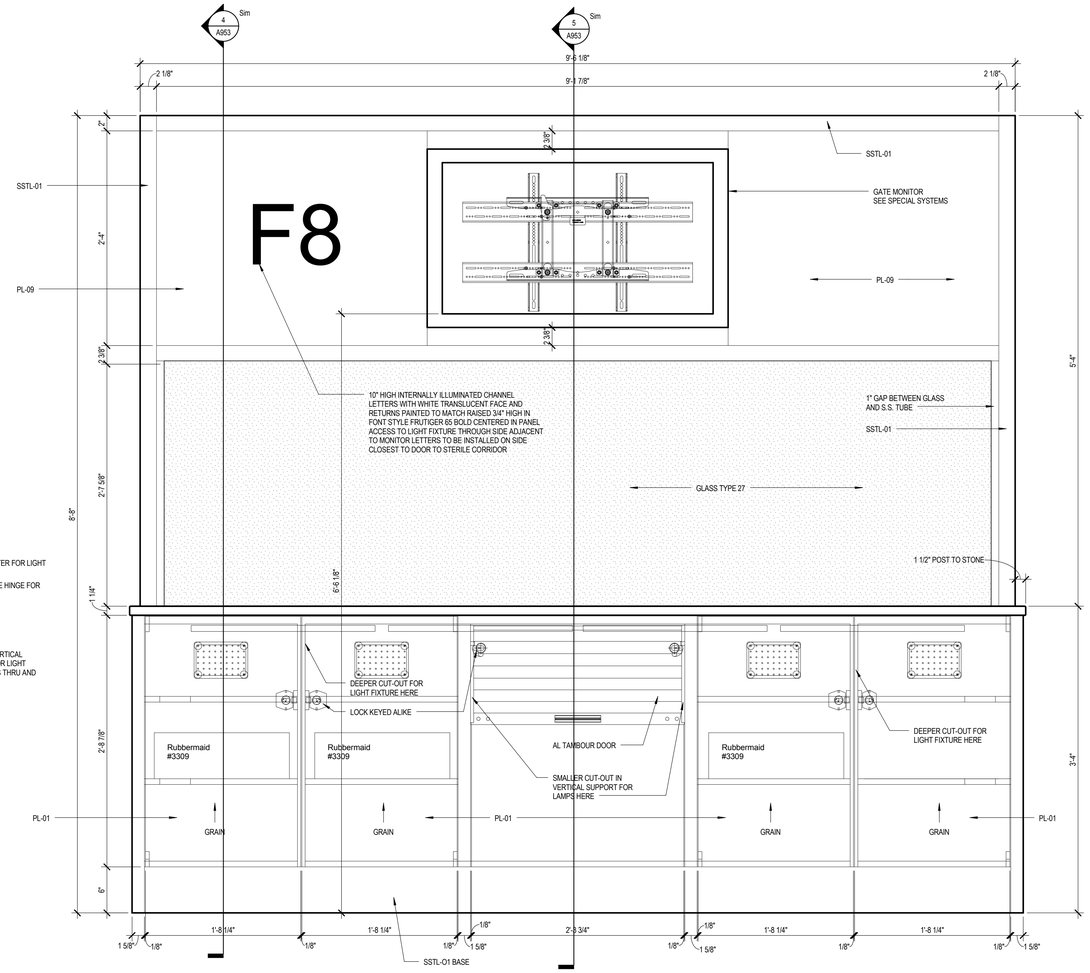
3 GATE BACK COUNTER SIDE ELEVATION
1 1/2" = 1'-0"



4 GATE BACK COUNTER SECTION 1
1 1/2" = 1'-0"



5 GATE BACK COUNTER SECTION 2
1 1/2" = 1'-0"



6 GATE BACK COUNTER ELEVATION
1 1/2" = 1'-0"

4/15/2015 11:05:31 PM

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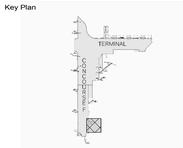

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3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: Author Reviewed by: Checker

Project No:

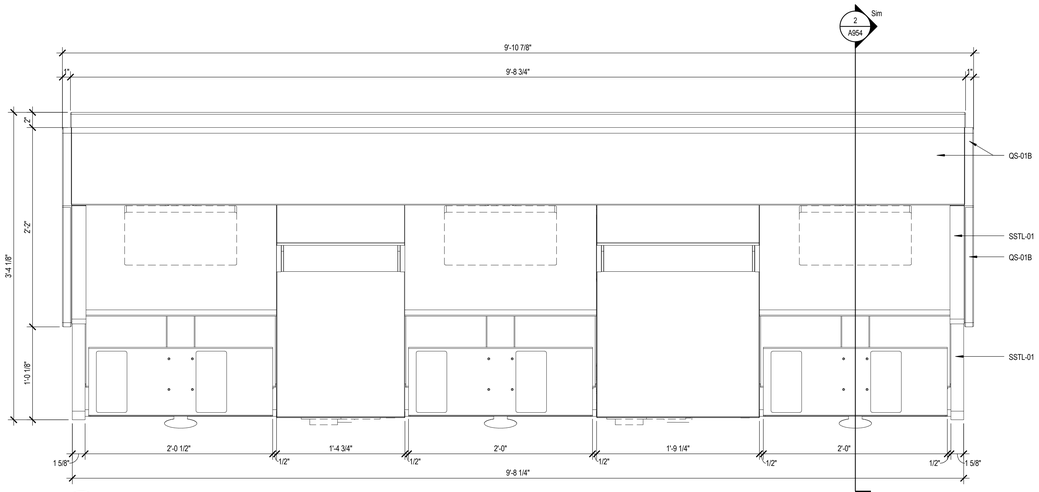
Sheet Title

INTERIOR MILLWORK DETAILS

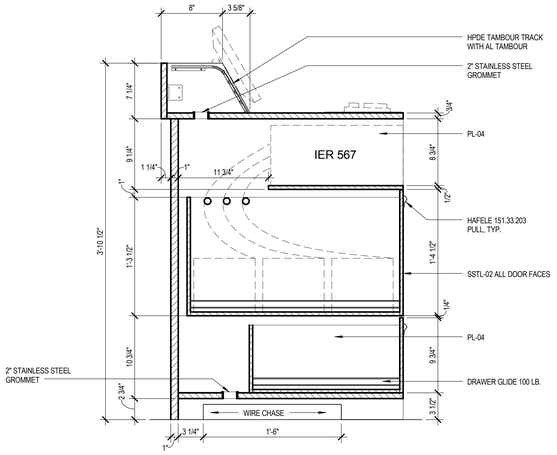
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

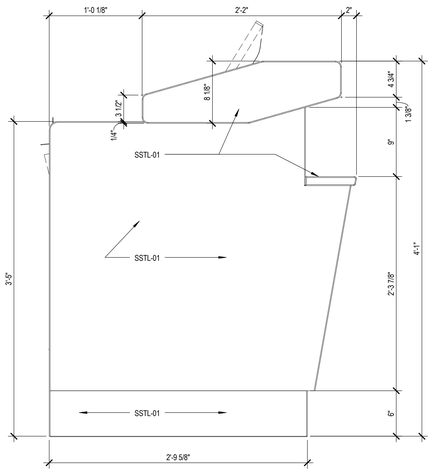
A953



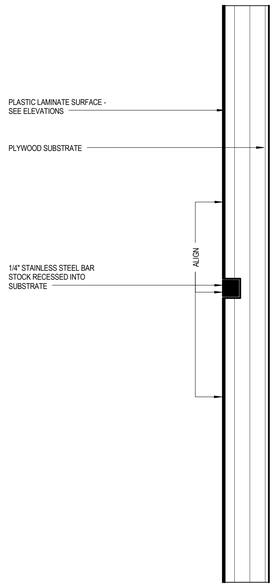
1 GATE FRONT COUNTER PLAN
1 1/2" = 1'-0"



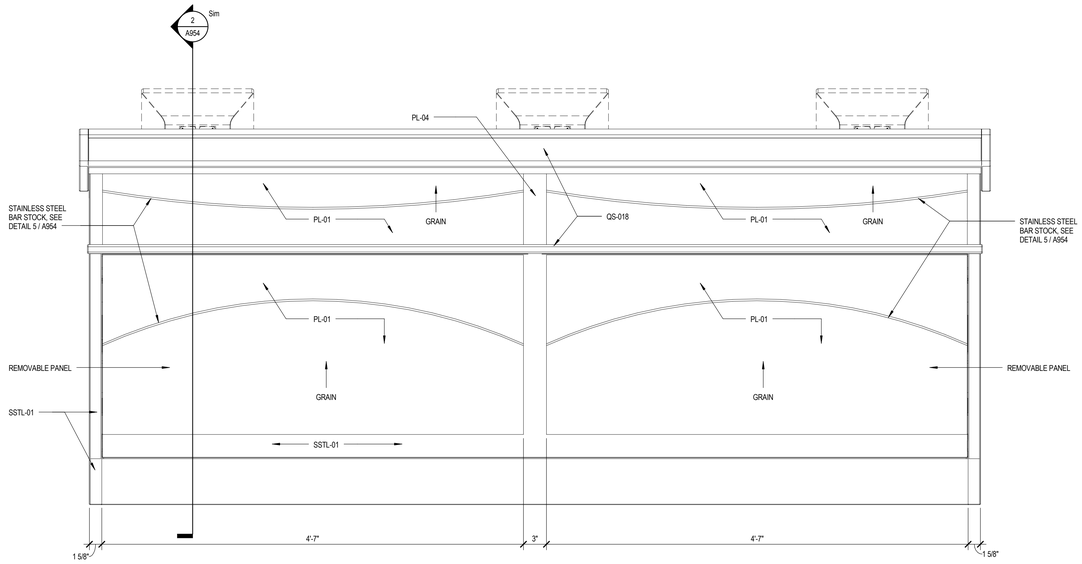
2 GATE FRONT COUNTER SECTION
1 1/2" = 1'-0"



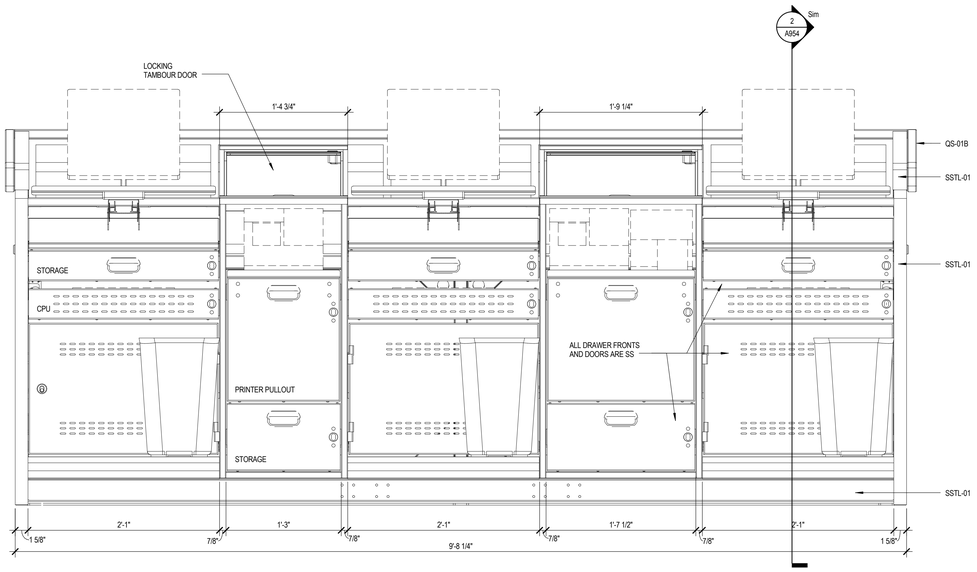
4 GATE FRONT COUNTER SIDE ELEVATION
1 1/2" = 1'-0"



5 SECTION DETAIL
3" = 1'-0"



3 GATE FRONT COUNTER ELEVATION 1
1 1/2" = 1'-0"



6 GATE FRONT COUNTER ELEVATION 2
1 1/2" = 1'-0"

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Hartsfield-Jackson
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"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

Hartsfield Jackson + Partnership
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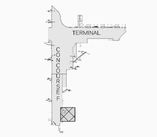
Key Plan



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Drawn by: Author Reviewed by: Checker

Project No:

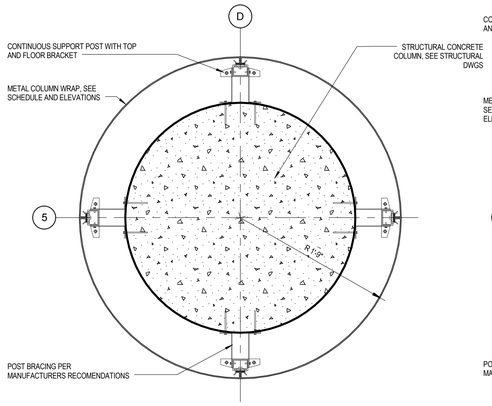
Sheet Title

INTERIOR MILLWORK DETAILS

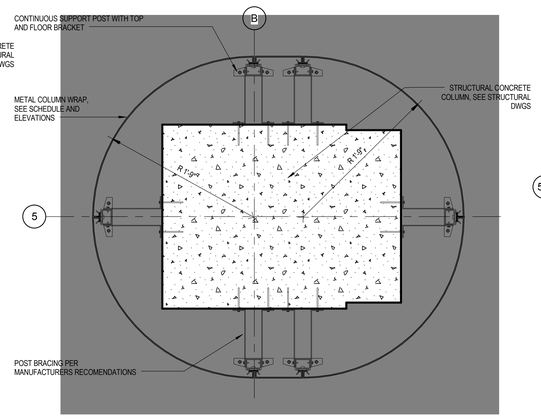
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

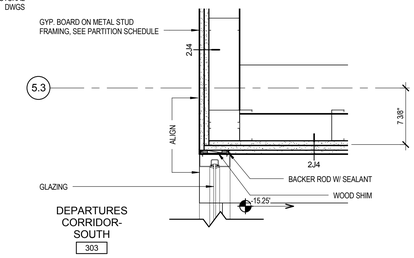
A954



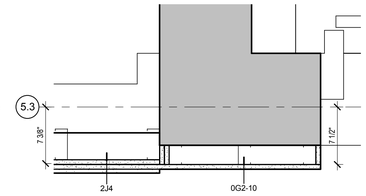
1 TYPICAL COLUMN WRAP DETAIL - METAL
1 1/2" = 1'-0"



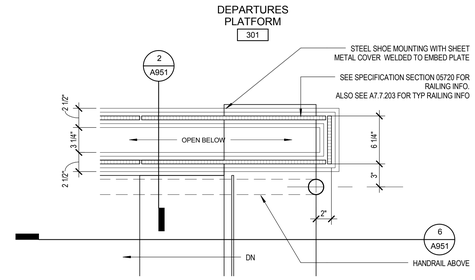
2 EXTENDED COLUMN WRAP DETAIL - METAL
1 1/2" = 1'-0"



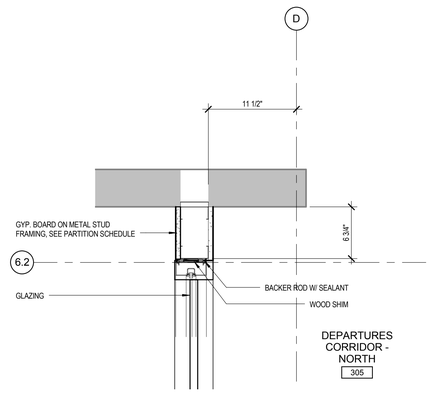
3 GLAZING PLAN DETAIL - DEPARTURES LEVEL
1 1/2" = 1'-0"



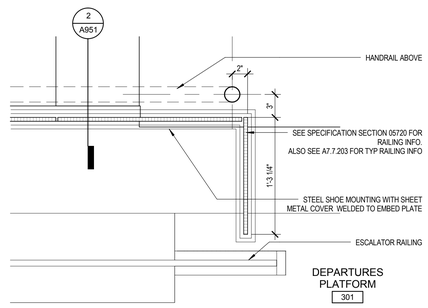
4 PLAN DETAIL @ ELEVATOR - DEPARTURES LEVEL
1 1/2" = 1'-0"



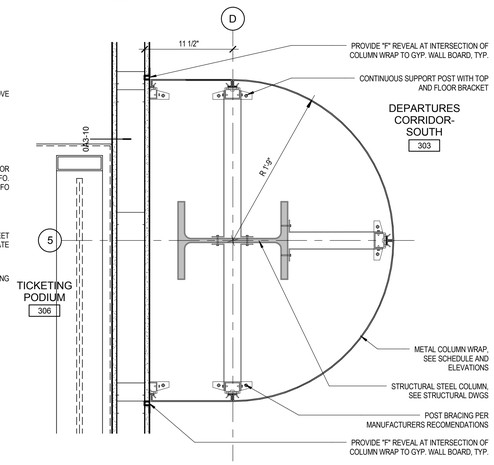
5 RAILING PLAN DETAIL @ STAIR - DEPARTURES LEVEL
1 1/2" = 1'-0"



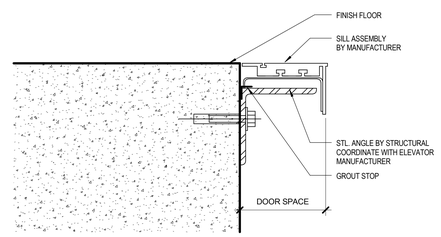
6 CORRIDOR WALL PLAN DETAIL @ EXISTING WALL
1 1/2" = 1'-0"



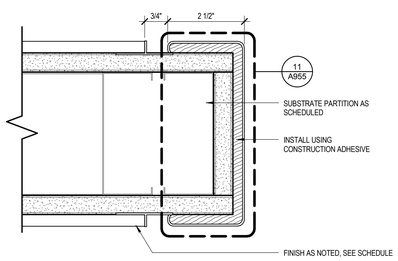
7 PLAN DETAIL @ STAIR / ESCALATOR
1 1/2" = 1'-0"



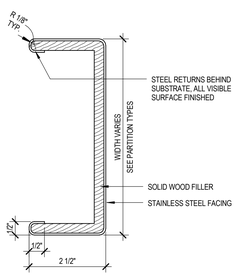
8 COLUMN PLAN DETAIL - DEPARTURES CORRIDOR
1 1/2" = 1'-0"



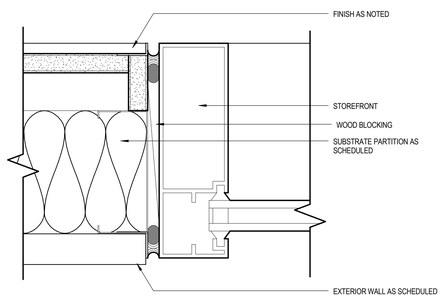
9 ELEVATOR SILL DETAIL
3" = 1'-0"



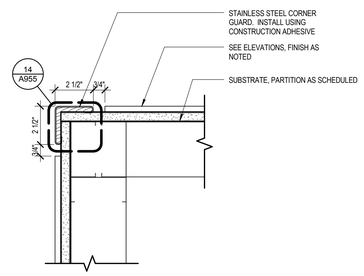
10 TYPICAL END WALL PLAN DETAIL
6" = 1'-0"



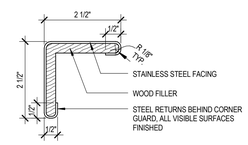
11 TYPICAL CORNER GUARD DETAIL AT END WALL
6" = 1'-0"



12 TYPICAL DRYWALL DETAIL AT STOREFRONT
6" = 1'-0"



13 TYPICAL 2 1/2" CORNER GUARD THRU TILE PLAN DETAIL
3" = 1'-0"



14 TYPICAL CORNER GUARD DETAIL
6" = 1'-0"

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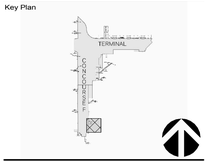
Key Plan



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Drawn by: CA Reviewed by: Checker

Project No:

Sheet Title

INTERIOR PLAN DETAILS

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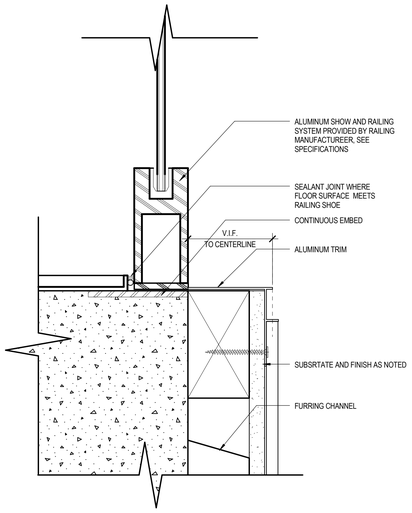
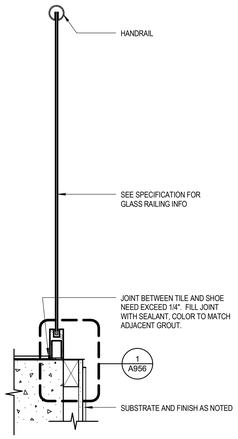
Sheet Number

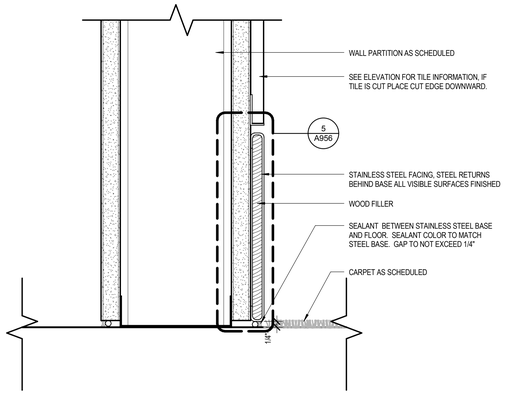
A955



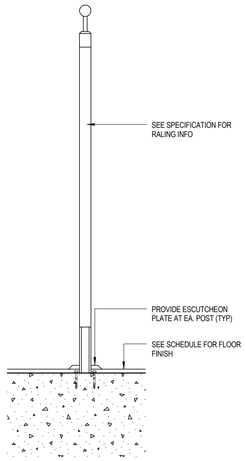
1 GLASS PANEL RAILING BASE DETAIL
6" = 1'-0"



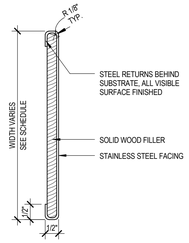
2 GLASS PANEL RAILING SYSTEM SECTION
1 1/2" = 1'-0"



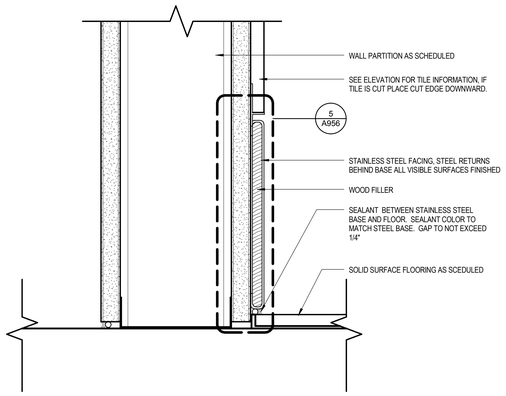
3 STAINLESS STEEL BASE AT CARPET DETAIL
6" = 1'-0"



4 STAINLESS STEEL POST RAILING SYSTEM SECTION
1 1/2" = 1'-0"



5 TYPICAL STAINLESS BASE
6" = 1'-0"



6 STAINLESS STEEL BASE AT SOLID SURFACE DETAIL
6" = 1'-0"

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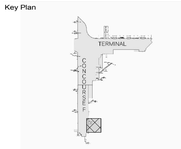

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Sheet Title

INTERIOR SECTION DETAILS

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A956

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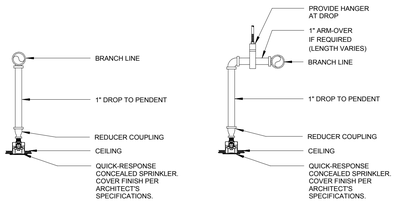
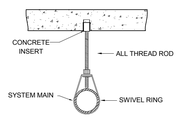


DROP ASSEMBLY **ARM-OVER ASSEMBLY**

DETAILS OF PENDENT DROP ASSEMBLIES TO CEILINGS

NOT TO SCALE

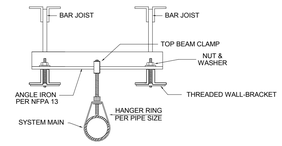
ALL NIPPLES, ARM-OVERS AND DROPS TO BE 1" SCHEDULE 40 BLACK STEEL PIPE. PENDENT SPRINKLERS IN SUSPENDED CEILINGS SHALL BE A MINIMUM OF SIX INCHES (6") FROM THE CEILING GRID. HEADS SHALL BE CENTER OF TILE AS REQUIRED.



INSERT HANGER ASSEMBLY

NOT TO SCALE

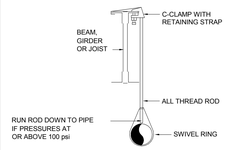
ALL THREAD ROD SIZE SHALL BE PER NFPA REQUIREMENTS.



TRAPEZE HANGER ASSEMBLIES

NOT TO SCALE

UNISTRUT AND ALL THREAD ROD SHALL BE PER NFPA REQUIREMENTS.



CLAMP HANGER ASSEMBLY

NOT TO SCALE

ALL THREAD ROD SIZE SHALL BE PER NFPA REQUIREMENTS.

HANGER SCHEDULE

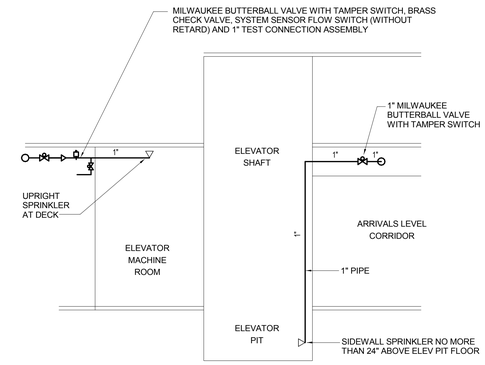
MAXIMUM DISTANCE BETWEEN HANGERS

PIPE SIZE (IN.)	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"	5"	6"	8"
STEEL PIPE	12-0	12-0	15-0	15-0	15-0	15-0	15-0	15-0	15-0	15-0	15-0
THREADED LIGHTWALL	12-0	12-0	12-0	12-0	12-0	N/A	N/A	N/A	N/A	N/A	N/A

NOTE: HANGERS ARE TO BE INSTALLED AS PER THE SCHEDULE ABOVE.

THE UNSUPPORTED LENGTH BETWEEN THE END SPRINKLER AND THE LAST HANGER ON THE LINE SHALL NOT EXCEED 36" FOR 1" PIPE, 48" FOR 1 1/4" PIPE AND 60" FOR 1 1/2" PIPE OR LARGER.

THE CUMULATIVE HORIZONTAL LENGTH OF AN UNSUPPORTED ARMOVER TO A SPRINKLER, SPRINKLER DROP, OR SPRIG-UP SHALL NOT EXCEED 24"



DETAIL OF ELEVATOR SHAFT and ELEVATOR EQUIPMENT ROOM PROTECTION

NOT TO SCALE

CONTROL VALVES, CHECK VALVES, FLOW SWITCHES AND TEST CONNECTION ASSEMBLIES SHALL BE LOCATED OUTSIDE AND ADJACENT TO THE MACHINE ROOM. THE TEST VALVE DRAIN SHALL BE ROUTED TO THE EXTERIOR OR A 4" DIAMETER (MIN.) FLOOR DRAIN.

SYSTEM NOTES

1. THE FIRE PROTECTION SPRINKLER SYSTEM LAYOUTS SHOWN ON THESE PLANS ARE FOR INFORMATION PURPOSES ONLY. IT IS THE INTENT OF THESE DRAWINGS TO INDICATE AREAS OF COVERAGE, TYPES OF SPRINKLER HEADS, AND FINISHES TO BE USED. THE FIRE PROTECTION CONTRACTOR SHALL DESIGN A FULL AND COMPLETE FIRE PROTECTION SPRINKLER SYSTEM AND INSTALL IN ACCORDANCE WITH NFPA-13 AND AIRPORT FIRE MARSHALL REQUIREMENTS.
2. THE FIRE PROTECTION CONTRACTOR SHALL INSTALL NEW FIRE SUPPRESSION SYSTEMS THROUGHOUT THE PROPOSED AND RECONFIGURED AIRPORT TERMINAL GATE F3.
3. ALL WORK SHALL BE IN COMPLIANCE WITH NFPA 13 EDITION 2013
4. NOT USED.
5. PROVIDE DRAIN VALVES AS NECESSARY.
6. HANGERS TO BE INSTALLED AND SPACED PER NFPA REQUIREMENTS.
7. ANY ELECTRICAL EQUIPMENT (EXCEPT FOR BELL, FLOW AND TAMPER SWITCHES) IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
8. ANY ELECTRICAL WIRING IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
9. ALL DIMENSIONS, MEASUREMENTS AND ELEVATIONS ARE TO BE FIELD VERIFIED.
10. ANY PAINTING OF PIPE IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
11. SPRINKLERS TO BE INSTALLED BELOW ANY EXPOSED OBSTRUCTIONS 48" AND WIDER.
12. SPRINKLER DEFLECTOR DISTANCES AT CEILINGS AND BELOW EXPOSED CONSTRUCTION DECKING TO BE PER NFPA 13 REQUIREMENTS.
13. ALL MATERIALS AND EQUIPMENT SHALL BE UL LISTED FOR THE INTENDED USE AND INSTALLED IN COMPLIANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
14. LOCATIONS OF PIPING AS SHOWN ON THE DRAWINGS ARE APPROXIMATE AND SUBJECT TO MINOR ADJUSTMENTS IN THE FIELD.
15. SPACE TO BE MAINTAINED AT A MINIMUM OF 40 DEGREES FAHRENHEIT TO PREVENT FREEZING OF THE WET PIPE SYSTEMS.
16. SPRINKLER PIPE SIZES 2-1/2" THROUGH 6" TO BE BLACK STEEL, SCHEDULE 10 PIPE.
17. SPRINKLER PIPE SIZES 1" THROUGH 2" TO BE BLACK STEEL, SCHEDULE 40 PIPE.

DESIGN BASIS

(LH) LIGHT HAZARD
0.10 GPM/FT2 OVER 1500 SQ.FT.
WITH 250 GPM HOSE ALLOWANCE
225 SQ.FT. MAX. PER SPRINKLER

(OH1) ORDINARY HAZARD GROUP 1
0.15 GPM/FT2 OVER 1500 SQ.FT.
WITH 500 GPM HOSE ALLOWANCE
130 SQ.FT. MAX. PER SPRINKLER

(OH2) ORDINARY HAZARD GROUP 2
0.20 GPM/FT2 OVER 1500 SQ.FT.
WITH 500 GPM HOSE ALLOWANCE
130 SQ.FT. MAX. PER SPRINKLER

PERMISSIBLE DECREASES AND REQUIRED INCREASES FROM NPFA 13 SHALL BE APPLIED TO AN INITIAL HYDRAULICALLY REMOTE 1500 SQUARE FEET.

SPRINKLER SYMBOL DESCRIPTION

SYMBOL	MAKE	MODEL	SIZE	PART NUMBER	RESPONSE	FINISH	STYLE	TEMP	K-FACTOR	ESCUTCHEON	TOTAL
⦿	GLOBE	GL-QR	1/2"	GL-5601	QR	CHROME	PENDENT	155°	5.6	RECESSED	15
●	GLOBE	GL-QR	1/2"	GL-5606	QR	CHROME	PENDENT	155°	5.6	CONCEALED	41
○	GLOBE	GL-QR	1/2"	GL-5615	QR	BRASS	UPRIGHT	155°	5.6	---	15
◁	GLOBE	GL-QR	1/2"	GL-5626	QR	BRASS	SIDEWALL	155°	5.6	---	1

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

Hartsfield Jackson + Partnership
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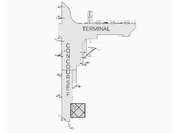
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: PES Reviewed by: MA

Project No:

Sheet Title

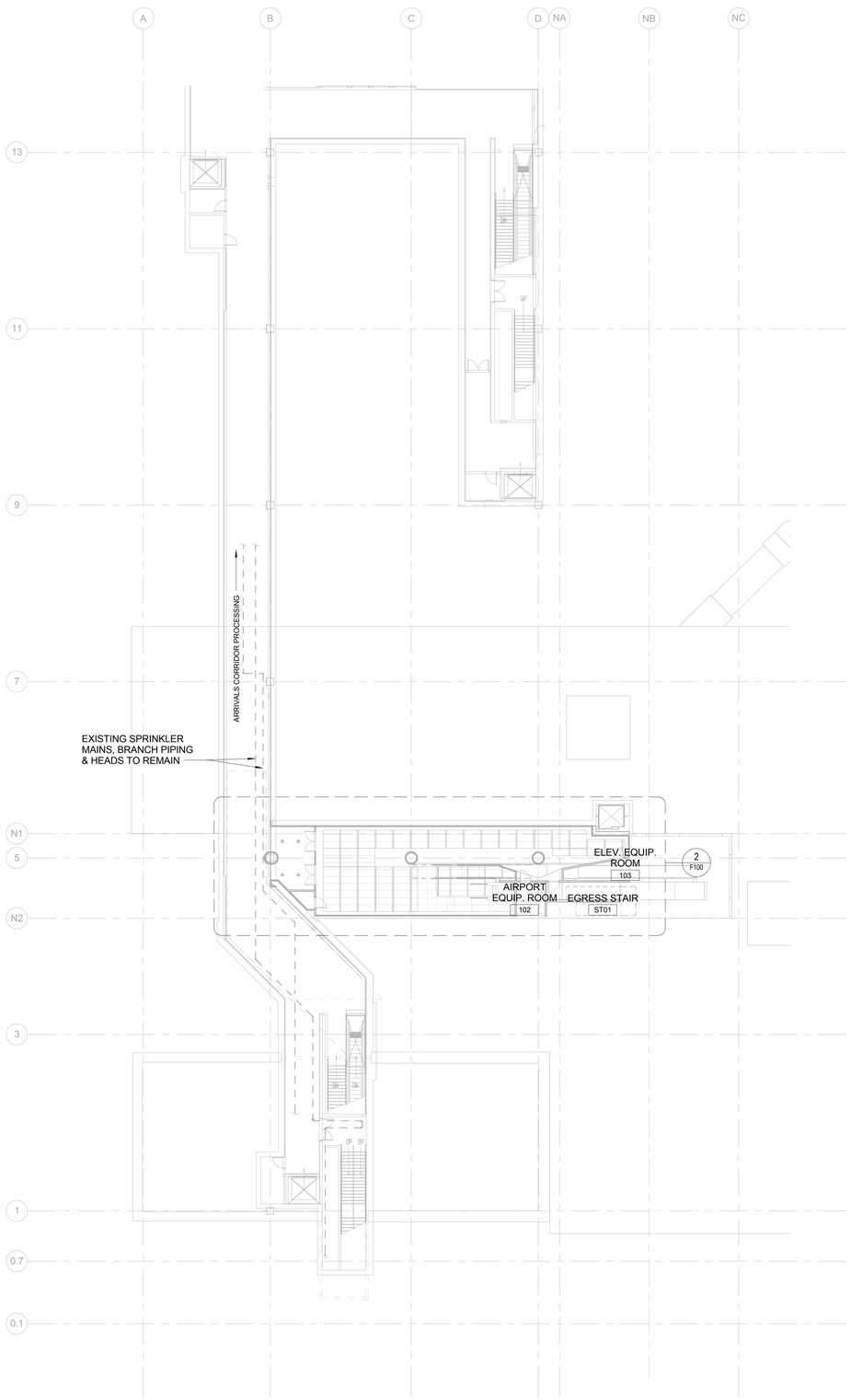
ABBREVIATIONS, DETAILS, LEGEND AND GENERAL NOTES

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

F000

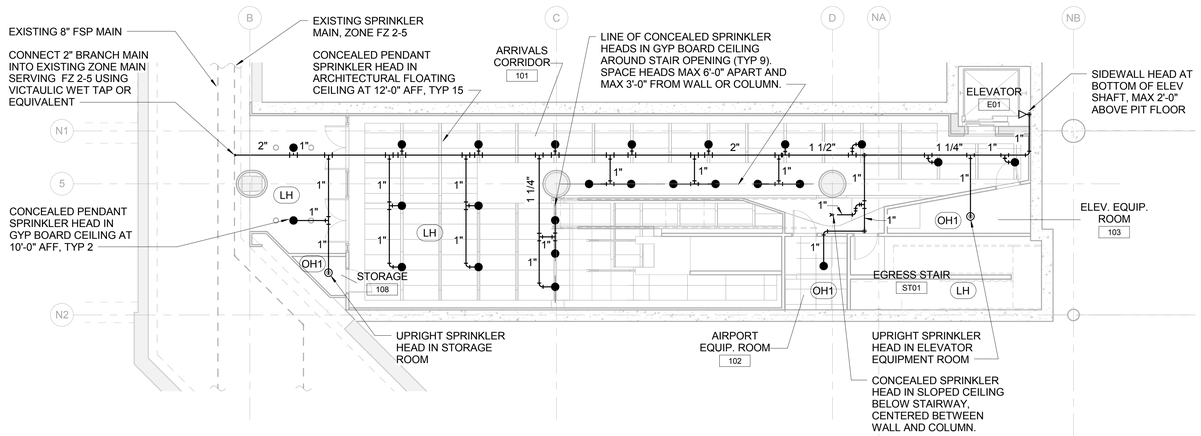
4/14/2015 9:30:32 AM



1 FIRE SPRINKLER PLAN, OVERALL - ARRIVALS LEVEL

1/16" = 1'-0"

0 4 8 16 32 FT.



2 FIRE SPRINKLER PLAN, ENLARGED - ARRIVALS LEVEL

1/8" = 1'-0"

0 2 4 8 16 FT.

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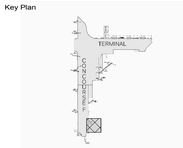
Key Plan



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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: PES Reviewed by: MA

Project No:

Sheet Title

FIRE SUPPRESSION PLANS - ARRIVALS LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

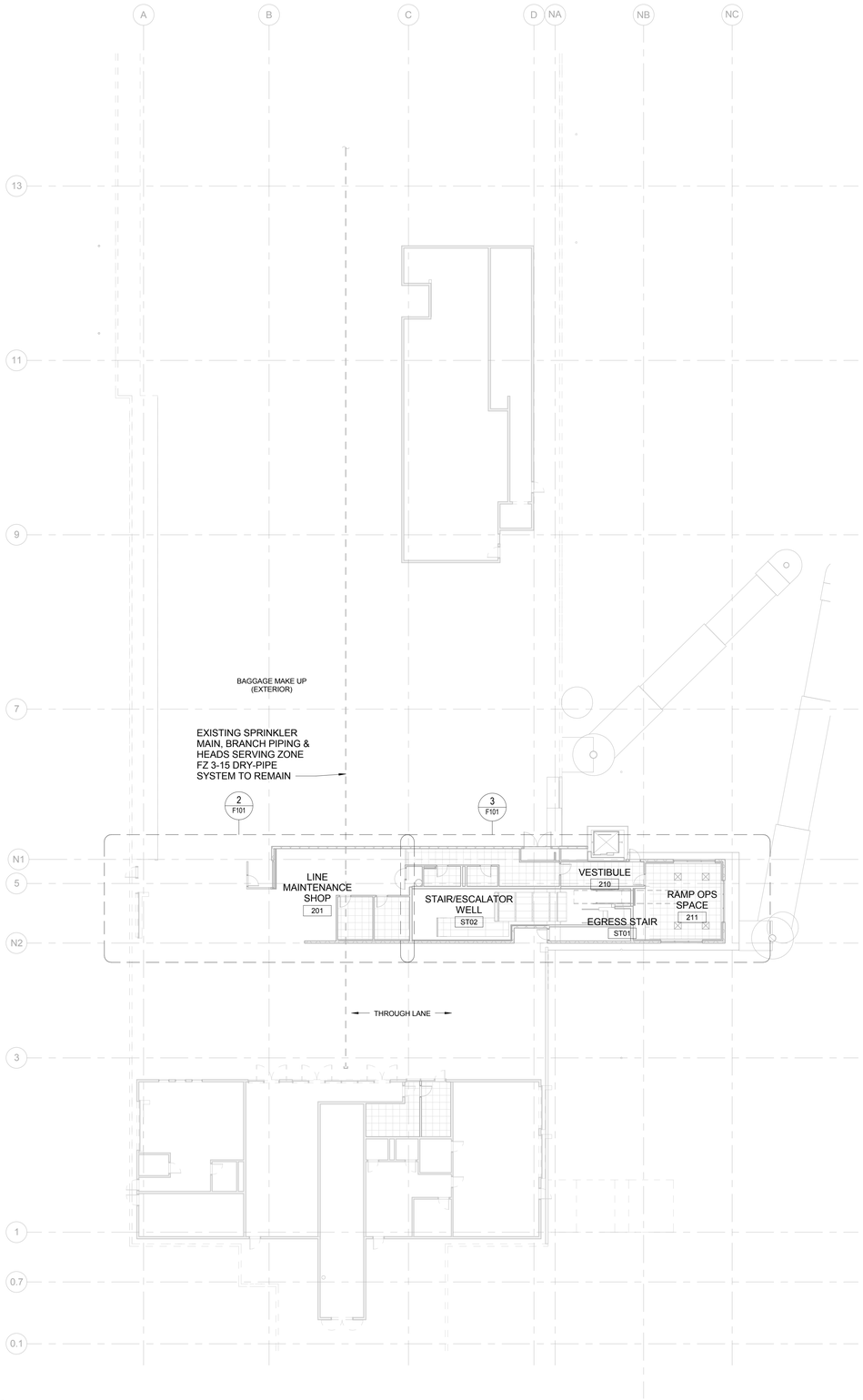
Sheet Number

F100

4/14/2015 9:30:33 AM

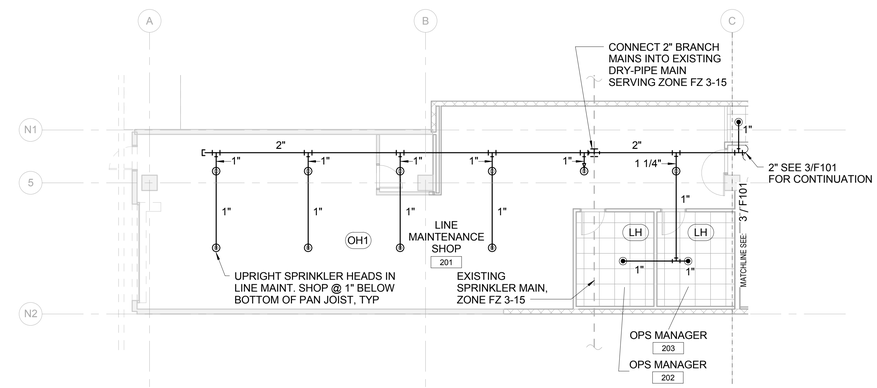
NOTES:

1. SLOPE DRY-SYSTEM SPRINKLER PIPING DOWN TOWARD EXISTING MAIN IN ACCORDANCE WITH NFPA 13.
2. PROVIDE DRUM DRIPS AT LOW POINTS OF ANY TRAPPED PIPING SECTIONS.
3. PROVIDE DRY PENDENT DROPS AT PENDENT SPRINKLER HEADS.

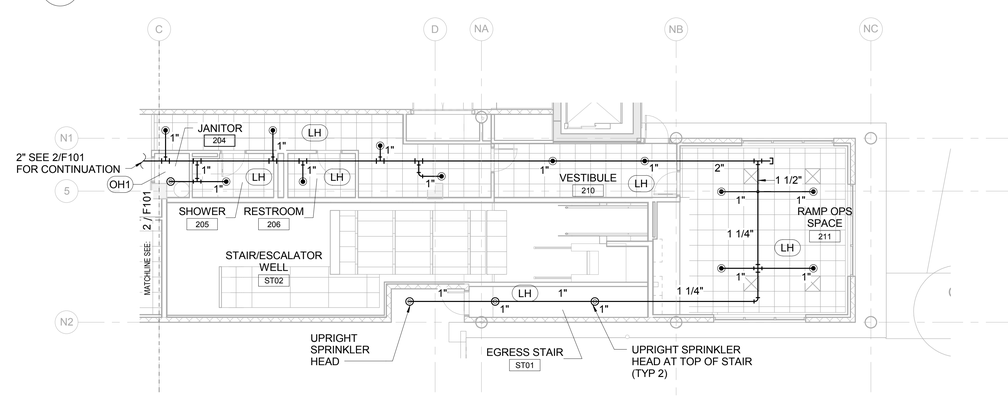


1 FIRE SPRINKLER PLAN, OVERALL - APRON LEVEL
1/16" = 1'-0"

0 4 8 16 32 FT.



2 FIRE SPRINKLER PLAN, ENLARGED - APRON LEVEL, WEST
1/8" = 1'-0"



3 FIRE SPRINKLER PLAN, ENLARGED - APRON LEVEL, EAST
1/8" = 1'-0"

0 2 4 8 16 FT.

4/14/2015 9:30:38 AM

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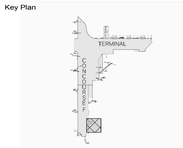
Key Plan



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Drawn by: PES Reviewed by: MA

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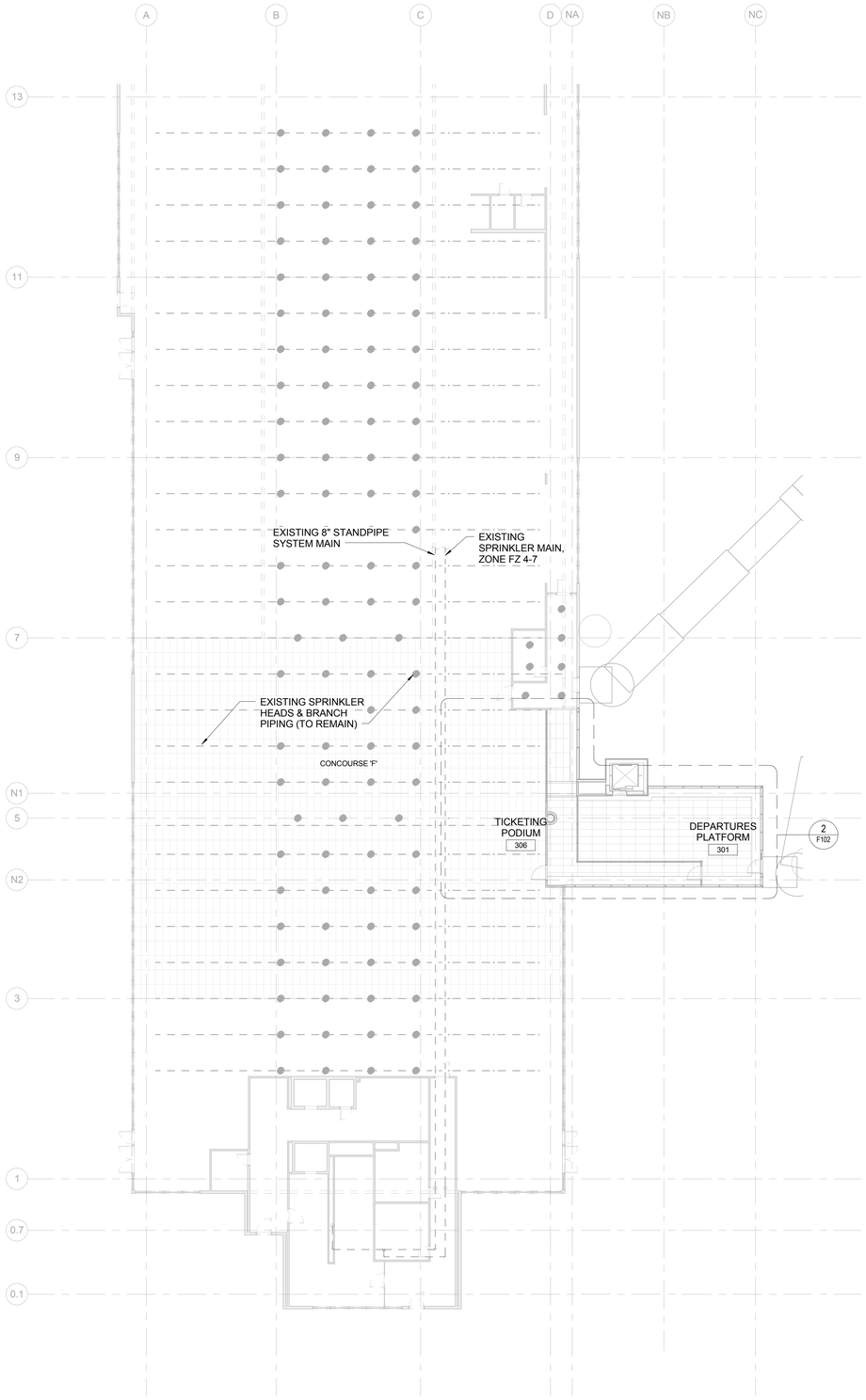
Sheet Title

FIRE SUPPRESSION PLANS - APRON LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

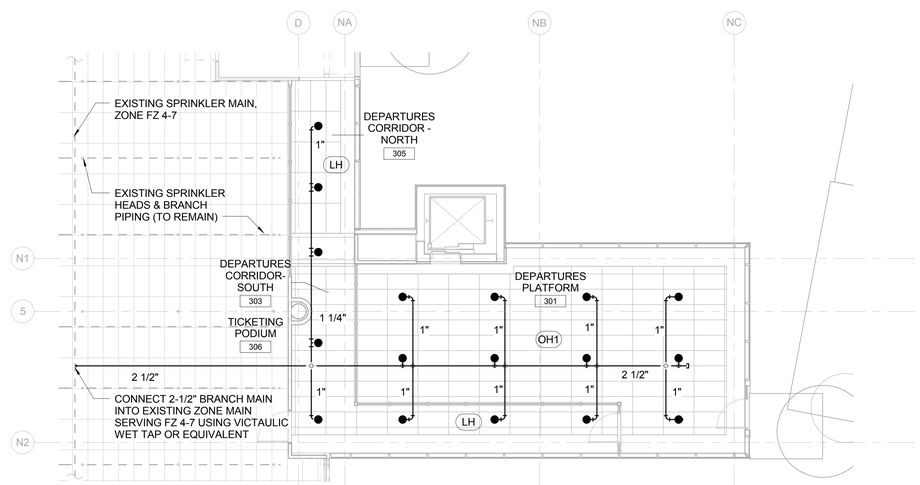
Sheet Number

F101



1 FIRE SPRINKLER PLAN, OVERALL - DEPARTURE LEVEL
1/16" = 1'-0"

0 4 8 16 32 FT.



2 FIRE SPRINKLER PLAN, ENLARGED - DEPARTURE LEVEL
1/8" = 1'-0"

0 2 4 8 16 FT.

4/14/2015 9:30:42 AM

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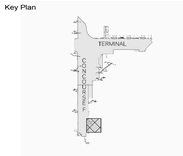

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: PES Reviewed by: MA

Project No:

Sheet Title

FIRE SUPPRESSION PLANS - DEPARTURE LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

F102

HVAC LEGEND

PIPING, VALVES AND ACCESSORIES

CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
D	DRAIN
HHWS	HOT WATER SUPPLY
HHWR	HOT WATER RETURN
	PIPE ANCHOR
	PIPE ALIGNMENT GUIDE
	BLIND FLANGE
	PIPE CAP
	DIRECTION OF FLOW
	ELBOW - 45°
	ELBOW - 90°
	ELBOW - TURNED DOWN
	ELBOW - TURNED UP
	STRAINER
	REDUCER - CONCENTRIC
	REDUCER - ECCENTRIC
	TEE
	TEE OUTLET DOWN
	TEE OUTLET UP
	UNION OR FLANGE
	BALL OR BUTTERFLY VALVE (SEE SPECIFICATIONS FOR USE)
	2-WAY CONTROL VALVE
	EXISTING PIPING
	EXISTING PIPING TO BE REMOVED
	GATE VALVE
A	BALANCING VALVE
V	AIR VENT (M-MANUAL TYPE; A-AUTOMATIC TYPE; T-THERMOSTATIC TYPE)
	THERMOMETER
	PRESSURE GAUGE
	NEEDLE VALVE

DUCTWORK AND AIR DISTRIBUTION

20X20	DUCT (FIRST DIMENSION IS SIDE SHOWN IN INCHES)
	DUCT LINING (1" THICK UNLESS 2" NOTED)
	SUPPLY AIR DUCT SECTION
	RETURN OR OUTSIDE AIR DUCT SECTION
	EXHAUST AIR DUCT SECTION
	TRANSITION
	SPIN-IN FITTING WITH ROUND FLEXIBLE DUCT
	90° BRANCH TAKEOFF
MD	MANUAL DAMPER (MD), BACKDRAFT DAMPER (BD), LOW LEAKAGE MANUAL DAMPER (LMD), OR CONTROL DAMPER (CD)
FD	FIRE DAMPER (FD), SMOKE DAMPER (SD), OR COMBINATION FIRE/SMOKE DAMPER (FD/SD), VERTICAL POSITION.
FD	FIRE DAMPER (FD), SMOKE DAMPER (SD), OR COMBINATION FIRE/SMOKE DAMPER (FD/SD), HORIZONTAL POSITION.
	CONTROL DAMPER
	TURNING VANES
	FLEXIBLE CONNECTION AT DUCTWORK OR FAN
18 X 18 R-600 CFM	CEILING RETURN OR EXHAUST GRILLE OR REGISTER WITH SIZE, TYPE, AND CFM
12"Ø S-700 CFM	FLEXIBLE DUCT AND CEILING SUPPLY DIFFUSER WITH ROUND NECK SIZE, TYPE, AND CFM
12"Ø S-330 CFM	FLEXIBLE DUCT AND LINEAR DIFFUSER WITH ROUND NECK SIZE, TYPE, AND CFM

	EXISTING DUCTWORK OR EQUIPMENT
	EXISTING DUCTWORK OR EQUIPMENT TO BE REMOVED
	ACCESS DOOR
PRD	PRESSURE RELIEF DOOR
	24" x 24" CEILING RETURN GRILLE (R-EG UNLESS NOTED OTHERWISE)
	FLEXIBLE DUCT

CONTROLS AND SENSORS

T	TEMPERATURE SENSOR
DP	DIFFERENTIAL PRESSURE SENSOR SENSING LOCATION

ABBREVIATIONS

ABV	ABOVE
AD	ACCESS DOOR
AFF/AFG/ARF	ABOVE FINISHED FLOOR/GRADE/RAISED FLOOR
AP	ACCESS PANEL
APD	AIR PRESSURE DROP
ARCH	ARCHITECT/ARCHITECTURAL
BEL	BELOW
BOD	BOTTOM OF DUCT
BCS	BUILDING CONTROL SYSTEM
CFM	CUBIC FEET PER MINUTE
CLG	CEILING
COL	COLUMN
CTE	CONNECT TO EXISTING
DB	DRY BULB
DWG	DRAWING
EAT	ENTERING AIR TEMPERATURE
ELEC	ELECTRICAL/ELECTRIC
EWT	ENTERING WATER TEMPERATURE
EX	EXISTING
FPM	FEET PER MINUTE
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GR	GRADE
LAT	LEAVING AIR TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OA	OUTSIDE AIR
RA	RETURN AIR
REL	RELOCATE
REM	REMOVE
TEMP	TEMPERATURE
VFD	VARIABLE FREQUENCY DRIVE
WB	WET BULB
WG	WATER GAUGE

GENERAL DEMOLITION NOTES:

1. ALL EXISTING DUCTWORK AND PIPING CONNECTIONS THAT ARE NOT BEING REUSED SHALL BE CAPPED.
2. DUCTWORK, PIPING, AND EQUIPMENT SHOWN DASHED ON THESE PLANS IS EXISTING, UNLESS NOTED OTHERWISE. SIZES AND LOCATIONS SHALL BE VERIFIED BY THE CONTRACTOR.
3. MATERIAL AND EQUIPMENT WHICH HAS BEEN REMOVED AND NOT ACCEPTED BY THE OWNER SHALL BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE.

GENERAL NEW WORK NOTES:

1. WHERE WORK SHOWN HEREIN REQUIRES THE REMOVAL OF PIPING, DUCTWORK, WIRING, OR CONDUITS, THE CONTRACTOR SHALL FILL OPENING AND REPAIR FINISHES TO MATCH EXISTING UPON COMPLETION OF THE WORK.
2. WHERE WORK SHOWN HEREIN REQUIRES THE REMOVAL OF FINISHES SUCH AS ACOUSTICAL CEILING, GYPSUM BOARD WALL OR CEILING, ETC., THE CONTRACTOR SHALL PATCH AND REPAIR FINISHES TO MATCH EXISTING UPON COMPLETION OF THE WORK.
3. REBALANCE DIFFUSERS FOR TERMINAL UNIT VAV-F-02-07 TO CFM INDICATED ON DRAWING M103.
4. THE CONTRACTOR SHALL PREPARE A SCHEDULE FOR ALL SHUTDOWNS FOR APPROVAL BY THE OWNER PRIOR TO BEGINNING WORK. THE CONTRACTOR SHALL SUBMIT A UTILITY SERVICE REQUEST FORM TO THE OWNER PRIOR TO ANY WORK ON EXISTING BCS SYSTEMS.
5. THE CONTRACTOR SHALL BE AWARE THAT SPACE CONDITIONS ABOVE CEILINGS AT THE DEPARTURES LEVEL ARE EXTREMELY TIGHT. PIPING AND DUCTWORK ROUTING SHALL BE COORDINATED WITH AND AVOID PLUMBING RAINWATER AND OVERFLOW PIPING TO FIT IN THE AVAILABLE SPACE. SEE SPECIFICATION 23 00 10 FOR COORDINATION DRAWINGS THAT SHALL BE SUBMITTED AND APPROVED PRIOR TO FABRICATION AND INSTALLATION OF WORK.
6. THE CONTRACTOR SHALL SUBMIT A CERTIFIED TEST AND BALANCE REPORT TO THE OWNER PRIOR TO THE START OF THE PROJECT AND AT THE COMPLETION OF THE PROJECT TO VALIDATE THERE IS NO NEGATIVE IMPACT TO THE HOT WATER TERTIARY PUMPS AND THE SECONDARY CHILLED WATER PUMPS.
7. THE CONTRACTOR SHALL COVER ALL RETURN AIR INTAKES WITHIN THE LIMITS OF THE PROJECT WITH TEMPORARY MERV 8 FILTER MEDIA DURING ALL PHASES OF CONSTRUCTION. FILTER MEDIA SHALL BE REMOVED UPON COMPLETION OF THE PROJECT.
8. EACH TEMPERATURE SENSOR SHALL BE LABELED WITH ITS CORRESPONDING TERMINAL UNIT.
9. THE CONTRACTOR SHALL COORDINATE THE RELOCATION OF EXISTING EQUIPMENT WITH THE OWNER.

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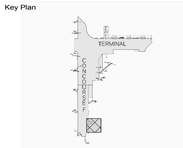

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: DYM Reviewed by: SYC

Project No:

Sheet Title

HVAC LEGEND AND GENERAL NOTES

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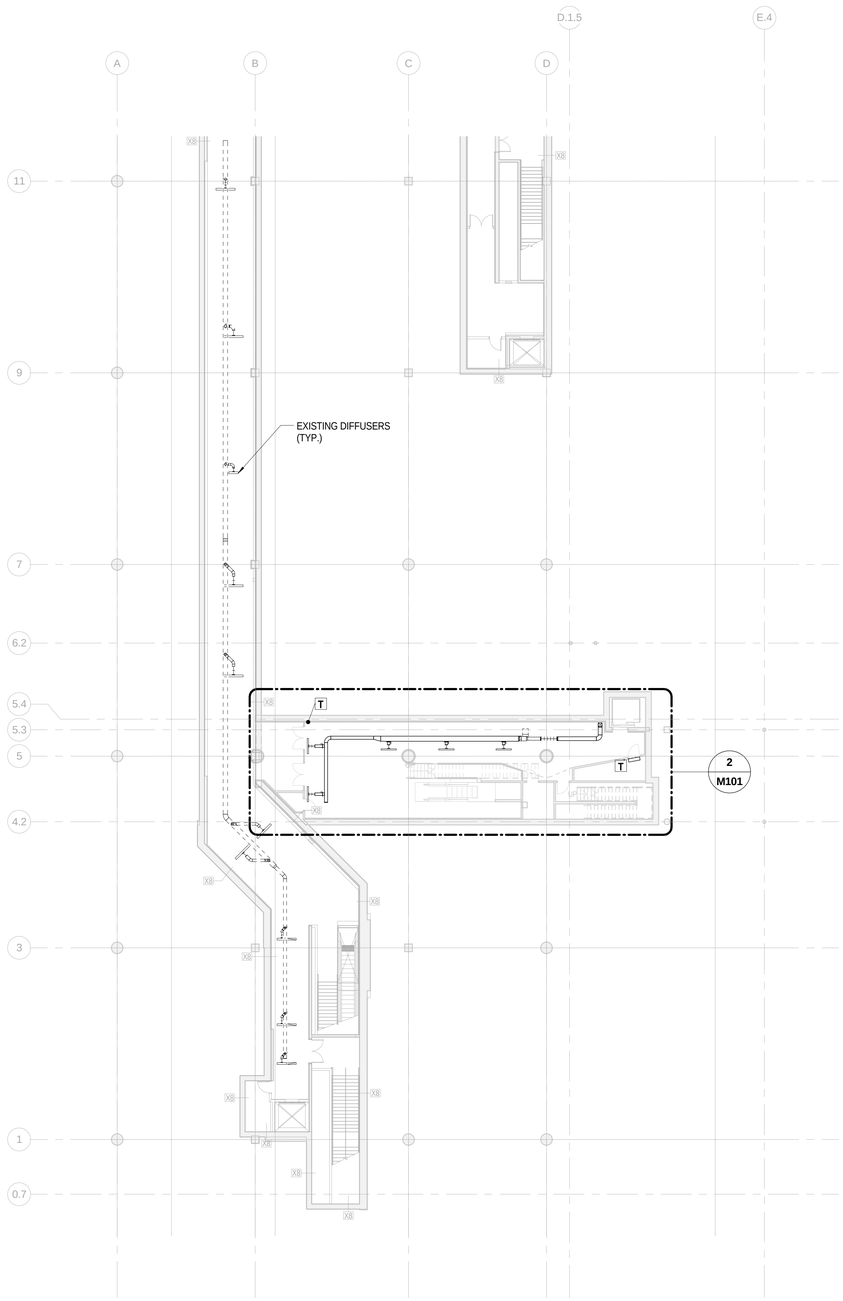
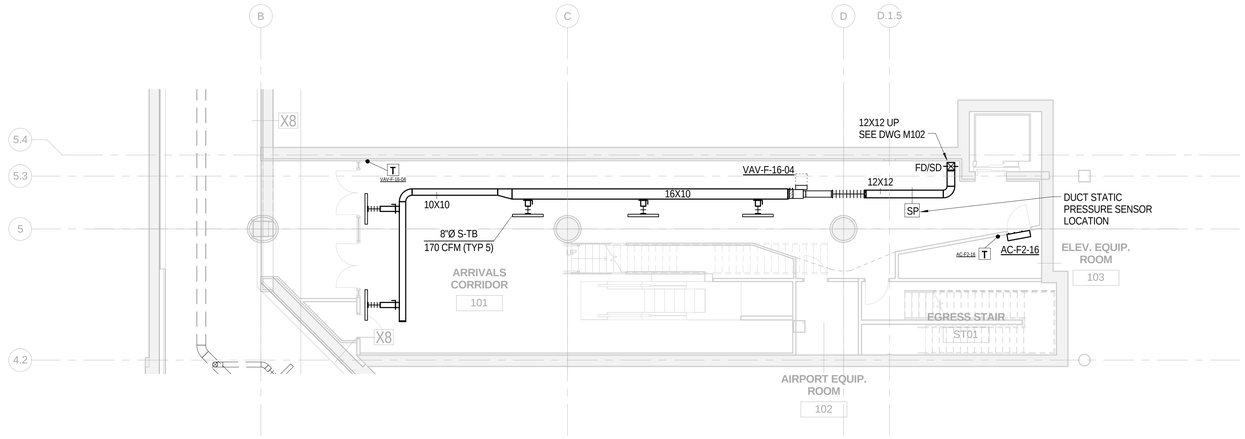
Sheet Number

M000

4/14/2015 3:37:55 PM



1 ARRIVALS LEVEL - HVAC DUCTWORK FLOOR PLAN
1/16" = 1'-0"



2 ARRIVALS LEVEL - HVAC DUCTWORK ENLARGED FLOOR PLAN - NEW WORK
1/8" = 1'-0"

0 2 4 8 16 FT.

4/14/2015 4:00:14 PM

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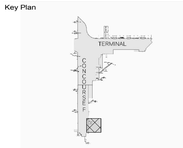

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: DYM Reviewed by: SYC

Project No:

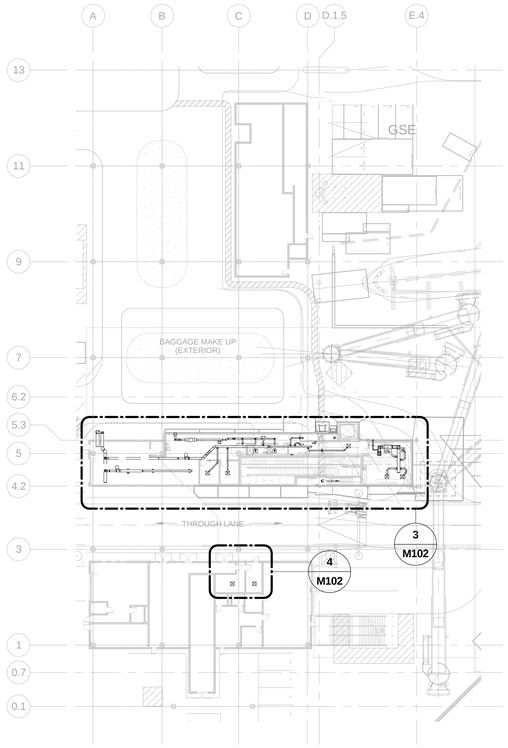
Sheet Title

HVAC DUCTWORK
ARRIVALS LEVEL
PLAN

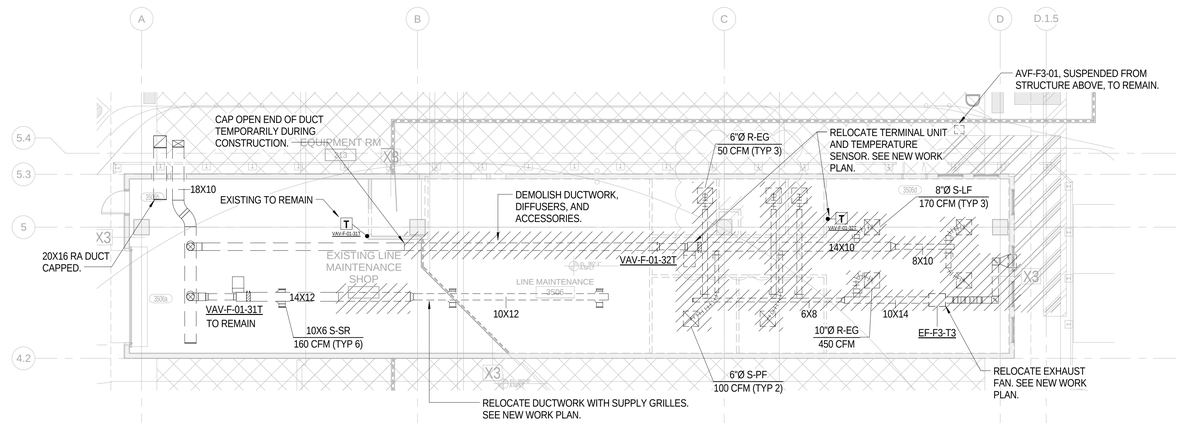
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

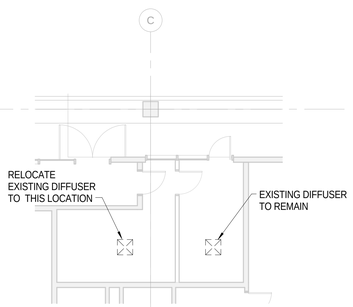
M101



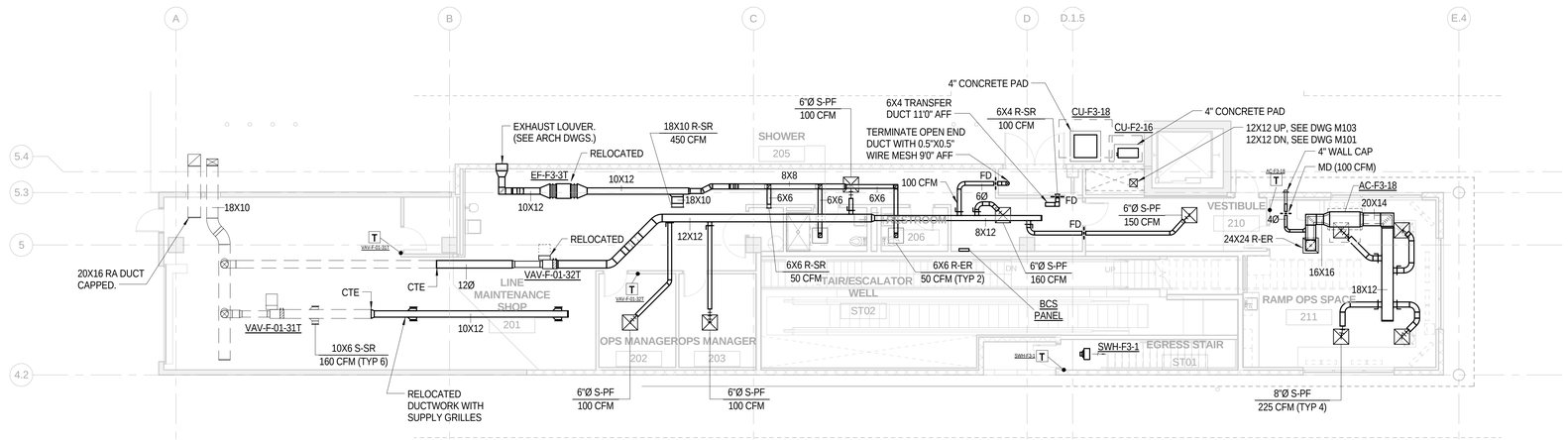
1 APRON LEVEL - HVAC DUCTWORK FLOOR PLAN
1/32" = 1'-0"



2 APRON LEVEL- HVAC DUCTWORK ENLARGED FLOOR PLAN - DEMOLITION
1/8" = 1'-0"



4 APRON LEVEL SWING SPACE - HVAC DUCTWORK FLOOR PLAN
1/8" = 1'-0"



3 APRON LEVEL - HVAC DUCTWORK ENLARGED FLOOR PLAN - NEW WORK
1/8" = 1'-0"

4/14/2015 3:38:03 PM

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"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

Hartsfield Jackson + Partnership
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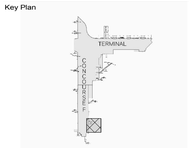


Professional Seals

No.	Description	Date
1. ISSUED FOR 35% CONSTRUCTION DOCUMENTS		06-23-14
2. ISSUED FOR 65% CONSTRUCTION DOCUMENTS		10-30-14
3. ISSUED FOR 95% CONSTRUCTION DOCUMENTS		01-23-15
4. ISSUED FOR 100% CONSTRUCTION DOCUMENTS		03-23-15
5. ISSUED FOR BID DOCUMENTS		04-17-15

Drawn by: DYM Reviewed by: SYC

Project No:

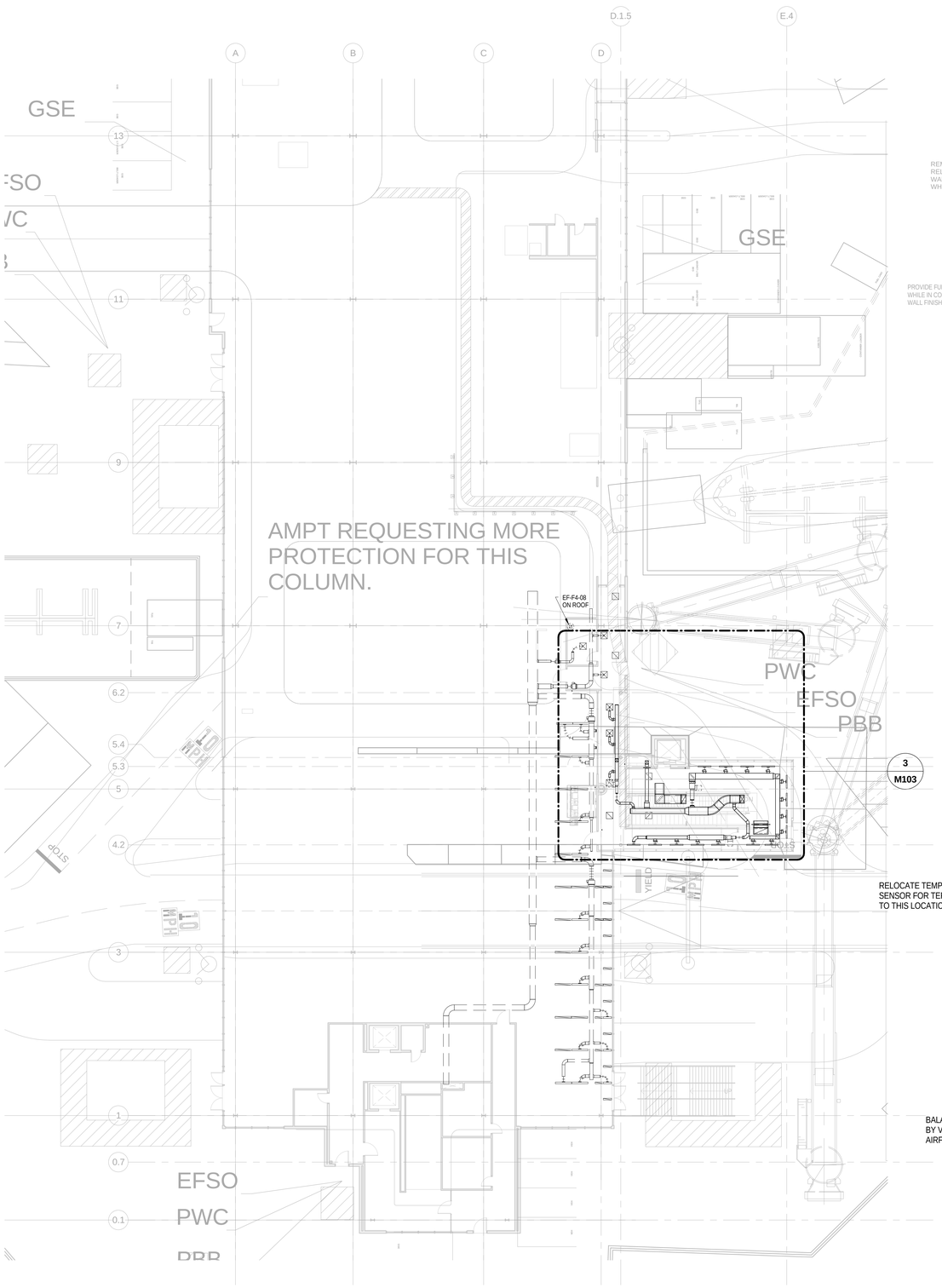
Sheet Title

HVAC DUCTWORK APRON LEVEL PLAN

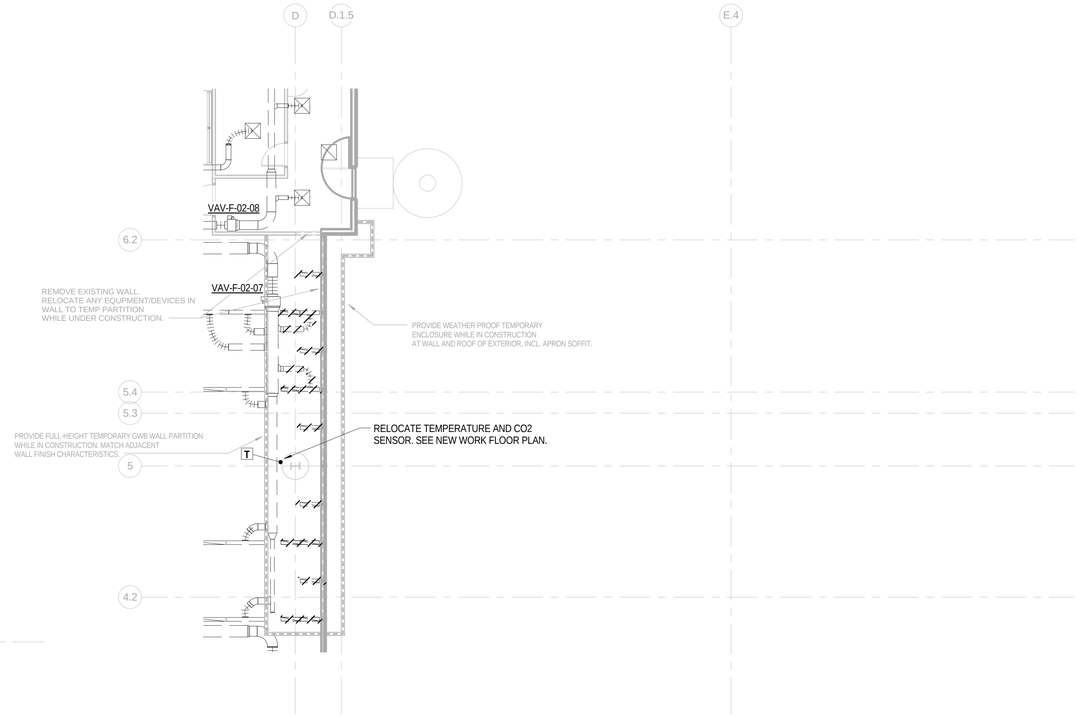
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

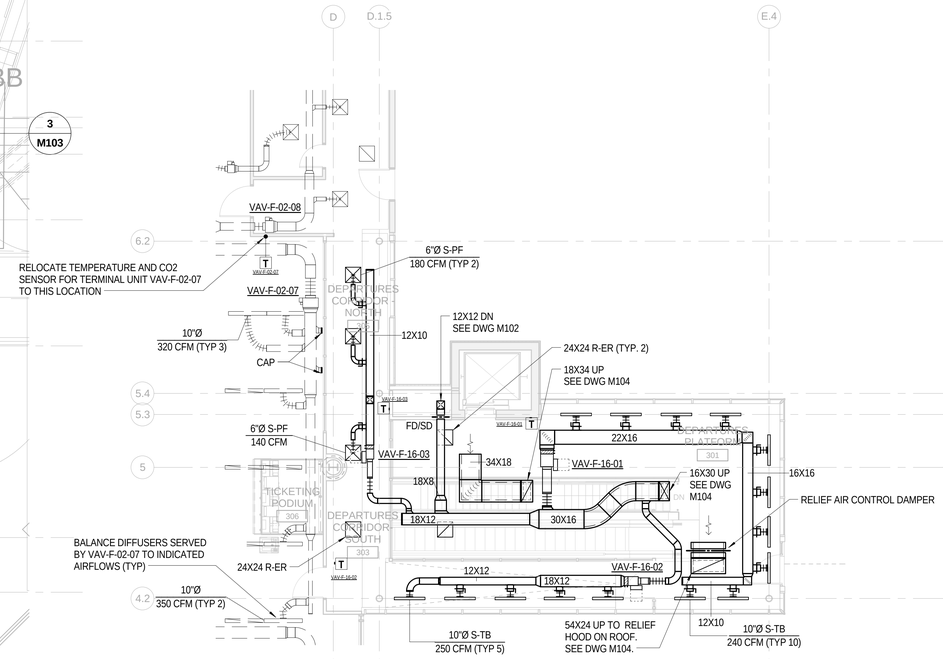
M102



1 DEPARTURES LEVEL - HVAC DUCTWORK FLOOR PLAN
1/16" = 1'-0"



2 DEPARTURES LEVEL - HVAC DUCTWORK ENLARGED FLOOR PLAN - DEMOLITION
1/8" = 1'-0"



3 DEPARTURES LEVEL - HVAC DUCTWORK ENLARGED FLOOR PLAN - NEW WORK
1/8" = 1'-0"

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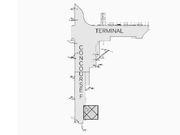

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: DYM Reviewed by: SYC

Project No:

Sheet Title

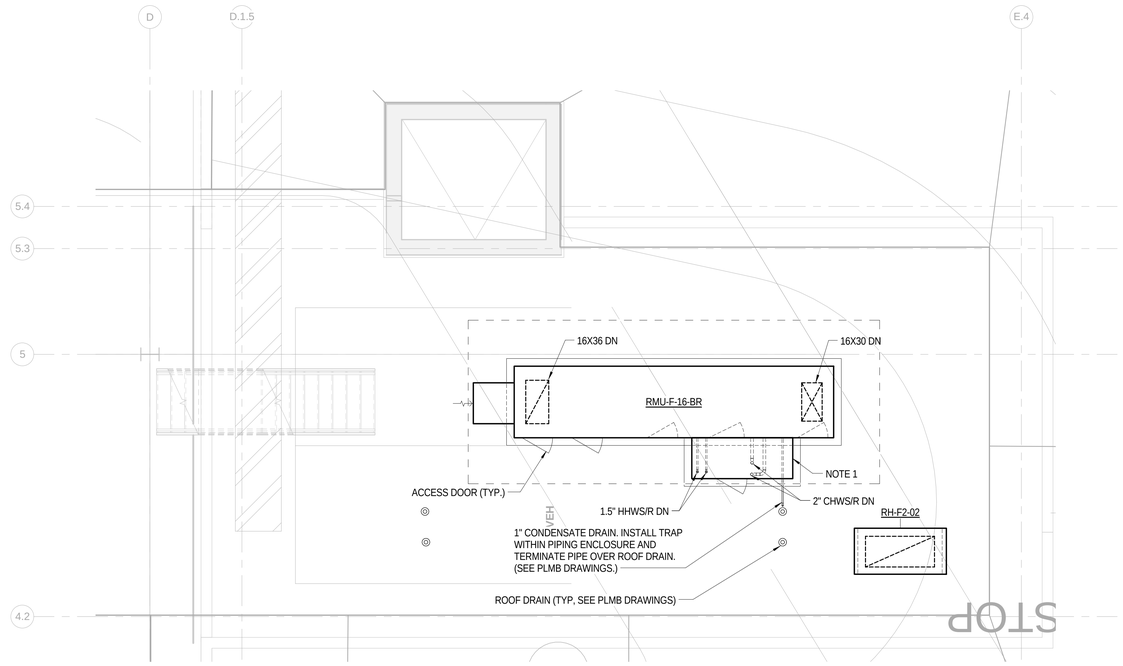
HVAC DUCTWORK DEPARTURES LEVEL PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

M103

4/14/2015 3:38:08 PM



1 ROOF LEVEL - HVAC FLOOR PLAN

1/4" = 1'-0"

0 2 4 8 16 FT.

NOTES:

1. OMIT INSULATION FOR HOT WATER RETURN PIPING WITHIN ROOFTOP UNIT PIPING ENCLOSURE.

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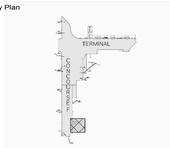

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

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Project No:

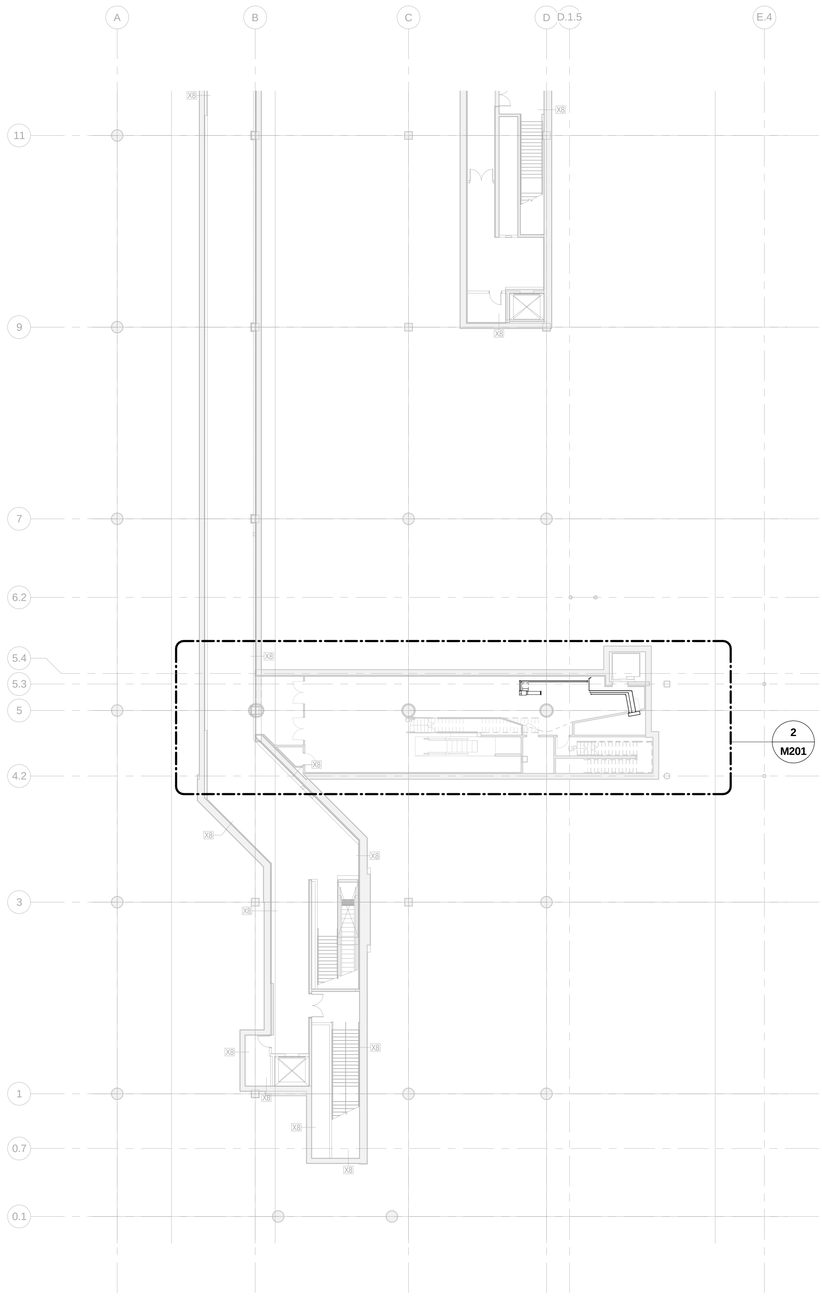
Sheet Title

HVAC ROOF PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

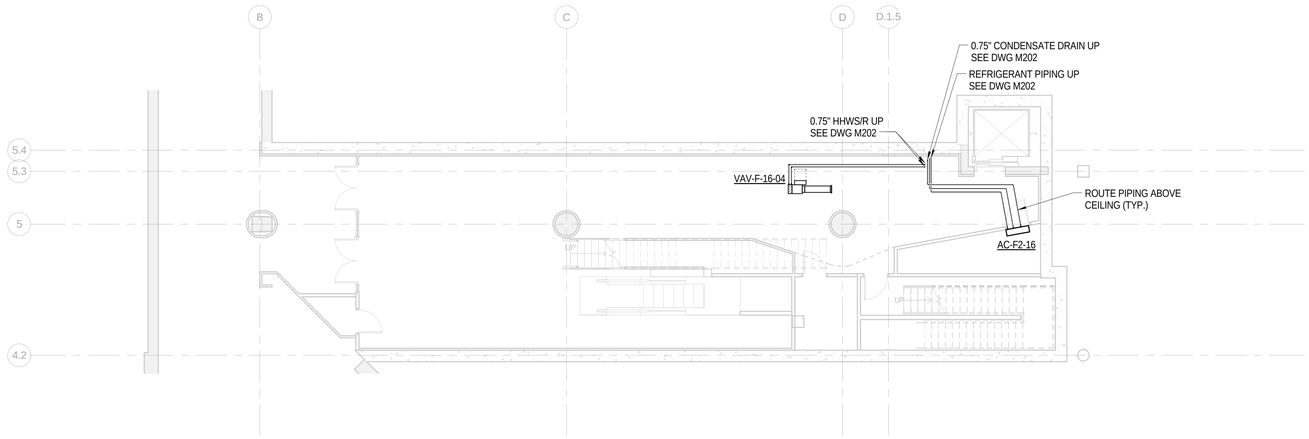
Sheet Number

M104



1 ARRIVALS LEVEL - HVAC PIPING FLOOR PLAN
1/16" = 1'-0"

0 4 8 16 32 FT.



2 ARRIVALS LEVEL - HVAC PIPING ENLARGED FLOOR PLAN - NEW WORK
1/8" = 1'-0"

0 2 4 8 16 FT.

4/14/2015 3:38:12 PM

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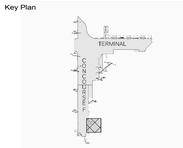

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: DYM Reviewed by: SYC

Project No:

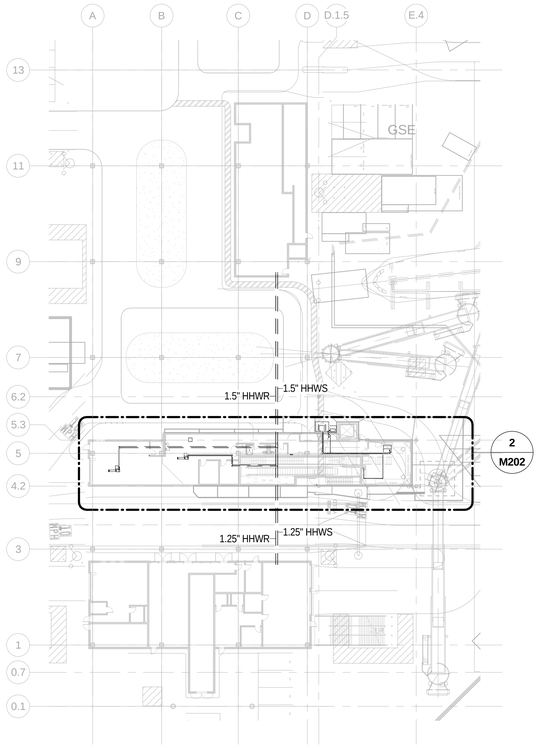
Sheet Title

HVAC PIPING
ARRIVALS LEVEL
PLAN

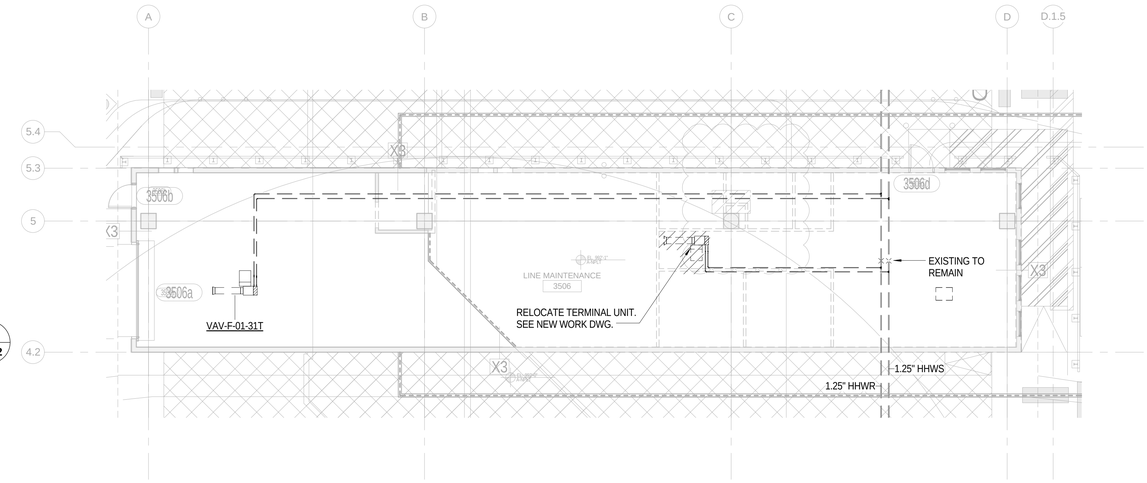
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

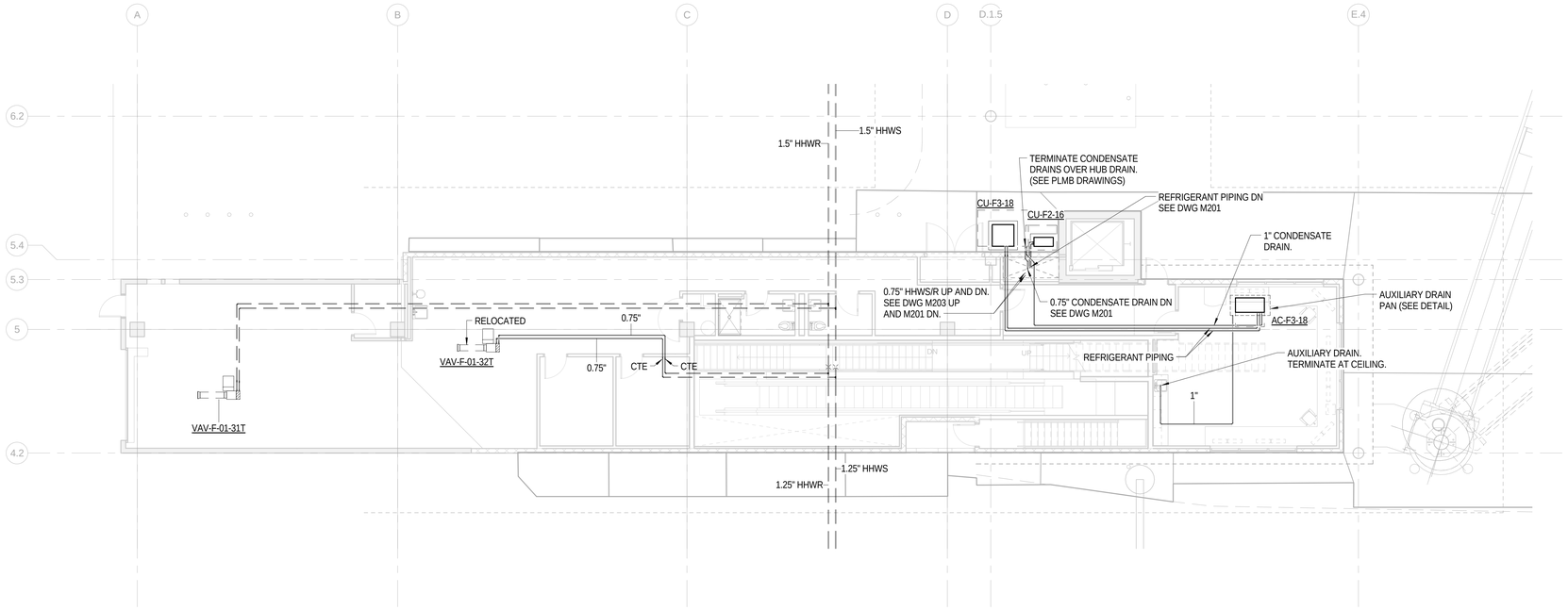
M201



1 APRON LEVEL - HVAC PIPING FLOOR PLAN
1/32" = 1'-0"
0 8 16 32 64 FT.



3 APRON LEVEL - HVAC PIPING ENLARGED FLOOR PLAN - DEMOLITION
1/8" = 1'-0"
0 2 4 8 16 FT.



2 APRON LEVEL - HVAC PIPING ENLARGED FLOOR PLAN - NEW WORK
1/8" = 1'-0"
0 2 4 8 16 FT.

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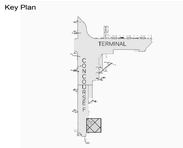

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: DYM Reviewed by: SYC

Project No:

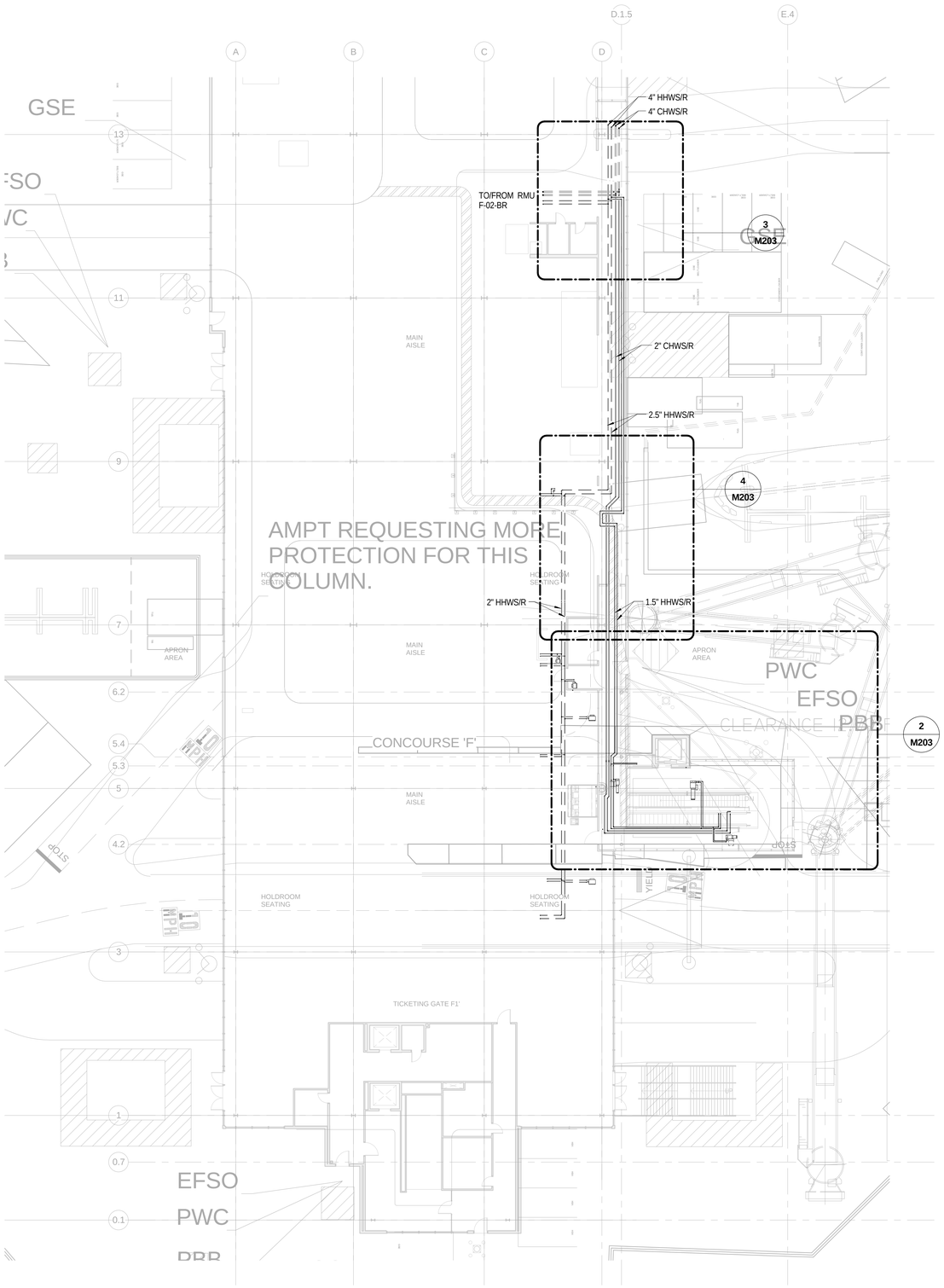
Sheet Title

HVAC PIPING APRON LEVEL PLAN

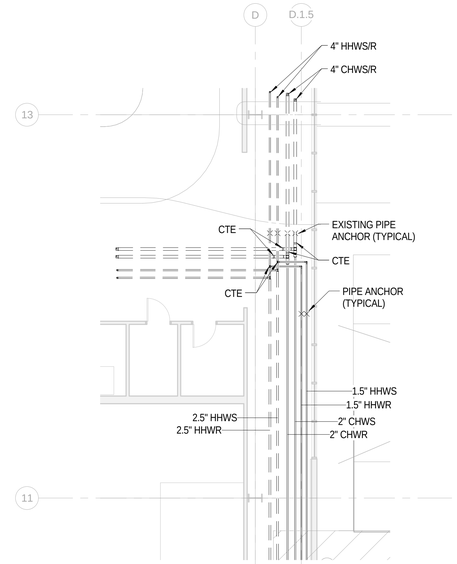
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

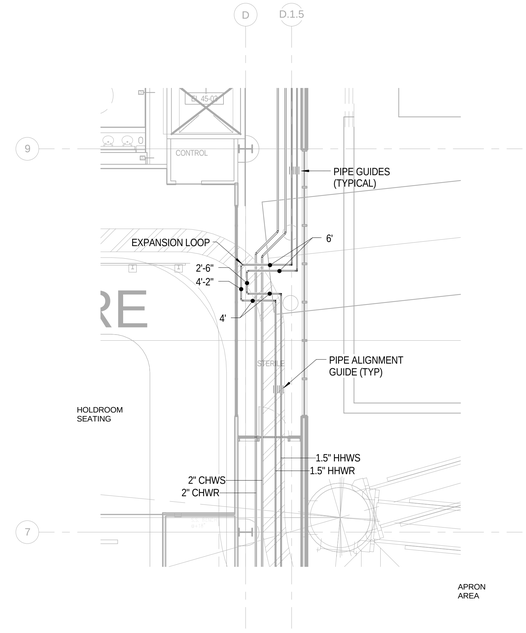
M202



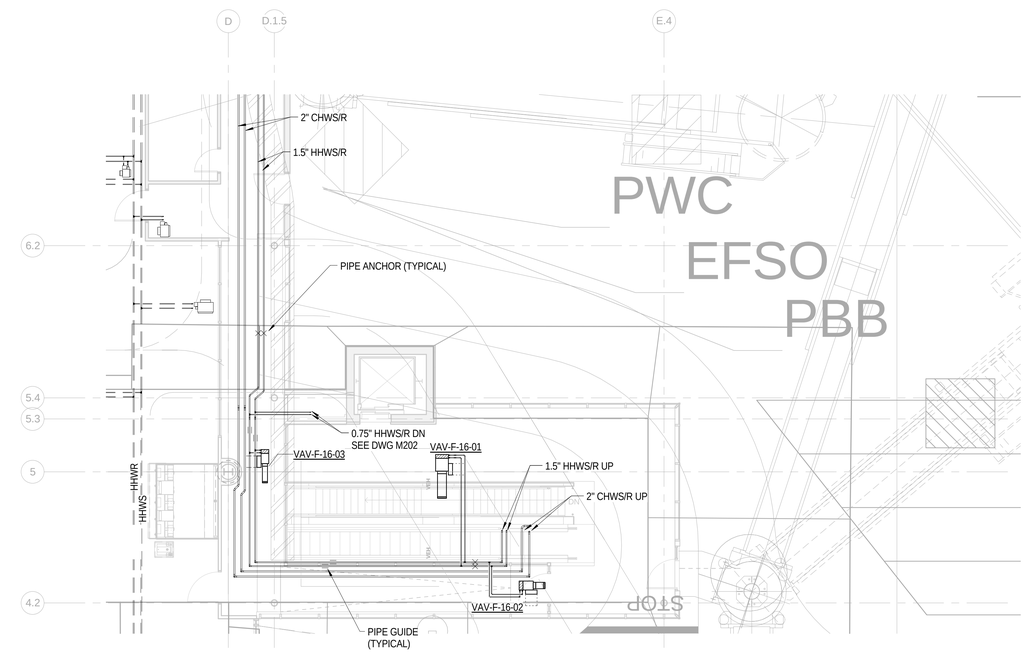
1 DEPARTURES LEVEL - HVAC PIPING FLOOR PLAN
1/16" = 1'-0"



3 HVAC PIPING FLOOR PLAN - PIPE MAIN CONNECTION
1/8" = 1'-0"



4 HVAC PIPING FLOOR PLAN - EXPANSION LOOP
1/8" = 1'-0"



2 DEPARTURES LEVEL - HVAC PIPING ENLARGED FLOOR PLAN - NEW WORK
1/8" = 1'-0"

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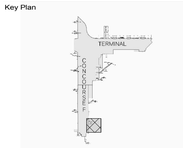

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: DYM Reviewed by: SYC

Project No:

Sheet Title

HVAC PIPING DEPARTURES LEVEL PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

M203

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FAN SCHEDULE

NO.	AREA SERVED	TYPE (NOTE 1)	CFM	STATIC PRESSURE, IN.WG	NOMINAL WHEEL DIAMETER, IN.	MAXIMUM RPM	MOTOR MINIMUM HP	MOTOR MAXIMUM BRAKE HP	DRIVE (NOTE 2)	NOTES
EF-F3-3T (EXISTING)	LINE MAINT. EXHAUST	CI	600	0.40	12	3214	0.25	0.07	D	3

NOTES:
1. TYPE:
   CI CENTRIFUGAL INLINE
2. DRIVE:
   D DIRECT
3. EXISTING FAN TO REMAIN. INFORMATION SHOWN FOR REFERENCE ONLY.

DUCTLESS SPLIT SYSTEM SCHEDULE

NO.	AREA SERVED	TYPE (NOTE 2)	INDOOR UNIT NOMINAL CFM (NOTE 3)	COOLING (NOTE 4) SENSIBLE CAPACITY, MBH	COOLING (NOTE 4) TOTAL CAPACITY, MBH	COOLING (NOTE 4) MINIMUM SEER	INDOOR UNIT MOUNTING HEIGHT (FT)	NOTES
AC-F2-16	ELEVATOR EQUIP RM	AC	325	8.0	9.0	13	8.5	1, 5

NOTES:
1. DESIGN CONDITIONS:
   OUTSIDE — SUMMER: 95°F DB, 74°F WB; WINTER: 19°F
2. TYPE:
   AC COOLING ONLY
3. INDOOR UNIT CFM IS BASED ON MEDIUM FAN SPEED.
4. BASED ON 76°F DB 63°F WB ENTERING INDOOR COIL, AND 105°F DB ENTERING OUTSIDE COIL.
5. PROVIDE WITH CONDENSATE PUMP. SEE SPECIFICATIONS.

UNIT HEATER SCHEDULE

NO.	AREA SERVED	TYPE (NOTE 1)	CAPACITY, kW (NOTE 2)	NOMINAL CFM	MOUNTING HEIGHT, FT (NOTE 3)	NOTES
SWH-F3-1	EGRESS STAIR	H	3.0	350	8	4

NOTES:
1. TYPE:
   H HORIZONTAL
2. CAPACITY BASED ON 60°F EAT.
3. HEIGHT IS TO CENTERLINE OF HEATER ABOVE FINISHED FLOOR.
4. REFER TO THE ELECTRICAL DRAWINGS FOR THE EQUIPMENT ELECTRICAL CHARACTERISTICS.

RELIEF HOOD SCHEDULE

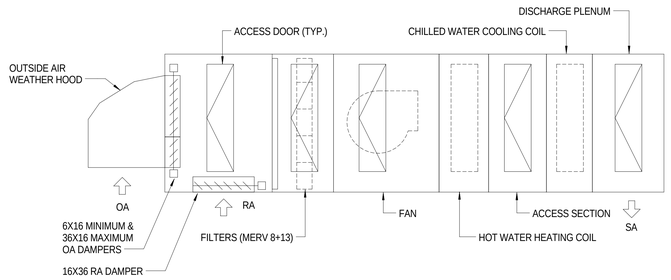
NO.	AREA SERVED	TYPE (NOTE 1)	MINIMUM THROAT AREA, FT²	MAXIMUM FLOW, CFM	NOMINAL HOOD SIZE, IN X IN	NOMINAL HEIGHT, IN	MAXIMUM APD, IN WG (NOTE 2)	NOTES
RH-F2-02	A380 GATE F3	GRV-R	9.0	5000	54 X 24	26	0.05	

NOTES:
1. TYPE:
   GRV GRAVITY ROOF VENTILATOR - R - RELIEF
2. THE STATIC AIR PRESSURE DROP THROUGH THE HOOD AT SCHEDULED CFM.

ROOFTOP AIR CONDITIONING UNIT SCHEDULE

NO.	AREA SERVED (NOTE 1)	FAN CFM	FAN RPM	FAN TYPE (NOTE 2)	FAN ESP, IN. WG. (NOTE 3)	FAN MOTOR MINIMUM HP	FAN MOTOR MAXIMUM BRAKE HP	MINIMUM OA, CFM	COOLING COIL SECTION (NOTE 5) MAXIMUM CHILLED WATER GPM (NOTE 4)	COIL EAT °F DB	COIL EAT °F WB	COIL LAT °F DB	COIL LAT °F WB	HEATING COIL SECTION (NOTE 6) HEATING CFM	HEATING COIL EAT °F	HEATING COIL LAT °F	HEATING COIL MAXIMUM HOT WATER GPM	VIBRATION ISOLATION TYPE	VIBRATION ISOLATION MIN. STATIC DEFLECTION, IN.	NOTES
RMU-F-16-BR	A380 GATE F3	5000	2300	P-VV-D	2.75	7.5	5.5	750	22.8	82.7	64.6	51.0	50.4	3500	19.0	51.0	12.5	FS	1.0	7, 8

NOTES:
1. DESIGN CONDITIONS:
   INSIDE — SUMMER: 75°F DB , 50% RH; WINTER: 75°F
2. FAN TYPE:
   P PLUG VV VARIABLE VOLUME D DIRECT DRIVE
3. EXTERNAL STATIC PRESSURE DOES NOT INCLUDE UNIT CASING, UNIT-MOUNTED COOLING AND HEATING SECTION, OR UNIT-MOUNTED DAMPERS, BUT DOES INCLUDE FILTERS.
4. CHILLED WATER BASED ON 43°F EWT AND MAXIMUM 18' WPD.
5. MAXIMUM 500 FPM COIL FACE VELOCITY, 1.0" WG APD.
6. HOT WATER BASED ON 160°F EWT AND MAXIMUM 3' WPD.
7. PROVIDE VARIABLE FREQUENCY DRIVE.
8. REFER TO THE ELECTRICAL DRAWINGS FOR THE EQUIPMENT ELECTRICAL CHARACTERISTICS.



TERMINAL UNIT SCHEDULE

NO.	TYPE (NOTE 1)	PRIMARY CFM MAXIMUM	PRIMARY CFM MINIMUM	HOT WATER COIL CAPACITY MBH (NOTE 2)	HOT WATER COIL GPM (NOTE 3)	HOT WATER COIL PIPE RUNOUT SIZES, IN.	NOTES
VAV-F-01-31T	VV-R	960	750	42.3	4.0	0.75	8
VAV-F-01-32T	VV-R	710	600	33.5	3.5	0.75	8
VAV-F-16-01	VV-R	2400	600	31.1	3.3	0.75	4, 5, 6, 7
VAV-F-16-02	VV-R	1250	315	16.1	1.7	0.75	4, 5, 6, 7
VAV-F-16-03	VV-R	500	125	6.4	0.7	0.75	4, 5, 6, 7
VAV-F-16-04	VV-R	850	350	19.4	2.1	0.75	4, 5, 6, 7

NOTES:
1. TYPE:
   VV VARIABLE VOLUME - R REHEAT
2. CAPACITY BASED ON 51°F EAT.
3. HOT WATER BASED ON 160°F EWT AND MAXIMUM 3' WPD.
4. SOUND POWER LEVELS IN dB re 10 pW, UNLESS AS SCHEDULED, SHALL BE WITHIN THE AHRI 880-2011 ADDENDUM 1 TOLERANCES OF THE FOLLOWING LEVELS:

	OCTAVE BAND 2	3	4
CASING RADIATED	71	66	63
DISCHARGE			
LESS THAN 900 CFM	66	63	59
900 CFM OR MORE	68	63	61

LEVELS BASED ON MAXIMUM PRIMARY CFM AND MINIMUM DIFFERENTIAL STATIC PRESSURE OF 1" WG. PROVIDE SOUND ATTENUATORS ON DISCHARGE AND PLENUM RETURN AIR TO MEET THE SPECIFIED SOUND POWER LEVELS.

5. DIFFERENTIAL STATIC PRESSURE DROP ACROSS COMPLETE ASSEMBLY, INCLUDING HEATING COIL, FOR ALL UNITS SHALL NOT EXCEED 0.3" WG APD.
6. REFER TO THE ELECTRICAL DRAWINGS FOR THE EQUIPMENT ELECTRICAL CHARACTERISTICS.
7. THE DRAWINGS INDICATE THE DESIGN INTENT TO PROVIDE ACCESS TO HEATING COILS, CONTROL PANELS, AND ACCESS DOORS. IF TERMINAL UNITS PROVIDED ARE CONFIGURED DIFFERENTLY, THE ACCESS REQUIREMENTS SHALL BE ADJUSTED IN THE FIELD.
8. EXISTING TERMINAL UNIT TO REMAIN. INFORMATION SHOWN FOR REFERENCE ONLY.

SPLIT SYSTEM AIR CONDITIONING UNIT SCHEDULE

NO.	AREA SERVED	INDOOR UNIT NOMINAL CFM (NOTE 2)	ESP, IN. WG (NOTE 3)	MINIMUM MOTOR HP	MINIMUM OA CFM	COOLING (NOTE 4) SENSIBLE CAPACITY, MBH	COOLING (NOTE 4) TOTAL CAPACITY, MBH	COOLING (NOTE 4) MINIMUM SEER	ELECTRIC HEAT kW	MAXIMUM CONDENSING UNIT REQUIRED CIRCUIT AMPERES	NOTES
AC-F3-18	LINE OFFICE	900	0.4	0.5	100	21	23.6	13	7.0	45	1,5

NOTES:
1. DESIGN CONDITIONS:
   OUTSIDE — SUMMER: 95°F DB, 74°F WB; WINTER: 19°F
2. NOMINAL CFM IS BASED ON MEDIUM FAN SPEED.
3. EVAPORATOR COIL, HEATING COIL, AND FILTER NOT INCLUDED.
4. BASED ON 79.2°F DB 64.6°F WB ENTERING INDOOR COIL, AND 105°F DB ENTERING OUTSIDE COIL.
5. REFER TO THE ELECTRICAL DRAWINGS FOR THE EQUIPMENT ELECTRICAL CHARACTERISTICS.

A380 - AIR FLOW BALANCE SUMMARY SCHEDULE

AIR HANDLING UNIT	SPACE	AHU SUPPLY AIR MAXIMUM CFM	OUTSIDE AIR CFM	RETURN AIR CFM	RELIEF HOOD CFM	TOILET EXHAUST CFM	AIR BALANCE (CFM)
RMU-F-16-BR	ARRIVALS LEVEL						
	ARRIVALS CORRIDOR 24	850	125	725	0	0	125
	APRON LEVEL						
	RAMP OPS SPACE	SERVED BY A DEDICATED SPLIT SYSTEM					
	DEPARTURE LEVEL						
	DEPARTURES CORRIDOR - NORTH	360	55	305	0	0	55
	DEPARTURES CORRIDOR - SOUTH	1390	210	1180	0	0	210
	DEPARTURES PLATFORM	2400	360	2040	0	0	360
	RELIEF HOOD	0	0	0	0	0	0
TENANT AIR FLOW BALANCE RELATIVE TO BASE BUILDING							750

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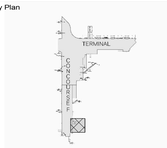

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Sheet Title

HVAC SCHEDULES

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Sheet Number

M400

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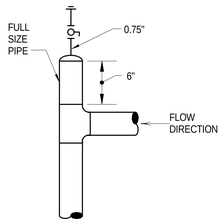
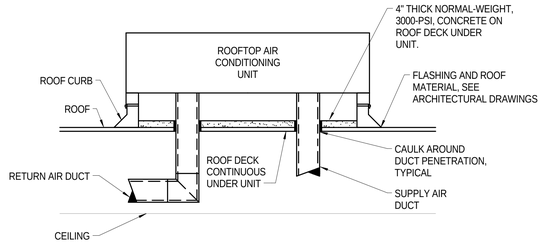
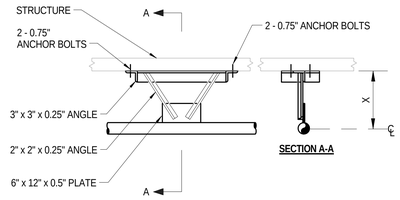


7 MANUAL AIR VENTS
NO SCALE



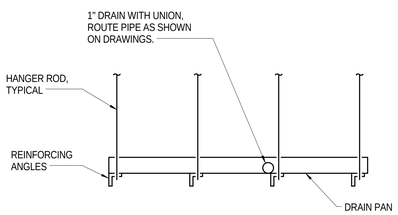
4 ROOFTOP AIR CONDITIONING UNITS
NO SCALE

NOTES:
1. SEE DETAIL FOR CONDENSATE DRAIN PIPING.
2. GYPSUM BOARD JOINTS SHALL BE STAGGERED AND TAPED AND SEALED.



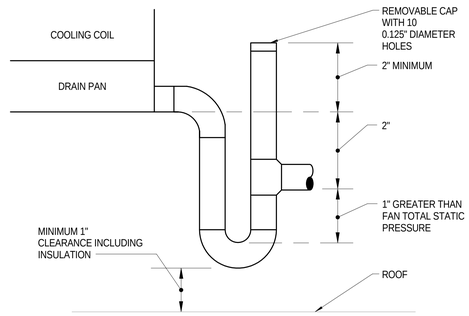
1 ANCHORS FOR HORIZONTAL STEEL PIPING
NO SCALE

NOTES:
1. ANGLE AND PLATE CONNECTIONS SHALL BE MADE WITH CONTINUOUS WELDS.
2. FOR BAR JOIST OR STEEL CONSTRUCTION, PROVIDE SUPPLEMENTAL MEMBERS AS REQUIRED AND ATTACH ANCHOR ASSEMBLY BY WELDING.
3. PROVIDE BRACING AS REQUIRED FOR LATERAL STABILITY WHERE X > 3'-0".
4. PROVIDE ISOLATOR ANCHORS WITH BASEPLATES BETWEEN STRUCTURE AND ANCHOR WHERE SPECIFIED.



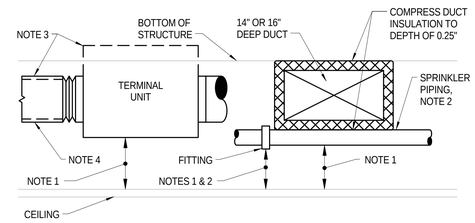
8 AUXILIARY DRAIN PANS
NO SCALE

NOTES:
1. DRAIN PANS SHALL BE REMOVABLE, MINIMUM 1.5" DEEP, CONSTRUCTED OF 18 GAUGE GALVANIZED SHEET METAL WITH WELDED CORNERS AND SEAMS, AND SIZED TO COVER AND EXTEND 3" BEYOND THE AREA BELOW FAN AND COIL SECTIONS, AND PIPING CONNECTIONS AND VALVES.
2. DRAIN PAN SUPPORTS SHALL BE INDEPENDENT OF EQUIPMENT AND EQUIPMENT SUPPORTS.



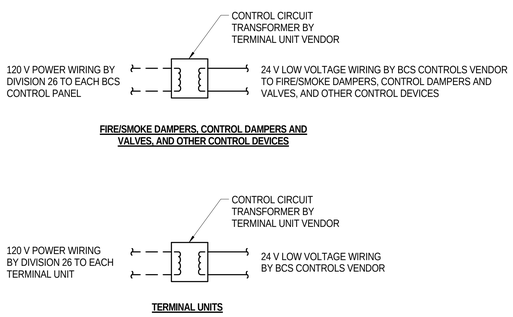
5 CONDENSATE DRAIN FOR BLOW-THROUGH COOLING COILS
NO SCALE

NOTES:
1. PIPING SHALL BE FULL SIZE OF DRAIN CONNECTION.
2. EXTEND DRAIN PIPING AS INDICATED ON THE DRAWINGS OR TO THE NEAREST INDIRECT WASTE RECEPTOR OR ROOF RECEPTOR ADJACENT TO EQUIPMENT.
3. WHERE SUPPORTED, ISOLATE DRAIN PIPING FROM CLAMPS WITH TYPE PI ISOLATORS.

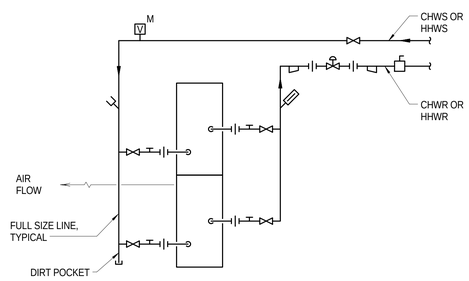


2 DUCTWORK INSTALLATION AND COORDINATION
NO SCALE

NOTES:
1. MAINTAIN MINIMUM 7" HIGH CLEARANCE FROM BOTTOM OF CEILING FOR LUMINAIRES.
2. DO NOT LOCATE SPRINKLER PIPE FITTINGS UNDER DUCTWORK, DUCTWORK FLANGES, OR TERMINAL UNITS UNLESS 7" CLEARANCE CAN BE MAINTAINED.
3. OFFSET TERMINAL UNITS AND CONNECTING DUCTWORK UP INTO STRUCTURE OR BETWEEN JOISTS TO MAINTAIN 7" CLEARANCE WHERE UNITS HAVE A DEPTH GREATER THAN 16".
4. OFFSET DUCTWORK AND RUNOUTS TO PASS BETWEEN LUMINAIRES TALLER THAN 6.75".
5. OFFSET PIPING, DUCTWORK AND EQUIPMENT TO ACCOMMODATE CEILING COVES AND FRAMING.

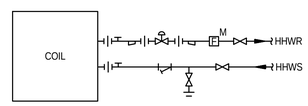


9 CONTROL POWER WIRING
NO SCALE



6 WATER COILS WITH 2-WAY VALVES IN AHUs
NO SCALE

NOTES:
1. COIL CONNECTIONS SHALL BE ARRANGED TO ACCOMMODATE COIL PULL AND TO ISOLATE COIL PIPING FROM SYSTEM.
2. PROVIDE MEANS OF DRAINING AND VENTING EACH COIL.
3. DELETE INDIVIDUAL COIL ISOLATION VALVES IN SINGLE COIL APPLICATIONS.



3 TERMINAL UNIT HOT WATER COILS
NO SCALE

NOTES:
1. PROVIDE SWING JOINTS AT SUPPLY AND RETURN CONNECTIONS TO MAINS WHERE COIL RUNOUTS ARE LESS THAN 5'-0" LONG.
2. LOCATE NEEDLE VALVES AS CLOSE TO COIL CONNECTIONS AS POSSIBLE.

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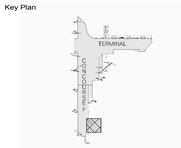

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HVAC DETAILS

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M500

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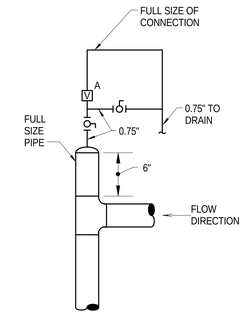
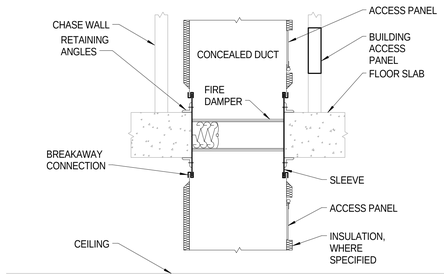


FOR PIPING 2.5" AND SMALLER

1 AUTOMATIC AIR VENTS
NO SCALE



2 CONCEALED DUCT FLOOR PENETRATIONS WITH FIRE DAMPERS
NO SCALE

NOTES:
1. INSTALL DAMPERS IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.
2. TAPE INSULATION TO DUCT AT BREAKAWAY CONNECTIONS. BREAKAWAY CONNECTIONS AND RETAINING ANGLES SHALL BE VISIBLE.
3. TYPE A FIRE DAMPER SHOWN. INSTALLATION SIMILAR FOR TYPE B AND TYPE C DAMPERS.
4. INSTALLATION SIMILAR FOR COMBINATION FIRE/SMOKE DAMPERS.
5. SEAL BREAKAWAY CONNECTIONS.
6. LOCATE DUCT ACCESS PANEL EITHER ABOVE OR BELOW SLAB FOR THE MOST CONVENIENT ACCESS TO THE FIRE DAMPER.
7. BUILDING ACCESS PANEL ONLY NECESSARY WHEN DUCT ACCESS PANEL LOCATION IS CONCEALED BY CHASE WALLS.

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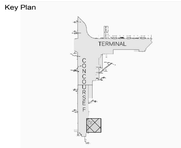

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Sheet Title

HVAC DETAILS

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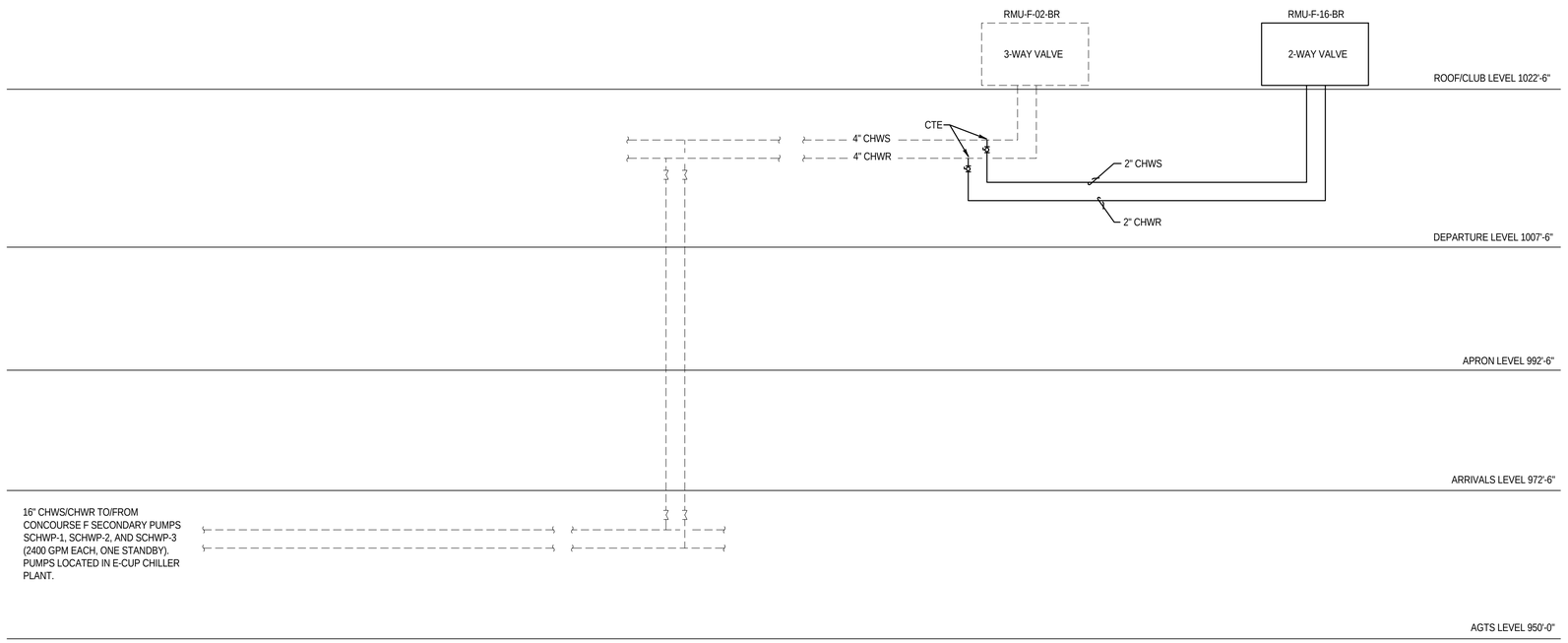
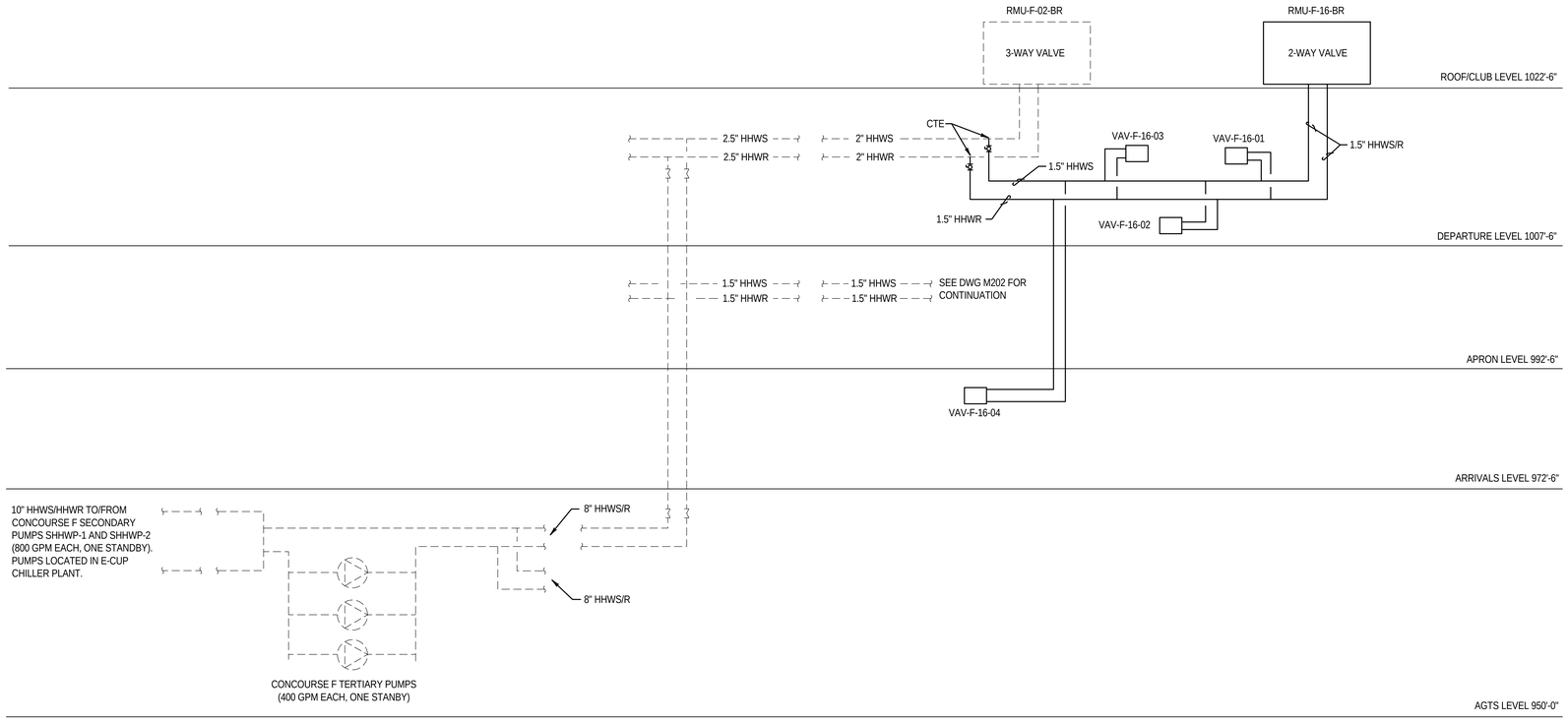


1 CHILLED WATER PIPING SCHEMATIC
NTS



2 HOT WATER PIPING SCHEMATIC
NTS

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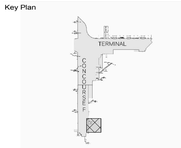

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Sheet Title

HVAC CHILLED AND HOT WATER PIPING SCHEMATICS

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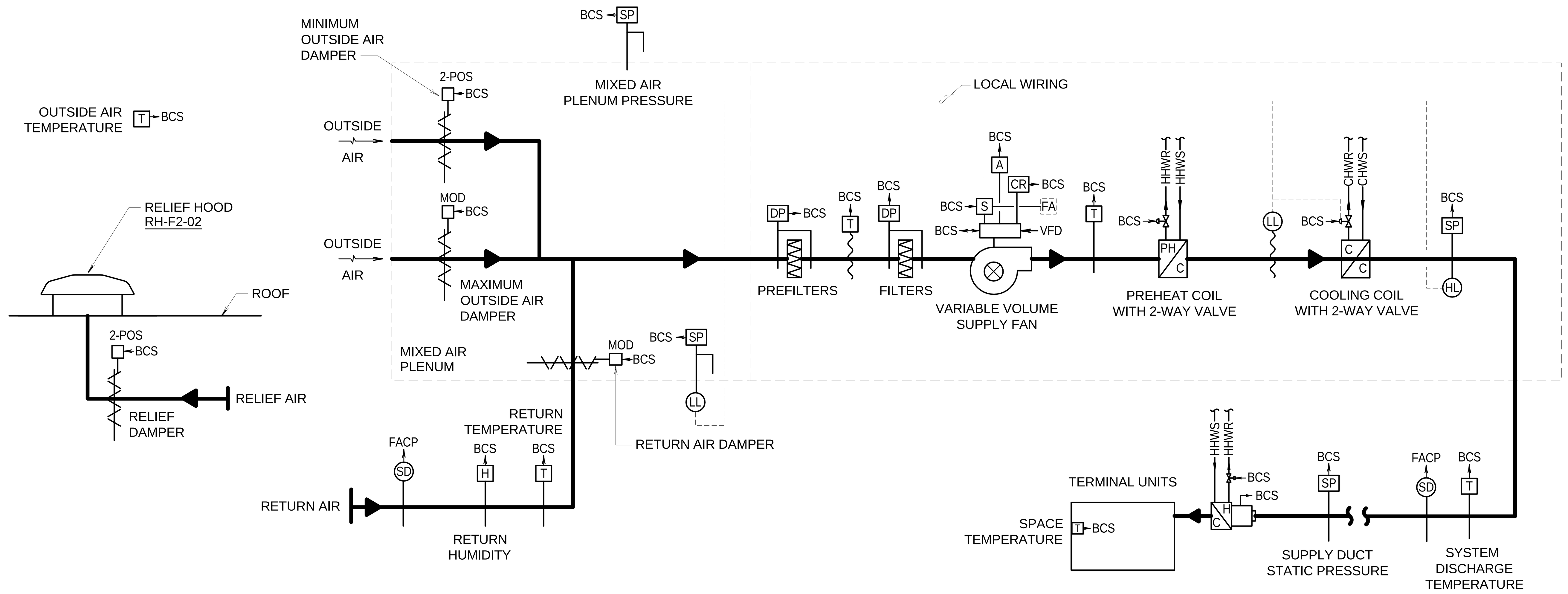
Sheet Number

M600

AUTOMATIC TEMPERATURE CONTROL LEGEND

Symbol	Description
* → BCS	BCS INPUT
* ← BCS	BCS OUTPUT
C/C	COOLING COIL
H/C	HEATING COIL
	CONTROL DAMPER
	CENTRIFUGAL FAN
	FILTER
	STARTER
VFD	VARIABLE FREQUENCY DRIVE
A	ALARM CONTACT
T	AVERAGING TEMPERATURE SENSOR
CR	CURRENT SENSING RELAY
DP	DIFFERENTIAL PRESSURE SENSOR SENSING LOCATION
FA	EXISTING FIRE ALARM RELAY
HL	HIGH LIMIT SENSOR
LL	LOWER LIMIT SENSOR

Symbol	Description
T	TEMPERATURE
S	START/STOP
SP	STATIC PRESSURE SENSOR SENSING LOCATION
T	AVERAGING TYPE THERMOSTAT
HL	HIGH LIMIT (LOCAL)
LL	LOWER LIMIT (LOCAL)
SD	SMOKE DETECTOR
	TWO-WAY CONTROL VALVE
FACP	EXISTING FIRE ALARM CONTROL PANEL



1 CONTROLS SCHEMATIC FOR ROOFTOP AIR CODITIONING UNIT
NO SCALE

BCS CONTROLLER INPUT/OUTPUT SUMMARIES		OUTPUTS						INPUTS										SOFTWARE												
		DIGITAL			ANALOG		DIGITAL						ANALOG				ALARM			BCS			ENERGY MGMT.							
	SYSTEM GRAPHIC DISPLAY	START/STOP	ENABLE/DISABLE	OPEN/CLOSE	SETPOINT ADJUST	BCS CONTROL	CURRENT SENSING RELAY	DIFFERENTIAL PRESSURE SWITCH	AUXILIARY CONTACT	ALARM CONTACT	PULSE CONTACT	END SWITCH	TEMPERATURE	RELATIVE HUMIDITY	PRESSURE	POSITION	STATUS/INTERLOCK	HIGH/LOW LIMIT	RUN TIME TOTALIZATION	PROPORTIONAL	PROPORTIONAL + INTEGRAL	TRACK W/ MAX OA DAMPER	SCHEDULED START-STOP	OPTIMUM START-STOP	DAY-NIGHT SETBACK	DEMAND LIMITING	RESET OPTIMIZATION	ECONOMIZER	FAILURE MODE (SEE NOTE 1)	NOTES
ROOFTOP AIR HANDLING UNIT RMU-F-16-BR	X																													
SUPPLY FAN START/STOP		X																					X						C	
SUPPLY FAN STATUS							X										X		X											
SUPPLY FAN SPEED						X															X									3
VFD MASTER ALARM									X								X													
SYSTEM DISCHARGE AIR TEMPERATURE													X					X												
SUPPLY DUCT STATIC PRESSURE															X															
SUPPLY AIR STATIC PRESSURE HIGH LIMIT STATUS										X							X													
COOLING COIL CONTROL VALVE						X															X								O	
PREHEAT COIL CONTROL VALVE						X															X								O	
PREHEAT COIL DISCHARGE AIR TEMPERATURE													X					X												
PREFILTER DIFF. PRESSURE															X			X												
FILTER DIFF. PRESSURE															X			X												
MINIMUM OUTSIDE AIR DAMPER				X																									O	
MAXIMUM OUTSIDE AIR DAMPER						X																							C	
RELIEF AIR DAMPER				X																										
RETURN AIR DAMPER						X																								
OUTDOOR AIR TEMPERATURE													X					X												
MIXED AIR TEMPERATURE													X					X												
MIXED AIR PLENUM PRESSURE															X															
RETURN TEMPERATURE													X					X												
RETURN PLENUM STATIC PRESSURE LOW LIMIT STATUS										X							X													
TERMINAL UNITS	X																													4
REHEAT COIL CONTROL VALVE						X															X								O	
SPACE TEMPERATURE													X																	
DAMPER CONTROL						X																								
UNIT HEATER	X																													
FAN START/STOP		X																											O	
ELECTRIC HEAT			X																											
SPACE TEMPERATURE													X					X												
SPLIT SYSTEM AIR CONDITIONING UNIT	X																													
SPACE TEMPERATURE													X					X												

NOTES:

1. FAILURE MODE:
   O - ON OR OPEN
   C - OFF OR CLOSE
   L - LAST COMMAND
2. BCS CONTROLS AND INTERFACES SHALL BE ARRANGED SO THAT EQUIPMENT CONTROLLED BY THE BCS SYSTEM OPERATES AS INDICATED ON FAILURE OF THE BCS CONTROLLER FOR ANY REASON, INCLUDING LOGIC POWER SUPPLY FAILURE, CPU LOCK-UP, OR INTERPOSING RELAY FAILURE. SAFETY AND OPERATIONAL INTERLOCKS SHALL REMAIN IN EFFECT.
3. UPON FAILURE OF CONTROL POWER, FAIL VFD TO 50% SPEED.
4. PROVIDE IDENTICAL POINTS FOR EACH TERMINAL UNIT.

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HVAC CONTROL SEQUENCES:

A. THE CONTROLS FOR THE ROOFTOP AIR HANDLING UNIT RMU-F-16-BR (SERVING THE F3 GATE) SHALL FUNCTION AS FOLLOWS:

1. THE SYSTEM SHALL BE AUTOMATICALLY STARTED AND STOPPED BY THE BCS CONTROLLER BASED ON A TIME SCHEDULE WHENEVER THE HAND-OFF-AUTOMATIC SWITCH IS IN THE AUTOMATIC POSITION, AND MANUALLY STARTED AND STOPPED BY THE HAND POSITION.
2. CONTROLS SHALL BE ENERGIZED AND THE RETURN DAMPER SHALL OPEN PRIOR TO SUPPLY FAN STARTING. DAMPERS SHOWN WITH END SWITCHES SHALL BE PROVEN OPEN PRIOR TO FAN STARTING.
3. WHEN STARTED, THE SYSTEM SHALL OPERATE IN MORNING WARM-UP MODE. DURING THE MORNING WARM-UP MODE, THE SUPPLY FAN SHALL RUN, THE MINIMUM AND MAXIMUM OUTSIDE AIR DAMPERS AND THE CHILLED WATER VALVE SHALL BE CLOSED, THE ECONOMIZER MODE SHALL BE DE-ACTIVATED, THE RETURN DAMPER SHALL BE OPEN, PREHEAT COIL DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE SET TO 80ºF, AND THE SPACE TERMINAL UNITS SHALL OPERATE UNDER NORMAL CONTROLS UNTIL ALL SPACE TEMPERATURE READINGS ARE ABOVE A 63 DEG F WARM-UP MODE SETPOINT. UPON COMPLETION OF THE MORNING WARM-UP MODE, THE MINIMUM OUTSIDE AIR DAMPER SHALL OPEN, AND THE SYSTEM SHALL OPERATE UNDER NORMAL CONTROLS.
4. MODULATE THE PREHEAT COIL VALVE TO MAINTAIN 51 DEG F COIL DISCHARGE TEMPERATURE SETPOINT DOWNSTREAM OF THE PREHEAT COIL. SENSOR SHALL BE AT LEAST 36" FROM THE COIL FACE. WHENEVER PREHEAT COIL DISCHARGE TEMPERATURE IS 42 DEG F OR LESS FOR 5 MINUTES, OVERRIDE OTHER CONTROLS AND OPEN THE HOT WATER CONTROL VALVE AND SIGNAL A "HEATING COIL FAILURE" ALARM AT THE BCS CENTRAL STATION. PREHEAT COIL CONTROLS SHALL REMAIN ACTIVE AT ALL TIMES, INCLUDING UNIT SHUTDOWN.
5. MODULATE THE CHILLED WATER VALVE TO MAINTAIN 51 DEG F SYSTEM DISCHARGE AIR TEMPERATURE SETPOINT.
6. WHEN THE SUPPLY FAN IS STARTED, THE BCS CONTROLLER SHALL MODULATE THE SUPPLY FAN VARIABLE FREQUENCY DRIVE TO MAINTAIN DUCT STATIC PRESSURE SETPOINT LOCATE DUCT STATIC PRESSURE SENSOR AS SHOWN ON THE DRAWINGS.
7. MODULATE THE NORMALLY-OPEN RETURN AIR DAMPER TO MAINTAIN MIXED AIR PLENUM STATIC PRESSURE AS MEASURED BY A STATIC PRESSURE SENSOR IN THE MIXED AIR PLENUM AT THE SETPOINT DETERMINED BY THE TEST AND BALANCE WORK. AT SYSTEM START-UP, FULLY OPEN THE RETURN AIR DAMPER. AFTER THE SUPPLY FAN HAS BEEN PROVEN OPERATING FOR 3 MINUTES, INITIATE MODULATING CONTROLS.
8. INITIATE ECONOMIZER MODE OPERATION ON A DROP IN OUTSIDE AIR DRY BULB TEMPERATURE BELOW 60 DEG F SET POINT. WITH THE UNIT OPERATING IN THE ECONOMIZER MODE, MODULATE THE MAXIMUM OUTSIDE AIR DAMPER TO MAINTAIN DISCHARGE AIR TEMPERATURE SETPOINT. IF THE MAXIMUM OUTSIDE AIR DAMPER IS FULLY OPEN AND THE DISCHARGE AIR TEMPERATURE SETPOINT STILL IS NOT SATISFIED, THE CHILLED WATER VALVE SHALL BE MODULATED TO SATISFY DEMAND. WHEN THE MAXIMUM OUTSIDE AIR DAMPER IS BEING COMMANDED OPEN, THE RELIEF DAMPER SHALL OPEN. CLOSE THE RELIEF DAMPER WHEN THE MAXIMUM OUTSIDE AIR DAMPER IS CLOSED. WHEN THE ECONOMIZER MODE IS DEACTIVATED, THE MAXIMUM OUTSIDE AIR DAMPER AND THE RELIEF DAMPER SHALL FULLY CLOSE. DEACTIVATE THE ECONOMIZER MODE OPERATION WHENEVER RETURN AIR HUMIDITY RISES ABOVE 65% ADJUSTABLE.
9. A SEPARATE HIGH PRESSURE LIMIT SAFETY LOCATED IN THE SUPPLY DUCTWORK SHALL SIGNAL AN ALARM CONDITION AT THE BCS CENTRAL STATION AND SHUTDOWN THE SUPPLY FAN UPON SENSING A DUCT STATIC PRESSURE GREATER THAN 3" WG (ADJUSTABLE).
10. A SEPARATE LOW LIMIT SAFETY SENSING AIR ENTERING THE COOLING COIL SET AT 40ºF ADJUSTABLE, SHALL STOP THE SUPPLY FAN AND OPEN THE CHILLED WATER VALVE.
11. WIRE FIRE ALARM RELAYS LOCATED IN THE AIR HANDLING UNIT INTO THE STARTING CIRCUITS FOR THE SUPPLY FAN. COORDINATE WITH THE FIRE ALARM SYSTEM. ALL SAFETIES SHALL REMAIN OPERATIONAL AND DAMPERS NECESSARY FOR SAFE OPERATION SHALL BE PROPERLY POSITIONED THROUGH LOCAL INTERLOCKS.
12. ON SYSTEM SHUTDOWN, THE MINIMUM AND MAXIMUM OUTSIDE AIR DAMPERS, RELIEF DAMPER, AND CHILLED WATER VALVE SHALL CLOSE, THE RETURN DAMPER SHALL OPEN, AND THE SUPPLY FAN SHALL STOP.
13. SPACE TERMINAL UNITS:
    a. VARIABLE VOLUME REHEAT - EACH TERMINAL UNIT CONTROLLER SHALL, ON A DROP IN SPACE TEMPERATURE, MODULATE THE PRIMARY AIR VALVE TO THE MINIMUM FLOW. UPON A FURTHER DROP IN SPACE TEMPERATURE, THE TERMINAL UNIT CONTROLLER SHALL MODULATE THE HOT WATER VALVE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

B. THE EXISITNG CONTROLS FOR EXHAUST FAN EF-F3-3T (SERVING THE LINE MTC), TERMINAL UNITS VAV-F-01-31T AND VAV-F-01-32T SHALL REMAIN.

1. EXTEND CONTROL WIRING TO LOCATION SHOWN ON NEW WORK FLOOR PLAN.

C. THE CONTROLS FOR UNIT HEATER SWH-F3-1 (SERVING THE STAIR) SHALL FUNCTION AS FOLLOWS:

1. ON A DROP IN SPACE TEMPERATURE BELOW SETPOINT THE BCS CONTROLLER SHALL START THE UNIT HEATER FAN AND ACTIVATE THE STEPS OF ELECTRIC HEAT TO MAINTAIN SPACE TEMPERATURE.
2. WHEN SPACE TEPMERATURE RISES ABOVE SETPOINT THE BCS CONTROLLER SHALL DEACTIVATE THE STEPS OF ELECTRIC HEAT AND STOP THE UNIT HEATER FAN.
3. THE BCS CONTROLLER SHALL ANNUNCIATE AN ALARM CONDITION AT THE BCS CENTRAL STATION WHENEVER SPACE TEMPERATURE IS BELOW 45 DEG F FOR 10 MINUTES.

D. THE CONTROLS FOR SPLIT SYSTEM AIR CONDITIONING UNIT AND DUCTLESS SPLIT SYSTEM UNIT EACH SHALL FUNCTION AS FOLLOWS:

1. PROVIDE CONTROL WIRING BETWEEN INDOOR AND OUTSOOR UNITS AND THERMOSTAT.
2. THE BCS CONTROLLER SHALL MONITOR SPACE TEMPERATURE AND SHALL ANUNCIATE AN ALARM CONDITION WHENEVER SPACE TEMPERATURE EXCEEDS 80 DEG F FOR 30 MINUTES.

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TASK ORDER No. : 001

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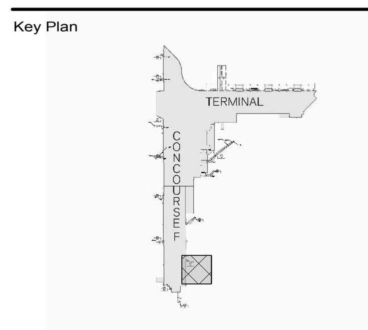

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: DYM Reviewed by: SYC

Project No:

Sheet Title

HVAC CONTROLS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

M900

PLUMBING FIXTURE SCHEDULE

NO.	FIXTURE TYPE	FLUSH/FLOW RATE	PIPING CONNECTION SIZE		
			HW	CW	S OR W
F1	WATER CLOSET (SENSOR FLUSH VALVE), WALL TYPE, ADA	1.28 GPF	-	1"	4"
F2	LAVATORY (MANUAL FAUCET), WALL TYPE, ADA	0.5 GPM	0.5"	0.5"	1.25"
F3	UTILITY SINK, MOLDED STONE, FREESTANDING	-	0.5"	0.5"	1.5"
F4	BREAK ROOM SINK, STAINLESS STEEL, 1-COMPARTMENT, ADA	1.5 GPM	0.5"	0.5"	1.5"
F5	SERVICE SINK, FLOOR TYPE	-	0.5"	0.5"	3"
F6	EMERGENCY EYE/FACE WASH, ADA	-	-	*0.5"	1.25"
F7	SHOWER, ADA	1.5 GPM	0.5"	0.5"	2"
F8	ICE MAKER BOX	-	-	0.5"	-

*NOTE: FIXTURE TO RECEIVE TEPID WATER FROM RELOCATED WATER HEATER WH-5-3.

DRAIN SCHEDULE

NO.	TYPE	GENERAL LOCATION	NOTES
D1	FLOOR DRAIN	FINISHED AREAS	-
D2	FLOOR SINK	JANITOR CLOSET	-
D3A	ROOF DRAIN	ROOF	-
D3B	OVERFLOW ROOF DRAIN	ROOF	-

CIRCULATING PUMP SCHEDULE

NO.	GPM	TOTAL DYMANIC HEAD, FT. WG	MAXIMUM MOTOR HP	SERVICE
CP-1	1	10	1/12	ALL

NOTES:

1. REFER TO THE ELECTRICAL DRAWINGS FOR EQUIPMENT ELECTRICAL CHARACTERISTICS.

SUMP PUMP SCHEDULE

NO.	SERVICE	TYPE (NOTE 1)	GPM	TOTAL DYNAMIC HEAD, FT. WG	MINIMUM MOTOR HP	NOTES
SP-1	ELEVATOR	S-OS	50	35	0.5	2

NOTES:

1. TYPE:
   S-OS SIMPLEX, OIL-SENSING
2. REFER TO THE ELECTRICAL DRAWINGS FOR EQUIPMENT ELECTRICAL CHARACTERISTICS.

MIXING VALVE SCHEDULE

NO.	SERVICE	TYPE (NOTE 1)	MINIMUM FLOW, GPM	DESIGN FLOW, GPM	MAXIMUM PRESSURE DROP, PSI	OUTLET TEMPERATURE
MV-1	LAVATORY	T-S	0.5	0.5	15	109°F

NOTES:

1. TYPE:
   T-S THERMOSTATIC, SINGLE FIXTURE

PLUMBING LEGEND

SYMBOLS

- SOIL (S) OR WASTE (W) ABOVE FLOOR OR GRADE
- SOIL (S) OR WASTE (W) BELOW FLOOR OR GRADE
- VENT (V)
- IW — INDIRECT WASTE (IW) ABOVE FLOOR OR GRADE
- IW — INDIRECT WASTE (IW) BELOW FLOOR OR GRADE
- RW — RAINWATER (RW) ABOVE FLOOR OR GRADE
- RW — RAINWATER (RW) BELOW FLOOR OR GRADE
- ORW — OVERFLOW RAINWATER (ORW) ABOVE FLOOR OR GRADE
- COLD WATER (CW)
- HOT WATER (HW)
- HOT WATER CIRCULATING (HWC)
- CA — COMPRESSED AIR (CA)
- FLOOR DRAIN (TYPE AS INDICATED IN SCHEDULE)
- ROOF DRAIN (RD) OR OVERFLOW ROOF DRAIN (ORD)
- FLOOR CLEANOUT (FCO) OR GROUND CLEANOUT (GCO)
- CLEANOUT (CO) IN THE RUN
- WALL HYDRANT (FPWH)
- GATE VALVE
- GATE VALVE IN VERTICAL RISE
- BALL VALVE
- BALL VALVE IN VERTICAL RISE
- EX-XX — EXISTING PIPING TO REMAIN (TYPE AS INDICATED)
- EX-XX — EXISTING PIPING TO BE REMOVED (TYPE AS INDICATED)
- CONNECT TO EXISTING

ABBREVIATIONS

A/C	ABOVE CEILING
AFF/AFG	ABOVE FINISHED FLOOR / GRADE
CTE	CONNECT TO EXISTING
DN	DOWN
DSN	DOWNSPOUT NOZZLE
EX	EXISTING
FBA	FLOW BALANCING ASSEMBLY
FD	FLOOR DRAIN
FS	FLOOR SINK
HD	HUB DRAIN
IE	INVERT ELEVATION
PBB	PASSENGER BOARDING BRIDGE
PWC	POTABLE WATER CABINET
SD	SHOWER DRAIN
SS	SERVICE SINK
TD	TRENCH DRAIN
U/G	UNDERGROUND
VTR	VENT THROUGH ROOF
WHA-X	WATER HAMMER ARRESTER, TYPE "X"

PLUMBING GENERAL NOTES

1. EXISTING PIPING AND EQUIPMENT IS BASED ON COMBINATION OF FIELD SURVEY, AS-BUILT DRAWINGS, AND ASSUMPTIONS. SOME EXISTING CONDITIONS MAY DIFFER FROM CONDITIONS SHOWN HEREIN. CONTRACTOR SHALL FIELD-VERIFY ALL EXISTING CONDITIONS PRIOR TO COMMENCING WORK.
2. ALL PLUMBING PIPING AND EQUIPMENT THAT IS TO BE DEMOLISHED SHALL BE REMOVED FROM THE SITE DURING THIS RENOVATION. NO PIPING IS TO BE ABANDONED IN PLACE UNLESS OTHERWISE NOTED.
3. WHERE EXISTING ELEMENTS TO REMAIN ARE DAMAGED DURING THIS RENOVATION, CONTRACTOR SHALL MAKE ALL NECESSARY REPAIRS TO MATCH FINAL SURFACES AND FINISHES.
4. UPON COMPLETION OF WORK, NO DEAD-LEGS LONGER THAN 6" SHALL REMAIN IN EXISTING PIPING, EXCEPT AT CLEANOUTS AND PIPES INDICATED FOR FUTURE USE.
5. CONTRACTOR IS TO PROVIDE ACCESS TO ALL NEW AND / OR EXISTING DEVICES REQUIRING OPERATION, MAINTENANCE, OR SERVICE THROUGHOUT THE LIFE OF THE SYSTEM.
6. SAW-CUTS MAY BE REQUIRED TO LOCATE EXISTING PIPE AND INSTALL NEW PIPING BELOW THE EXISTING SLAB.
7. PROVIDE ISOLATION BETWEEN ALL DISSIMILAR PIPING THROUGHOUT THIS RENOVATION.
8. FLOOR DRAINS AND ROOF DRAINS LOCATED AT EQUIPMENT SHALL BE COORDINATED WITH THE LAYOUT OF THE CONCRETE EQUIPMENT PAD FOR EACH INDIVIDUAL UNIT.
9. COORDINATE ALL UNDERGROUND PIPING WITH GRADE BEAMS, WALL FOOTINGS, AND COLUMN FOUNDATIONS AND WITH OTHER STRUCTURAL CONDITIONS.
10. PROVIDE TRAP GUARDS AT ALL NEW FLOOR DRAINS WITHIN THE SCOPE OF THE RENOVATION.

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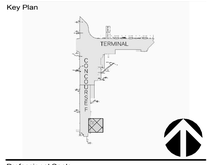

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: MFH Reviewed by: JBW

Project No:

Sheet Title

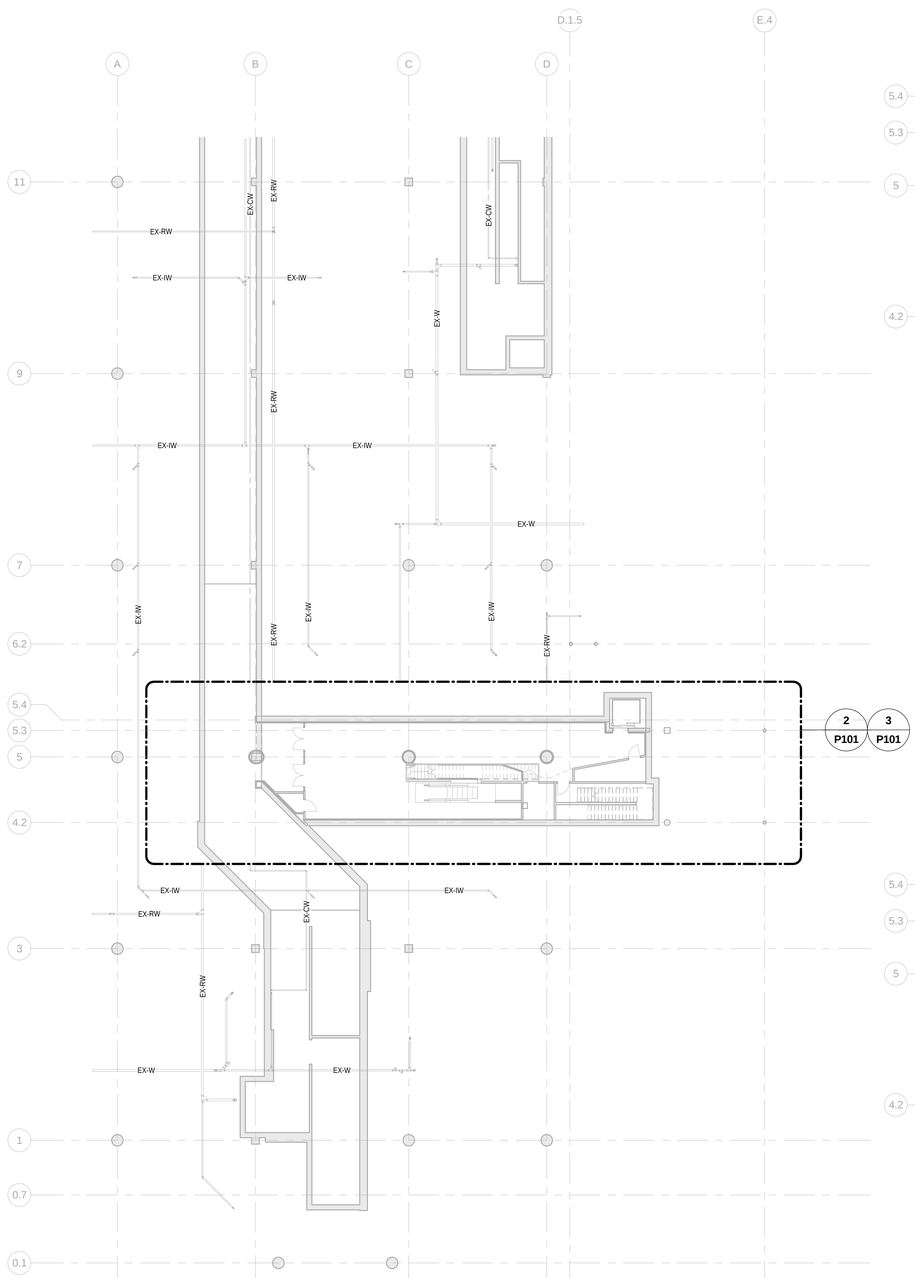
PLUMBING LEGEND, SCHEDULES, AND GENERAL NOTES

Original drawing is 42 x 30. Do not scale contents of this drawing.

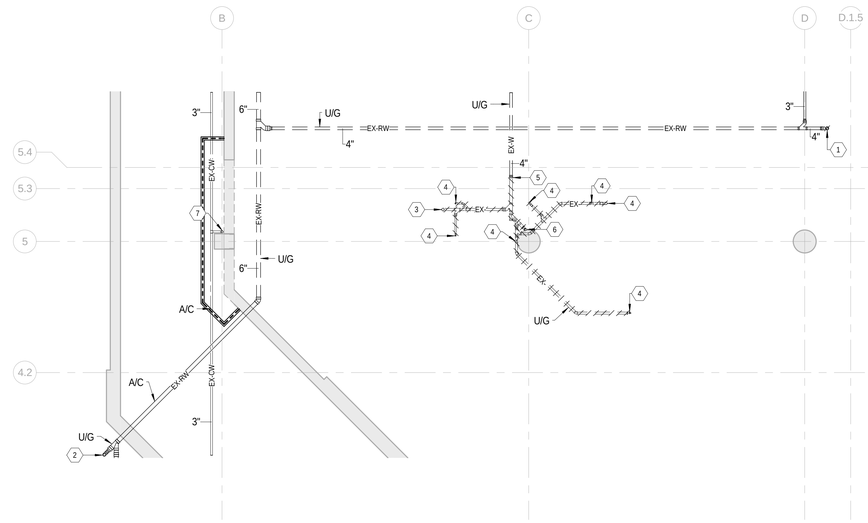
Sheet Number

P000

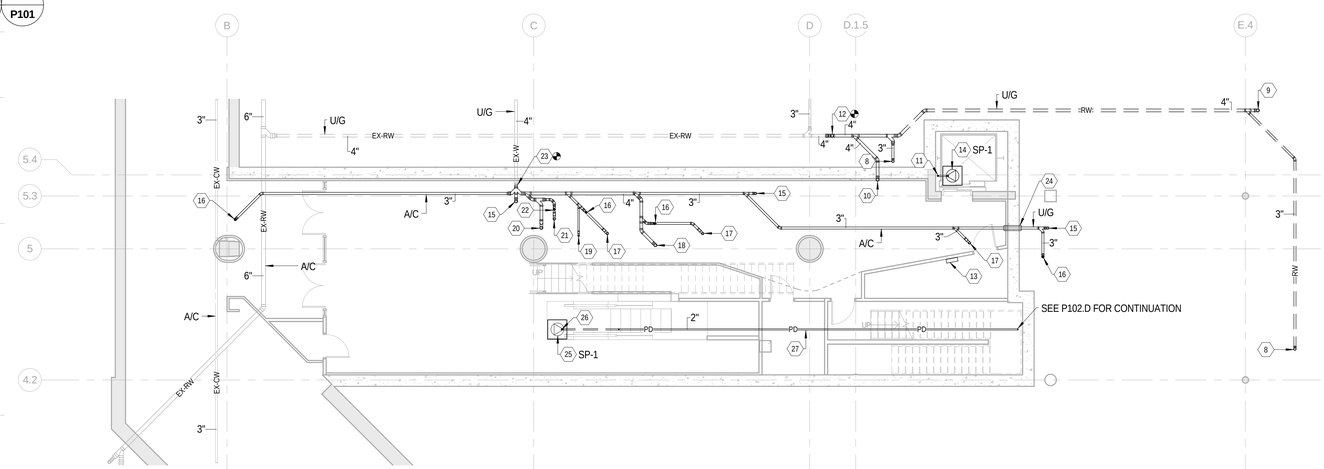
KEYNOTES (THIS SHEET)	
1	REMOVE EXISTING BEND AT BASE OF CLEANOUT.
2	UP TO EXISTING GCO.
3	REMOVE EXISTING WASTE UP TO FCO.
4	REMOVE EXISTING WASTE UP TO FIXTURE.
5	DISCONNECT EXISTING 4" W AND CAP DURING CONSTRUCTION.
6	REMOVE EXISTING 4" W UP.
7	EXISTING 3" CW UP.
8	3" RW UP TO HUB DRAIN.
9	UP TO GCO.
10	4" RW UP.
11	2" PD UP.
12	CONNECT 4" RW TO EXISTING RW AT BASE OF EXISTING GCO.
13	ELEVATOR SUMP PUMP CONTROL PANEL.
14	COORDINATE LOCATION OF ELEVATOR SUMP PUMP AND PIT WITH STRUCTURAL DRAWINGS; SEE DETAIL 2/P500.
15	UP TO FCO.
16	2" WASTE UP.
17	3" W UP TO FD.
18	4" WASTE UP.
19	2" W UP TO SD.
20	4" W UP TO FS.
21	3" W UP TO SS.
22	2" V UP.
23	CONNECT 4" SANITARY TO EXISTING 4" SANITARY ABOVE CEILING.
24	SLEEVE THROUGH FOUNDATION WALL.
25	COORDINATE LOCATION OF ESCALATOR SUMP PUMP AND PIT WITH STRUCTURAL DRAWINGS; SEE DETAIL 2/P500 (SIMILAR).
26	2" PD UP ALONG UNDERSIDE OF ESCALATOR. ROUTE PIPING CONCEALED WITHIN WALL.
27	PD PIPING CONCEALED BENEATH ESCALATOR WITHIN WALL ON UNDERSIDE OF ESCALATOR.



1 ARRIVALS LEVEL - PLUMBING FLOOR PLAN
1/16" = 1'-0"
0 4 8 16 32 FT.



2 ARRIVALS LEVEL - PLUMBING ENLARGED PLAN - DEMOLITION
1/8" = 1'-0"
0 2 4 8 16 FT.



3 ARRIVALS LEVEL - PLUMBING ENLARGED PLAN - NEW WORK
1/8" = 1'-0"
0 2 4 8 16 FT.

4/14/2015 4:00:36 PM

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TASK ORDER No.: 001

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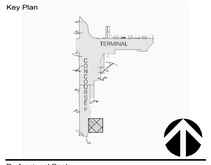

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: MFH Reviewed by: JBW

Project No:

Sheet Title

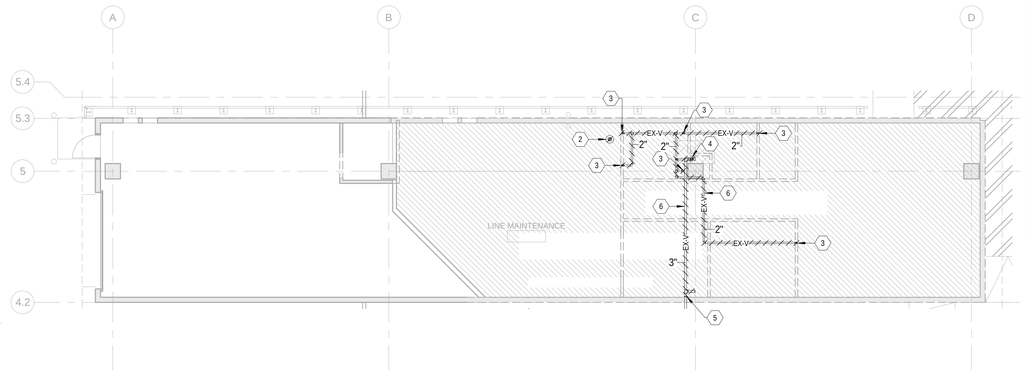
PLUMBING ARRIVALS LEVEL PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

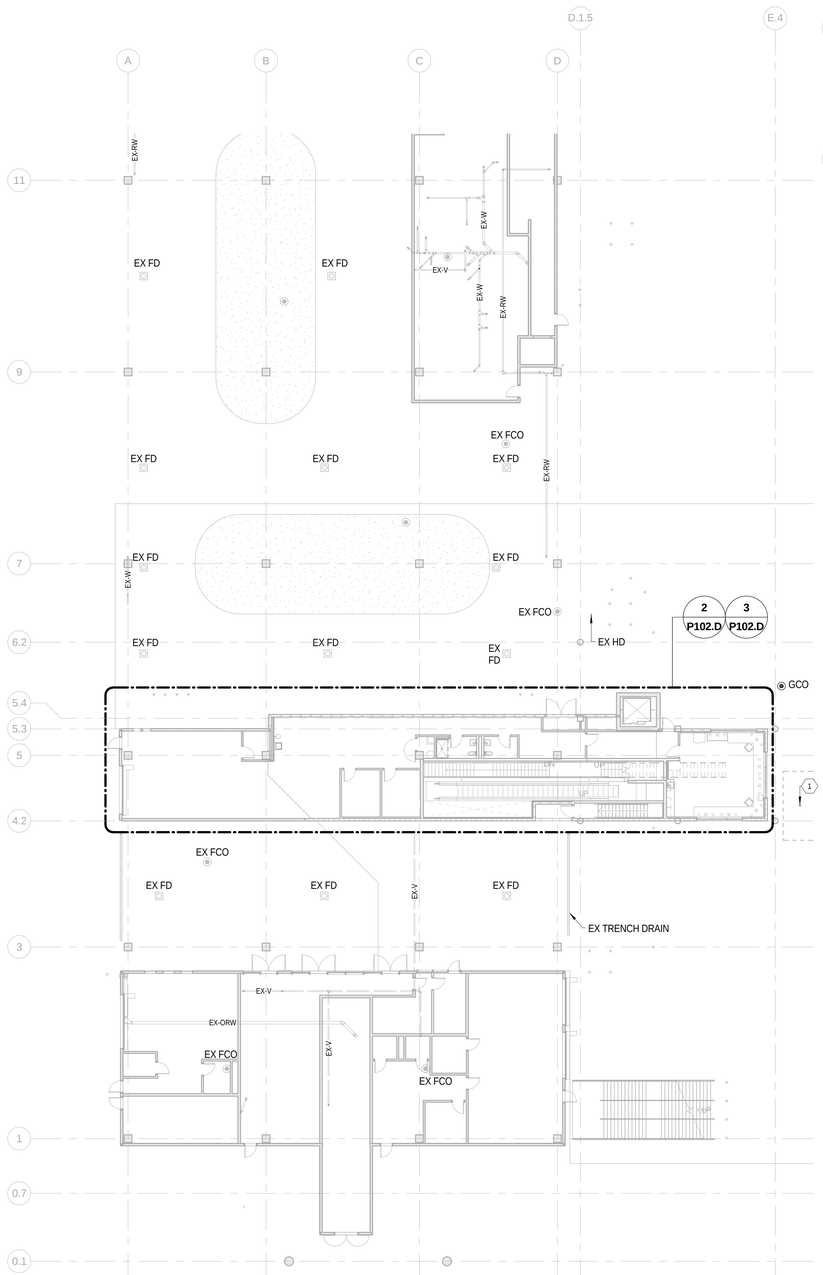
Sheet Number

P101

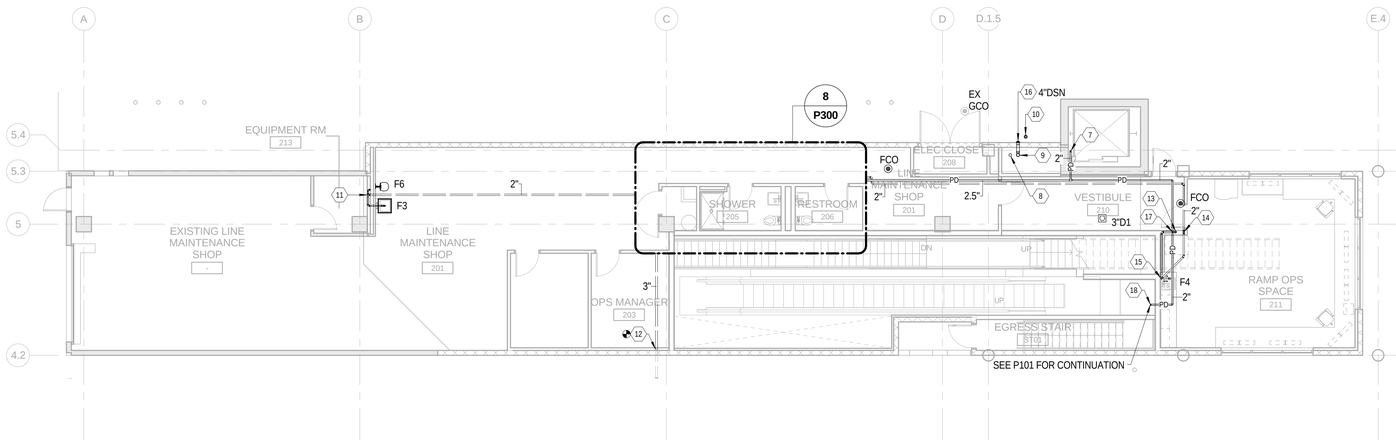
KEYNOTES (THIS SHEET)	
1	3" HUB DRAIN FOR PRECONDITIONED AIR UNIT CONDENSATE DRAINAGE. COORDINATE LOCATION WITH PEDESTAL FOUNDATION. CONTRACTOR SHALL PLACE HUB DRAIN BETWEEN BOLLARDS.
2	REMOVE EXISTING FCO.
3	REMOVE EXISTING WASTE AND VENT AT DEMOLISHED FIXTURE.
4	REMOVE EXISTING 3" V DN.
5	DISCONNECT EXISTING 3" V AND CAP DURING CONSTRUCTION.
6	REMOVE EXISTING VENT ABOVE CEILING.
7	2" PD DN.
8	4" RW UP & DN.
9	4" ORW UP.
10	3" HUB DRAIN FOR CONDENSATE RECOVERY.
11	2" W DN; 2" V DROP.
12	CONNECT 3" V TO EXISTING 3" V ABOVE CEILING.
13	2" WASTE DN.
14	2" V DROP INTO SOFFIT.
15	2" W DROP IN WALL; ROUTE ABOVE SLAB WITHIN WALL AS SHOWN. 2" V DROP.
16	LOCATE DOWNSPOUT NOZZLE AT 24" ABOVE FINISHED GRADE.
17	2" PD DROP INTO SOFFIT.
18	PD PIPING CONCEALED BENEATH ESCALATOR WITHIN WALL ON UNDERSIDE OF ESCALATOR.



2 APRON LEVEL - PLUMBING DRAINAGE ENLARGED PLAN - DEMOLITION
1/8" = 1'-0"



1 APRON LEVEL - PLUMBING DRAINAGE FLOOR PLAN
1/16" = 1'-0"



3 APRON LEVEL - PLUMBING DRAINAGE ENLARGED PLAN - NEW WORK
1/8" = 1'-0"

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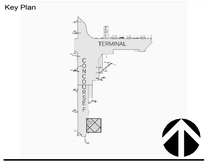

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5. ISSUED FOR BID DOCUMENTS		04-17-15

Drawn by: MFH Reviewed by: JBW

Project No:

Sheet Title

PLUMBING APRON LEVEL PLAN - DRAINAGE

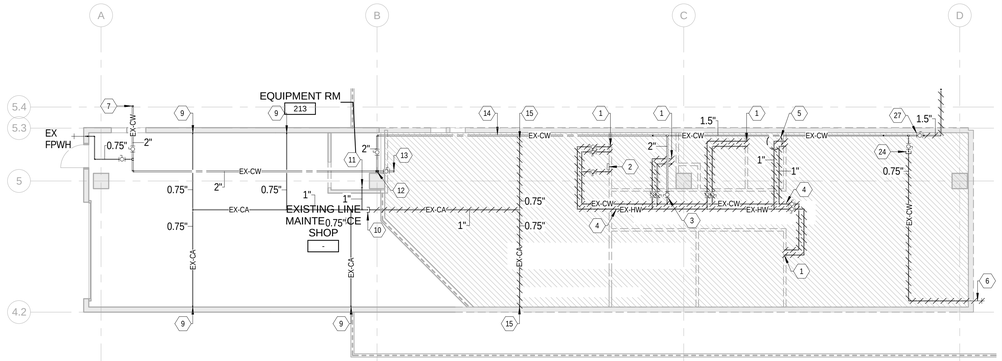
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

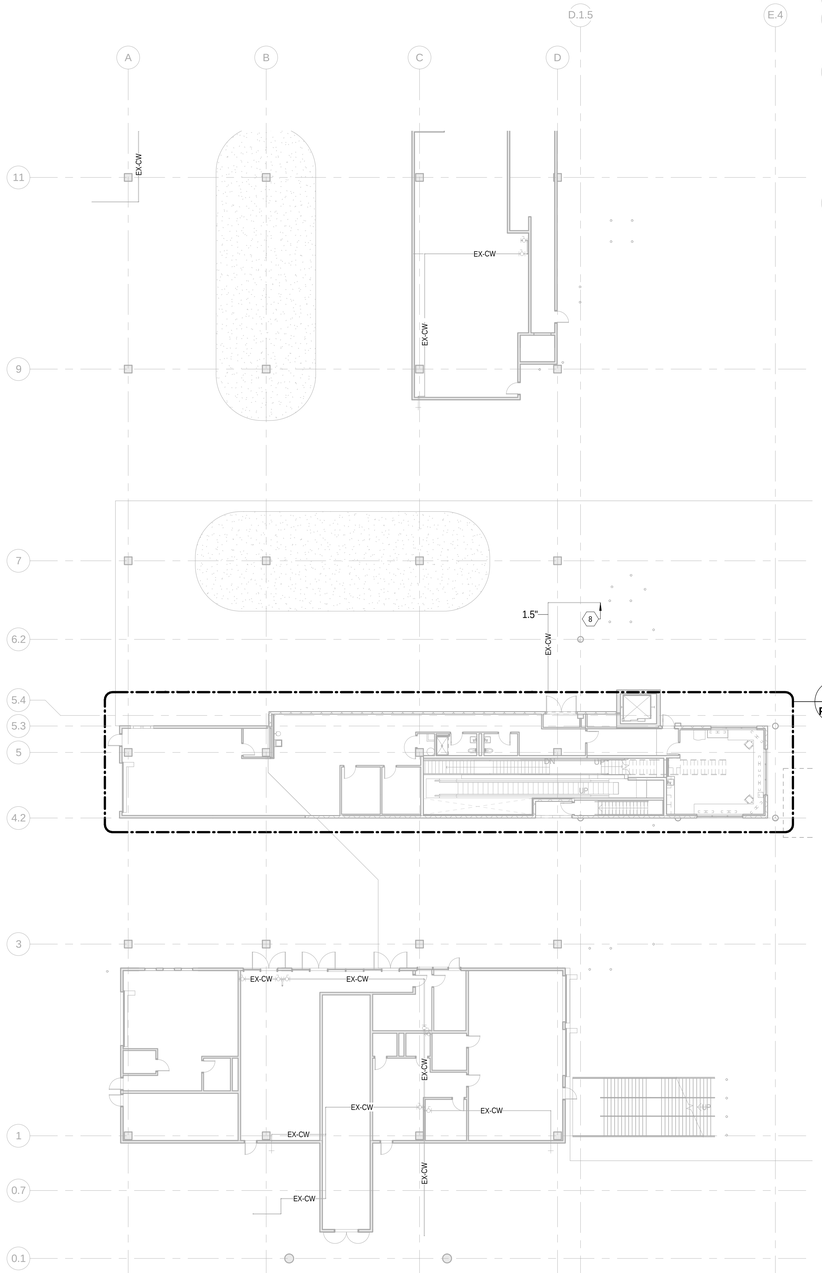
P102.D

4/14/2015 4:00:42 PM

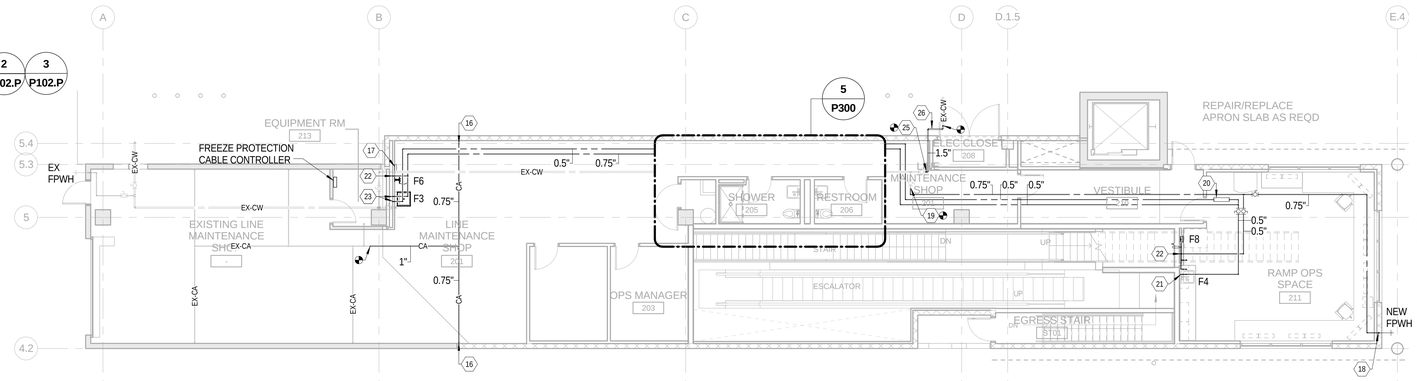
KEYNOTES (THIS SHEET)	
1	REMOVE EXISTING HW AND CW DROP TO FIXTURE.
2	REMOVE EXISTING WATER HEATER (WH-5-3); PROTECT AND STORE DURING CONSTRUCTION (TO BE REINSTALLED DURING THIS RENOVATION).
3	EXISTING 2" CW ISOLATION VALVE TO REMAIN.
4	REMOVE EXISTING HW AND CW ABOVE CEILING.
5	REMOVE EXISTING WATER HEATER (WH-4-3) AND EXISTING THERMAL EXPANSION TANK; PROTECT AND STORE DURING CONSTRUCTION (TO BE REINSTALLED DURING THIS RENOVATION).
6	REMOVE EXISTING FPWH.
7	EXISTING 2" CW UP.
8	EXISTING 1.5" CW DROP TO EXISTING PWC.
9	EXISTING 0.75" CA DROP.
10	CAP EXISTING 1" CA.
11	EXISTING 1" CA DROP TO EXISTING AIR COMPRESSOR AND AIR DRYER.
12	EXISTING 3" CW DN.
13	EXISTING 2" CW, VALVED AND CAPPED.
14	EXISTING 2" CW TO REMAIN ACTIVE DURING CONSTRUCTION.
15	REMOVE EXISTING 0.75" CA DROP.
16	0.75" CA DROP ALONG WALL. PROVIDE NEW CA OUTLET (MATCH EXISTING STYLE AND MOUNTING HEIGHT).
17	REINSTALL EXISTING WH-5-3 BELOW EYE/FACE WASH; SEE DETAIL 1/P500.
18	0.75" CW DROP IN WALL; PIPING SHALL BE ON INTERIOR SIDE OF BUILDING INSULATION.
19	CONNECT 0.75" CW TO EXISTING 0.75" CW ABOVE CEILING.
20	FLOW BALANCING ASSEMBLY; SEE DETAIL 4/P500.
21	0.5" HW DROP IN WALL.
22	0.5" CW DROP IN WALL.
23	0.5" CW & HW DROP IN WALL.
24	DISCONNECT EXISTING 0.75" CW AND CAP.
25	CONNECT 1.5" CW TO EXISTING 1.5" CW ABOVE CEILING.
26	EXTEND EXISTING INSULATION AND FREEZE PROTECTION CABLE ALONG NEW SECTION OF EXTERIOR CW PIPING.
27	EXISTING 1.5" CW ISOLATION VALVE TO REMAIN.



2 APRON LEVEL - PLUMBING PRESSURE ENLARGED PLAN - DEMOLITION
1/8" = 1'-0"



1 APRON LEVEL - PLUMBING PRESSURE FLOOR PLAN
1/16" = 1'-0"



3 APRON LEVEL - PLUMBING PRESSURE ENLARGED PLAN - NEW WORK
1/8" = 1'-0"

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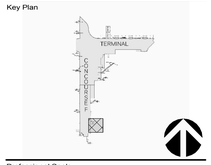
Key Plan



Professional Seals

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2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: MFH Reviewed by: JBW

Project No:

Sheet Title

PLUMBING APRON LEVEL PLAN - PRESSURE

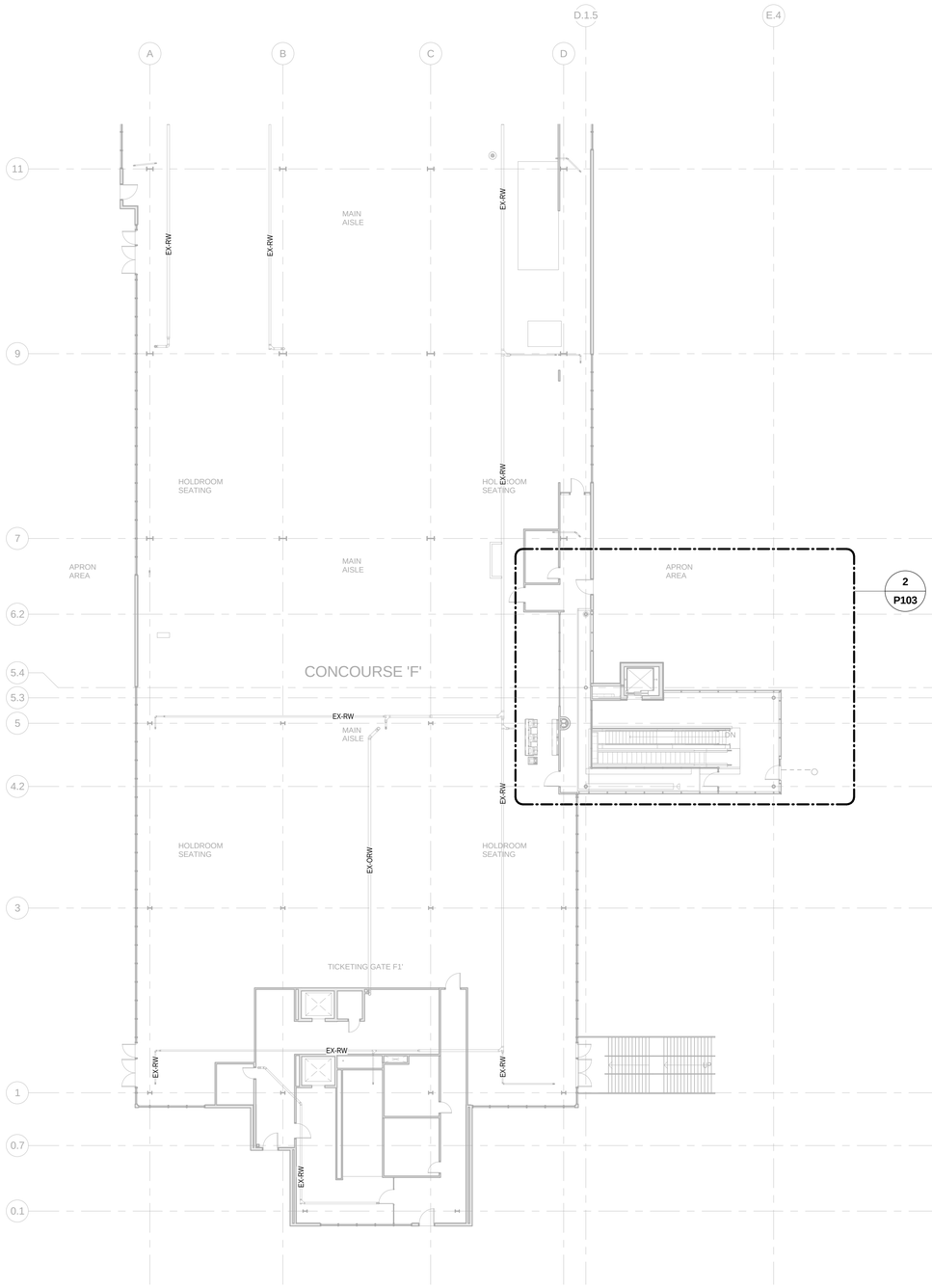
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

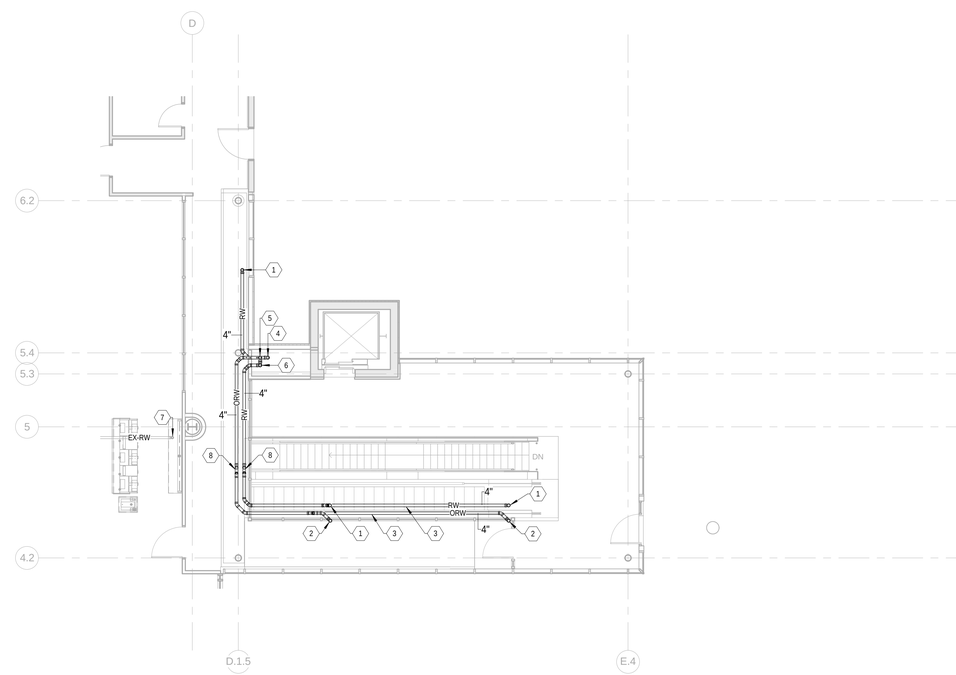
P102.P

4/14/2015 4:00:47 PM

KEYNOTES (THIS SHEET)	
1	4" RW UP TO RD.
2	4" ORW UP TO ORD.
3	INSTALL TIGHT TO STRUCTURE.
4	4" ORW DN.
5	4" RW DN.
6	DROP BELOW ORW PIPING.
7	EXISTING RW UP.
8	OFFSET RW AND ORW PIPING BELOW DUCTWORK.



1 DEPARTURES LEVEL - PLUMBING FLOOR PLAN
1/16" = 1'-0"
0 4 8 16 32 FT.



2 DEPARTURES LEVEL - PLUMBING ENLARGED PLAN - NEW WORK
1/8" = 1'-0"
0 2 4 8 16 FT.

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A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p
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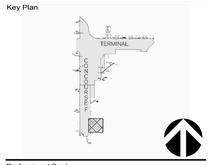
Key Plan



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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: MFH Reviewed by: JBW

Project No:

Sheet Title

PLUMBING DEPARTURES LEVEL PLAN

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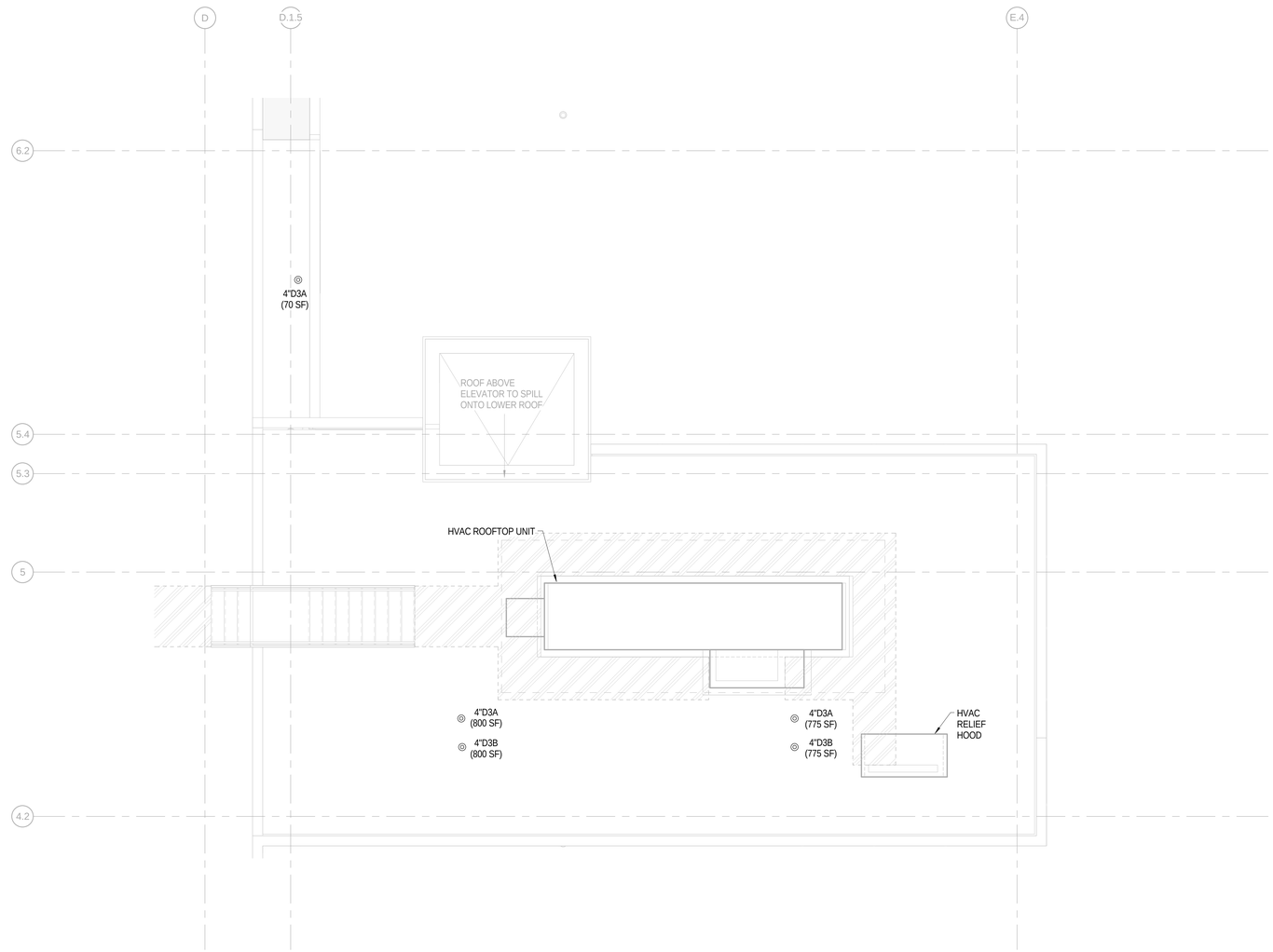
Sheet Number

P103

4/14/2015 4:00:54 PM



1 ROOF LEVEL - PLUMBING FLOOR PLAN - NEW WORK

1/4" = 1'-0"

0 2 4 8 16 FT.

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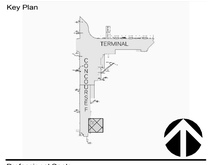

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: MFH Reviewed by: JBW

Project No:

Sheet Title

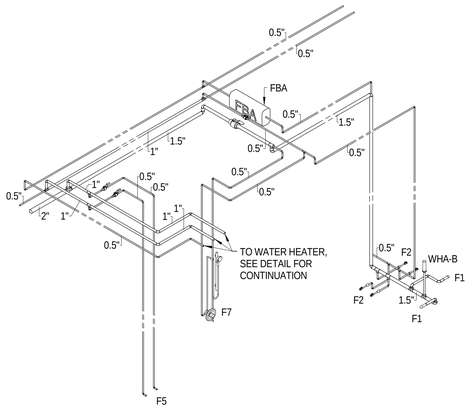
PLUMBING ROOF LEVEL PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

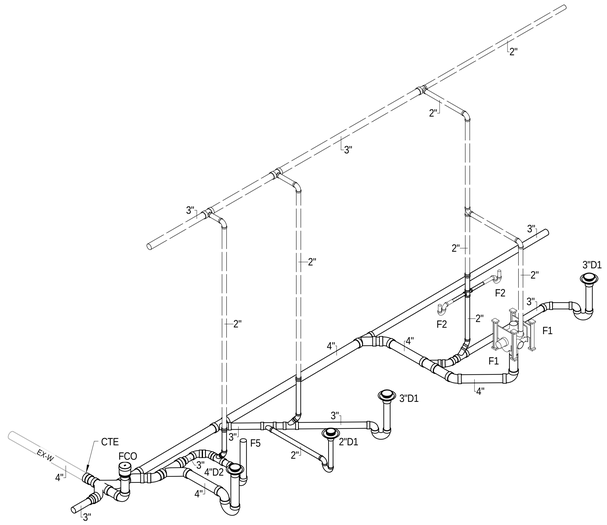
Sheet Number

P104

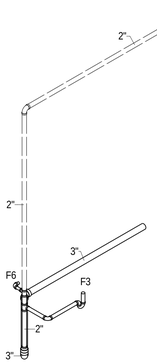
4/14/2015 4:00:56 PM



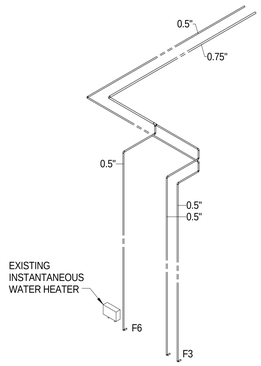
1 RESTROOM/SHOWER RISER DIAGRAM - PRESSURE



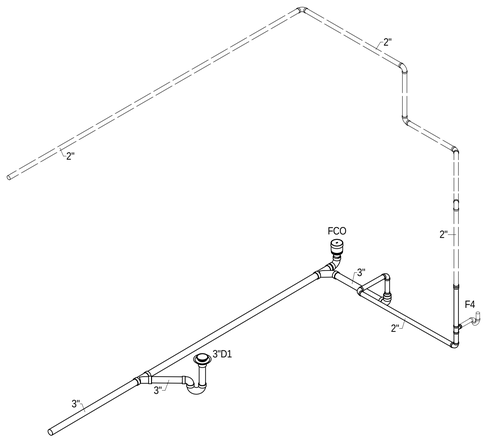
2 RESTROOM/SHOWER RISER DIAGRAM - DRAINAGE



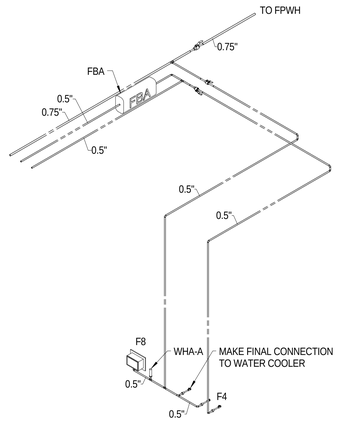
3 LINE MAINTENANCE RISER DIAGRAM - DRAINAGE



4 LINE MAINTENANCE RISER DIAGRAM - PRESSURE

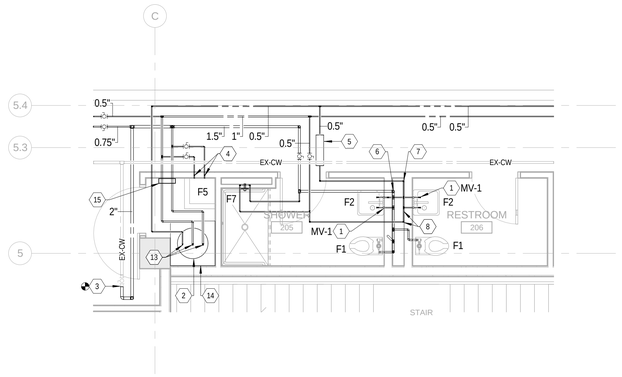


6 RAMP OPS RISER DIAGRAM - DRAINAGE

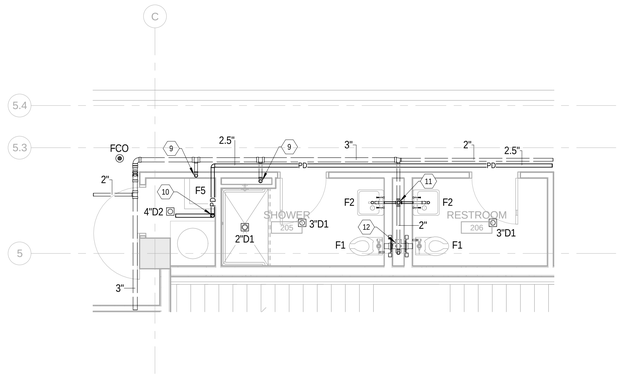


7 RAMP OPS RISER DIAGRAM - PRESSURE

KEYNOTES (THIS SHEET)	
1	PROVIDE THERMOSTATIC MIXING VALVE MOUNTED ON WALL BELOW LAVATORY. COORDINATE INSTALLATION LOCATION WITH SUPPLY AND WASTE PIPING.
2	REINSTALL EXISTING WH-4-3; SEE DETAIL 3/P500 FOR WATER HEATER AND HOT WATER CIRCULATING PUMP (CP-1).
3	CONNECT 2" CW TO EXISTING 2" CW ABOVE CEILING.
4	0.5" CW & HW DROP IN WALL.
5	FLOW BALANCING ASSEMBLY; SEE DETAIL 4/P500.
6	1.5" CW DROP IN CHASE.
7	0.5" HWC DROP IN CHASE.
8	0.5" HW DROP IN CHASE; ROUTE LOW IN CHASE AS SHOWN.
9	2" V DN.
10	2.5" PD DROP ALONG WALL. ROUTE ALONG FLOOR TIGHT TO EQUIPMENT PAD AND TERMINATE OVER FLOOR SINK.
11	2" W DN; 2" V DROP.
12	4" W DN; 2" V DROP.
13	1" CW, 1" HW, & 1" HWC DROP TO WATER HEATER; SEE DETAIL 3/P500 FOR CONTINUATION.
14	WATER HEATER CONCRETE EQUIPMENT PAD.
15	ESCALATOR SUMP PUMP CONTROL PANEL.



5 RESTROOM/SHOWER ENLARGED PLAN - PRESSURE
1/4" = 1'-0"



8 RESTROOM/SHOWER ENLARGED PLAN - DRAINAGE
1/4" = 1'-0"

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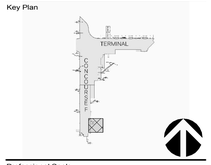

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5. ISSUED FOR BID DOCUMENTS		04-17-15

Drawn by: MFH Reviewed by: JBW

Project No:

Sheet Title

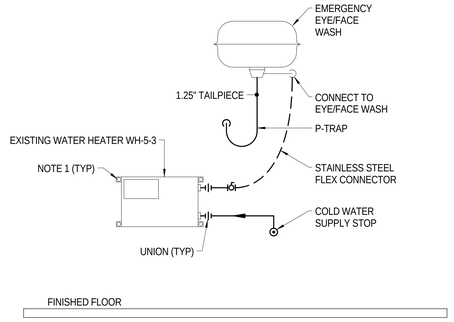
PLUMBING ENLARGED NEW WORK PLANS & RISER DIAGRAMS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

P300

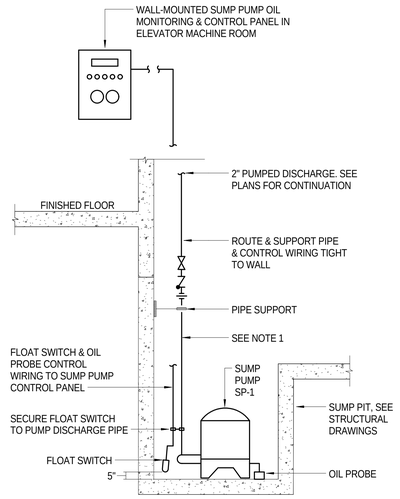
4/14/2015 4:01:02 PM



1 EMERGENCY EYE/FACE WASH STATION

NO SCALE

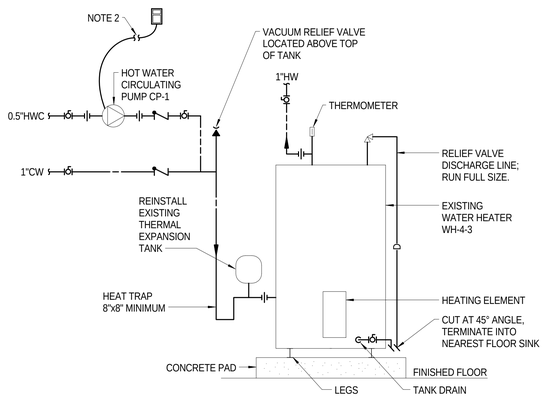
NOTES:
1. SECURE WATER HEATER TO WALL. ADJUST LOCATION OF HEATER AS NECESSARY TO COORDINATE WITH SUPPLY AND WASTE PIPING AND TO MAINTAIN ADA CLEARANCES FOR EYE/FACE WASH.
2. WATER HEATER SHALL BE FULLY ACCESSIBLE.
3. INSTALL EXISTING WATER HEATER IN ACCORDANCE WITH THE MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS.
4. ADJUST EXISTING WATER HEATER TO PRODUCE NO GREATER THAN 85°F WATER.



2 ELEVATOR SUMP PUMP (OIL-SENSING)

NO SCALE

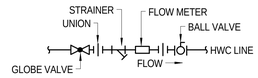
NOTES:
1. PROVIDE PUMP WITH 2" VERTICAL DISCHARGE.
2. ESCALATOR SUMP PUMP IS SIMILAR TO DETAIL ABOVE. LOCATE ESCALATOR SUMP PUMP CONTROL PANEL IN JANITOR CLOSET ON APRON LEVEL.



3 ELECTRIC WATER HEATER

NO SCALE

NOTES:
1. SET EXISTING WATER HEATER SETPOINT TO 120°F.
2. CONNECT TO HWC PUMP CONTROLLER MOUNTED ON WALL.



4 FLOW BALANCING ASSEMBLY

NO SCALE

NOTES:
1. VALVES AND ACCESSORIES SHALL BE LINE SIZE.
2. SET FLOW BALANCING ASSEMBLY TO 0.5 GPM, UNLESS OTHERWISE NOTED.
3. FLOW BALANCING ASSEMBLY SHALL BE FULLY ACCESSIBLE.

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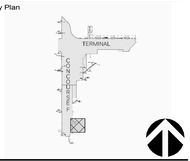

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: MFH Reviewed by: JBW

Project No:

Sheet Title

PLUMBING DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

P500

4/14/2015 4:01:03 PM

SYMBOL LEGEND

	FLUORESCENT LIGHTING FIXTURE AND OUTLET BOX
	DOWN LIGHT
AC y	THE LOWER CASE LETTER BESIDE LIGHT FIXTURES AND BESIDE A SWITCHING DEVICE OR DEVICES INDICATES THAT THOSE LIGHT FIXTURES ARE CONTROLLED BY THAT SWITCHING DEVICE OR DEVICES. UPPERCASE LETTER(S) INDICATE FIXTURE TYPE.
	EXIT LIGHTING WITH ARROWS AS INDICATED, DARKENED QUADRANT INDICATES FACE. PROVIDE WITH OUTLET BOX
S	SINGLE POLE SWITCH MOUNTED UP 48", EXCEPT AS NOTED.
S_3	THREE WAY SWITCH MOUNTED UP 48", EXCEPT AS NOTED.
30A/3P/1	DISCONNECT SWITCH PROVIDED BY DIVISION 16. IF THE EQUIPMENT THAT DISCONNECT SWITCH PROTECTS REQUIRES FUSES FOR OVER CURRENT PROTECTION, THEN THE DISCONNECT SWITCH SHALL BE FUSED AT THE MAXIMUM FUSE SIZE ALLOWED FOR THAT PARTICULAR PIECE OF EQUIPMENT. THE FIRST NUMBER INDICATES DISCONNECT SWITCH AMPACITY, THE SECOND NUMBER INDICATES THE NUMBER OF POLES AND THE THIRD NUMBER INDICATES THE NEMA RATING.
J	COMBINATION STARTER (INCLUDES DISCONNECT) FURNISHED BY MECHANICAL DIVISION INTEGRAL TO A PIECE OF EQUIPMENT AND WIRED TO BY ELECTRICAL DIVISION.
	CONTROLLER OR STARTER FURNISHED BY MECHANICAL DIVISION INTEGRAL TO A PIECE OF EQUIPMENT AND WIRED TO BY ELECTRICAL DIVISION.
	MOTOR OUTLET, WITH RATING AS SHOWN.
J J	CEILING OR WALL MOUNTED JUNCTION BOX.
L1-1,3,5	HOMERUN TO PANELBOARD, L1-DENOTES PANELBOARD, 1,3,5-DENOTES CIRCUITS IN PANELBOARD.
	RACEWAY CONCEALED IN CEILING OR WALL. CIRCUITS IN PANELBOARD.
	RACEWAY INSTALLED BELOW FLOOR OR GRADE.
	CONDUIT OR LIGHTNING PROTECTION CABLE RUN EXPOSED UNLESS SPECIFICALLY NOTED OTHERWISE ON THE DRAWINGS.
WP	WEATHERPROOF.
XE XE	EXISTING CIRCUITING OR ELECTRICAL EQUIPMENT THAT IS TO BE DEMOLISHED.
E E	EXISTING CIRCUITING OR ELECTRICAL EQUIPMENT THAT IS TO REMAIN.
UNO	UNLESS NOTED OTHERWISE.
xx	TWO LOWER CASE LETTERS INDICATE WHAT CIRCUITING ON ANOTHER DRAWING THIS PARTICULAR CIRCUITING IS TO BE CONNECTED TO.

SYMBOL LEGEND

	DUPLEX GFI RECEPTACLE MOUNTED AT 18" AFF UNO.
	QUAD OUTLET, TWO DUPLEX RECEPTACLES MOUNTED 18"A.F.F. UNO.
	DUPLEX RECEPTACLE MOUNTED 18"AFF, UNO
	DUPLEX RECEPTACLE MOUNTED ABOVE COUNTER OR AT 44" AFF UNO.
	SPECIAL RECEPTACLE - TYPE AS NOTED ON THE DRAWINGS. MOUNT 18"AFF UNO
F	FIRE ALARM SYSTEM MANUAL PULL STATION MOUNTED AT 48" AFF.
F	FIRE ALARM SYSTEM AUDIO VISUAL ALARM SIGNALING DEVICE, WALL MOUNTED.
HD	FIRE ALARM SYSTEM HEAT DETECTOR
SD	FIRE ALARM SYSTEM SMOKE DETECTOR
TS	FIRE ALARM SYSTEM TAMPER SWITCH
D	FIRE ALARM SYSTEM DUCT SMOKE DETECTOR
LB	TYPE 'LB' CONDULET
M	MOTION SENSOR LIGHT SWITCH WITH OFF POSITION. MOUNT AT 48" AFF.
	MULTIPLE USE FLUSH FLOOR BOX WITH ONE DUPLEX RECEPTACLE AND THREE COMPARTMENTS FOR DATA JACKS. SEE SPECIFICATIONS.
EC	EMPTY CONDUIT USED BY OTHER SECTION OF THE SPECIFICATIONS
— —XEG— —	EXISTING GROUND CONDUCTOR THAT IS TO BE DEMOLISHED.
— — EG — —	EXISTING GROUND CONDUCTOR THAT IS TO REMAIN.
— — G — —	NEW GROUND CONDUCTOR.
	CONNECTION OF TWO DIFFERENT GROUND CONDUCTORS (PATHS), BY AN EXOTHERMIC PROCESS.
OS	DUAL TECHNOLOGY OCCUPANCY SENSOR TO CONTROL LIGHTS. SEE DETAIL 1/E502.
PP	OCCUPANCY SENSOR CONTROLLED POWER PAK THAT CONTROLS LIGHT FIXTURES. SEE DETAIL 1/E502.

LIGHT FIXTURE SCHEDULE

AB	RECESSED, LAY-IN 2x4 FLUORESCENT FIXTURE WITH TWO 32 WATT, T8 LAMPS AND 0.156", #19 PATTERN ACRYLIC LENS. (61 WATTS).
AC	RECESSED, WET LOCATION LAY-IN FIXTURE WITH TWO 32 WATT, T8 LAMPS. (61 WATTS).
B	STEM MOUNTED FLUORESCENT FIXTURE WITH TWO 32 WATT, T8 LAMPS AND A-12 ACRYLIC LENS. MOUNT ON TWO STEMS WITH SWIVEL ALIGNERS. (61 WATTS).
B2	CHAIN HUNG, STRIP FIXTURE WITH 10% UPLIGHT REFLECTOR. MOUNT FIXTURE AT 8'-0" ABOVE FLOOR. FIXTURE TO HAVE TWO 32 WATT, T8 LAMPS. (61 WATTS).
D	RECESSED LAY-IN, DEEP CELL PARABOLIC FIXTURE WITH TWO 32 WATT LAMPS. (61 WATTS).
FA2	FOUR FOOT LONG, 6" WIDE RECESSED FLUORESCENT FIXTURE WITH DEEP REGRESSED 1/4" THICK FROSTED ACRYLIC LENS. FIXTURE SHALL MATCH LIKE FIXTURES IN ADJACENT AREA. FIXTURE TO HAVE TWO 32 WATT T8 LAMPS. FIXTURE SHALL EXACTLY MATCH EXISTING FIXTURES IN CLOSE PROXIMITY OR SIMILAR SITUATIONS. (61 WATTS).
FA7	RECESSED SINGLE LAMP 42 WATT, COMPACT FLUORESCENT DOWNLIGHT WITH 7 INCH APPERATURE.
FA7A	RECESSED SINGLE LAMP 42 WATT COMPACT FLUORESCENT LENS TYPE WALL WASHER WITH 7 INCH APERTURE. THIS FIXTURE SHALL BE THE SAME MANUFACTURE AND AND FAMILY AS TYPE 'FA7' LIGHT FIXTURES.
FA11	CONTINUOUS FLUORESCENT WALL WASHER WITH STAGGERED LAMPS. WITH TWO 32 WATT T8 LAMPS. FIXTURE SHALL EXACTLY MATCH EXISTING FIXTURES IN CLOSE PROXIMITY OR SIMILAR SITUATIONS. (61 WATTS)
FA23C	CONTINUOUS RUN OF LINEAR FLUORESCENT FIXTURES. NOMINAL FIXTURE SHALL BE AN 8 FOOT FIXTURE WITH TWO 28 WATT (F28T5) T5 LAMPS AND ONE BALLAST. PROVIDE VARIOUS OTHER LENGTHS OF FIXTURES TO FINISH THE OVERALL LENGTH OF THE RIM. REFLECTOR AIMING SHALL BE ADJUSTABLE WITH SCREWS TO LOCK REFLECTOR IN DESIRED POSITION. JOINER SCREWS SHALL ALLOW ADJACENT REFLECTORS TO BE LOCKED TOGETHER. REFLECTOR SHALL HAVE TWO PARABOLIC SECTIONS AND AN ELLIPTICAL SECTION TO DIRECT LIGHT OUTPUT. THE UPPER PARABOLIC REFLECTOR SHALL EXTEND THREE AND THREE QUARTERS OF AN INCH FROM THE BACK OF THE FIXTURE. FIXTURE SHALL BE MADE OF ALUMINUM AND STAINLESS STEEL. CONTRACTOR SHALL PROVIDE CONTINUOUS HEAVY METAL CHANNEL TO MOUNT THE FA23C FIXTURES SO AS TO KEEP THE ROW IN PERFECT ALIGNMENT. CONTRACTOR SHALL DO FINAL AIMING OF FIXTURE IN THE PRESENCE OF THE ARCHITECT. SEE DETAIL 9 ON E001 FOR MOUNTING.
FD12	FOUR FOOT LONG, 6" WIDE RECESSED FLUORESCENT FIXTURE WITH DEEP REGRESSED 1/4" THICK FROSTED ACRYLIC LENS. FIXTURE SHALL MATCH LIKE FIXTURES IN ADJACENT AREA. FIXTURE TO HAVE TWO 32 WATT T8 LAMPS. FIXTURE SHALL EXACTLY MATCH EXISTING FIXTURES IN CLOSE PROXIMITY OR SIMILAR SITUATIONS. (61 WATTS)
FD12A	THREE FOOT LONG, 6" WIDE RECESSED FLUORESCENT FIXTURE WITH DEEP REGRESSED 1/4" THICK FROSTED ACRYLIC LENS. FIXTURE SHALL MATCH LIKE FIXTURES IN ADJACENT AREAS. FIXTURE TO HAVE TWO 25 WATT T8 LAMPS. FIXTURE SHALL EXACTLY MATCH EXISTING FIXTURES IN CLOSE PROXIMITY OR SIMILAR SITUATIONS. (44 WATTS).
H	WALL MOUNTED FLUORESCENT FIXTURE WITH TWO 32 T8 LAMPS. MOUNT WITH FIXTURE 8'-0" ABOVE FLOOR (STEP) AT CENTER OF FIXTURE. FIXTURE TO HAVE WRAP AROUND PRISMATIC ACRYLIC REFRACTOR THAT PROVIDEDS A 180 DEGREE UNIFORM LIGHT DISTRIBUTION. (61 WATTS)
L	STEM MOUNTED FLUORESCENT FIXTURE WITH FOUR STEMS AND WITH EIGHT FOUR FOOT T5 LAMPS. COLD TEMPERATURE ELECTRONIC BALLASTS AND SPECULAR SILVER REFLECTORS.
P	PIT LIGHT - WALL MOUNTED NON-METALLIC COMPACT FLUORESCENT FIXTURE WITH 26 WATT LAMP, AND PRISMATIC, POLYCARBONATE GLASS GLOBE. THIS FIXTURE IS 120 VOLTS.
R	EXISTING LIGHT FIXTURE THAT IS TO REMAIN IN USE. RECIRCUIT AS INDICATED.
W1	175 WATT METAL HALIDE WALL PACK WITH SHARP CUT OFF. (210 WATTS) AT ZERO DEGREES, THE LAMP SHALL BE CONCEALED BY THE FIXTURE HOUSING AT A HORIZONTAL VIEWING ANGLE. MOUNT AS SHOWN ON ARCHITECTURAL ELEVATIONS.
W2	70 WATT METAL HALIDE WALL PACK WITH SHARP CUT OFF. (95 WATTS) AT ZERO DEGREES, THE LAMP SHALL BE CONCEALED BY THE FIXTURE HOUSING AT A HORIZONTAL VIEWING ANGLE. ARCHITECTURAL ELEVATIONS.
	LED EDGE LIT EXIT SIGN, COLOR OF LETTERS SHALL MATCH EXISTING EXIT SIGNS EXACTLY.

LIGHT FIXTURE SCHEDULE NOTES

1) ALL FLUORESCENT BALLASTS SHALL BE PROGRAM START ELECTRONIC BALLASTS.

2) EVERY FIXTURE THAT IS ON AN EMERGENCY CIRCUIT SHALL HAVE AN INTERNAL FAST BLOW FUSE.

3) ALL LIGHT FIXTURES SHALL BE COMPATIBLE WITH THE CEILING MATERIAL THEY ARE MOUNTED IN. CONTRACTOR SHALL SEE THE ARCHITECTURAL DRAWINGS TO WHAT THE CEILING SYSTEM OR CEILING MATERIAL IS IN ORDER TO PROVIDE THE CORRECT TYPE LIGHT FIXTURE.

4) ALL FIXTURES SHALL MEET ASHRAE 90.1 REQUIREMENTS FOR TANDEM WIRING. PROVIDE NEW BALLASTS IN EXISTING LIGHT FIXTURES THAT ARE TO REMAIN WHEN BALLASTS ARE IN A DEMOLISHED FIXTURE.

5) ALL FLUORESCENT LAMPS SHALL HAVE 3,700 DEGREE KELVIN LAMPS.

6) IF TWO FLUORESCENT FIXTUES ARE TANDEM WIRED WITH ONE BALLAST AND ONE OF THE FIXTURES IS BEING REMOVED, PROVIDE A NEW TWO LAMP BALLAST IN THE REMAINING FIXTURE THAT WAS PREVIOUSLY TANDEM WIRED.

7) THE ELECTRICAL SUB-CONTRACTOR SHALL PROVIDE ALL BLOCKING OR MISCELLANEOUS METAL NEEDED TO RIGIDLY AND SECURELY MOUNT ALL WALL AND CEILING MOUNTED LIGHT FIXTURES.

GENERAL NOTES:

1) GENERAL NOTES APPLY TO ALL ELECTRICAL DRAWINGS UNLESS NOTED OTHERWISE. LEGEND NOTES ARE INDICATED BY A LETTER (NOTE: a, NOTE: b, ETC.) AND APPLY ONLY TO THE DRAWING ON WHICH THEY APPEAR.

2) COORDINATE ALL PIPING, DUCTWORK, CONDUIT ROUTING AND LIGHT FIXTURE LOCATIONS WITH ALL TRADES FOR PROPER CLEARANCE OF STRUCTURE AND SUSPENDED CEILINGS.

3) OUTLETS WHICH ARE NOTED FOR A PARTICULAR PIECE OF EQUIPMENT ARE SO NOTED IN ORDER THAT THE CONTRACTOR CAN COORDINATE THE LOCATION OF THE OUTLET WITH CONNECTING LOCATION OF THE EQUIPMENT. THE RESPONSIBILITY FOR THIS COORDINATION SHALL BE THE CONTRACTOR'S. SEE SHOP DRAWINGS FROM ALL OTHER SECTIONS OF THE SPECIFICATIONS TO ACCOMPLISH THIS COORDINATION.

4) DIMENSION BESIDE OUTLET INDICATES MOUNTING HEIGHT (FROM FINISHED FLOOR TO CENTER OF OUTLET).

5) CROSS MARKS ON RACEWAY INDICATES THE NUMBER OR CONDUCTORS REQUIRED IN THE RACEWAY. NO CROSS MARKS INDICATE TWO CONDUCTORS. SEE SPECIFICATIONS FOR REQUIREMENTS FOR EQUIPMENT GROUNDING CONDUCTORS. THEY ARE NOT INDICATED BY HASHMARKS. ALL CIRCUITS ABOVE 32 VOLTS MUST HAVE A COPPER EQUIPMENT GROUNDING CONDUCTOR INSTALLED WITH THE CIRCUIT.

6) SEE ARCHITECTURAL REFLECTED CEILING PLAN FOR LOCATION OF ITEMS MOUNTED IN CEILING. THE REFLECTED CEILING PLANS TAKE PRECEDENCE OVER THE ELECTRICAL PLANS FOR LOCATING EQUIPMENT.

7) AFTER ALL CONSTRUCTION IS COMPLETED AND BEFORE THE FINAL INSPECTION. THE CONTRACTOR SHALL CHECK THE OPERATION OF EVERY, DEVICE AND GIVE THE ARCHITECT A LIST OF DEVICES THAT DO NOT OPERATE PROPERLY.

8) TYPICALLY, MOUNT THE LIGHT SWITCH OR THE FIRST SWITCH IN A BANK OF SWITCHES TWO OR THREE INCHES FROM THE EDGE OF THE DOOR FRAME. DO NOT SCALE THE DRAWINGS TO DETERMINE THE LOCATION OF THE LIGHT SWITCHES.

9) A NUMBER BESIDE CROSS MARKS INDICATES THE AWG SIZE WIRE REQUIRED IN THE RACEWAY. EXAMPLE: = 3#6 AWG., NO NUMBER INDICATES #12 AWG. NO CROSS MARKS INDICATES 2 CONDUCTORS, PLUS GROUNDING CONDUCTOR. EQUIPMENT GROUNDING CONDUCTORS ARE NOT INDICATED BY HASHMARKS. AN ISOLATED GROUND CONDUCTOR IS SHOWN AS A LONG HASH MARK WITH A SMALL TICK MARK ON ONE END.

10) EVERY EMPTY CONDUIT NEW AND EXISTING SHALL HAVE A PULL STRING OR PULL WIRE. THIS PULL STRING SHALL BE AT MINIMUM 200 POUND POLYLINE. THERE SHALL BE AT LEAST 18" OF EXTRA LINE AT EACH CONDUIT TERMINATION POINT. THE PULL WIRE OR STRING BE SECURELY FASTENED TO AN OBJECT ON EACH END SO THAT IT CAN NOT BE PULLED INTO THE CONDUIT WITHOUT FIRST BEING UNFASTENED. PROVIDE A DISTINCTIVELY NUMBERED HARD PLASTIC TAG ON EACH END OF EACH PULL STRING THAT STATES WHERE THE OTHER END OF THE CONDUIT TERMINATES AND WILL KEEP THE PULL STRING FROM BEING ACCIDENTLY PULLED INTO THE CONDUIT. PROVIDE 18" SLACK STRING OUT SIDE THE CONDUIT ON EACH END.

11) TERMINATE ALL EMPTY CONDUITS WITH A SMOOTH BUSHING.

12) CONTRACTOR SHALL PROVIDE A 20 AMP, 120 VOLT CIRCUIT TO EVERY CONTROL PANEL DDC, OR POWER SUPPLY PROVIDED BY ANY SECTION OF THE SPECIFICATIONS. CIRCUIT TO BE (2#12 & 1#12G-3/4"C) FROM A SPARE CIRCUIT BREAKER. PROVIDE A TAG ON THE CONTROL PANEL THAT TELLS WHAT BRANCH CIRCUIT FEEDS THE CONTROL PANEL.

13). ANY EQUIPMENT THAT IS LOCATED OUTSIDE A BUILDING OR CONDITIONED SPACE SHALL BE EITHER DAMP LOCATION LABELED OR WET LOCATION LABELED, AS THE LOCATION DICTATES.

14). THE CONTRACTOR SHALL FILL OUT THE PANELBOARD SCHEDULE IN EACH PANELBOARD WITH THE DEGREE OF DETAIL THAT WILL MEET THE REQUIREMENTS OF N.F.P.A. 70, SECTION 408.4. THIS APPLIES TO NEW AND EXISTING PANELBOARDS.

15). THERE SHALL BE NO SHARED NEUTRALS. EVERY CIRCUIT SHALL HAVE A SEPARATE NEUTRAL.

16). SET THE DELAY OFF TIME ON ALL MOTION SENSORS AS DIRECTED BY THE DEPARTMENT OF AVIATION.

17). THE MINIMUM WIRE SIZE FOR ANY CONDUCTORS SHALL # 12 AWG. ALL CONDUCTORS SHALL BE COPPER.

18). THE MINIMUM CONDUIT SIZE SHALL BE 3/4".

19). IF THERE IS A CONFLICT WITHIN THESE DRAWINGS OR BETWEEN THESE DRAWINGS AND THE SPECIFICATIONS, THE GREATER OR MORE STRIGENT REQUIREMENT SHALL BE MET.

20). IF THERE IS A CONFLICT BETWEEN THESE DOCUMENTS AND CODE, THE CODE REQUIREMENTS SHALL BE MET.

21) TYPICAL FLOOR SLAB HAS MAIN REINFORCING STEEL RUNNING TRANSVERSE TO THE POST TENSIONED BEAMS/JOIST AND TEMPERATURE REINFORCING STEEL LONGITUDINAL TO THE MEMBERS. ALL PENETRATIONS OF EXISTING CONCRETE FLOOR, WALLS AND CEILING REQUIRE AUTHORIZATION BY THE DEPARTMENT OF AVIATION. (DOA).

THE CONTRACTOR MUST SCAN THE EXISITNG CONCRETE SLAB WITHINTHE LIMITS OF HE PROPOSED CORE HOLE OR PENETRATION LOCATION USING APPROVED GROUND PENETRATING RADAR SYSTEM OR OTHER APPROVED SYSTEM UNDERTAKEN BY A CERTIFIED OPERATOR AND MAP THE AREA TO BE CORED A MINIMUM OF 1'-0" FROM THE EDGE OF THE CORE HOLE LOCATING REINFORCING STEEL CONFIGURATION, ANY EMBEDDED CONDUITS AND POST TENSIONING STRANDS. USE COLORED TAPE TO MARK THEIR LOCATION ON THE CONCRETE SLAB. WHITE WASHABLE CRAYON OR SOAPSTONE IS ACCEPTABLE. SEE OTHER SECTIONS OF THE SPECIFICATIONS FOR ADDITIONAL REQUIREMENT BEFORE ANY SLAB CAN BE PENETRATED.

22) ELECTRICAL CONTRACTOR SHALL PROVIDE GALVANIZED ANGLE IRON TO RIGIDLY SUPPORT WALL AND OVERHEAD MOUNTED ELECTRICAL EQUIPMENT. MOUNT ANGLE IRON CONCEALED BEHIND WALL SKIN OR ABOVE A CEILING WHERE POSSIBLE.

23) ATLANTA AIRLINES TERMINAL CORPORATION (AATC) ENGINEERING MUST GET A 72 HOUR PRIOR NOTIFICATION FROM THE CONTRACTOR FOR TIE INS/SERVICE INTERRUPTIONS TO ANY PART OF THE FIRE ALARM SYSTEM, ELECTRICAL PANELS, SWITCHBOARDS, AND HVAC EQUIPMENT AND FOR ROOF ACCESS AND FOR FLOOR CORING. THESE ACTIVITIES CAN OCCUR ONLY BETWEEN 11:00 PM AND 5:00 AM. CONTRACTOR MUST GET CONFIRMATION FROM AATC BEFORE ANY OF THESE ACTIVITIES ARE ALLOWED TO OCCUR. FORMS CAN BE LOCATED AT HTTP://WWW.AATC.ORG.

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TASK ORDER No. : 001

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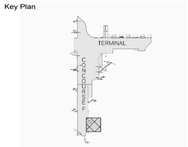
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

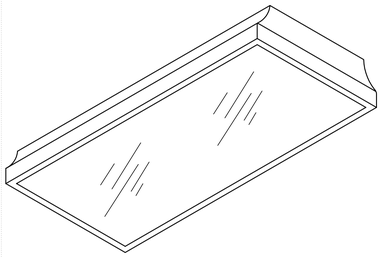
Sheet Title

ELECTRICAL SYMBOL LEGEND, LIGHT FIXTURE SCHEDULE & GENERAL NOTES

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

E000



1 LIGHTING DETAILS - ELECTRICAL LIGHTING TEMPLATE 'AC'
N.T.S.

SPECIFICATION AND FEATURES:

GENERAL ILLUMINATION FOR INDOOR AND OUTDOOR COVERED-CEILING LOCATIONS. IDEAL FOR SHOWERS LOCKER ROOMS, RECREATIONAL FACILITIES AND OTHER APPLICATIONS CALLING FOR A WET LOCATION LISTING.

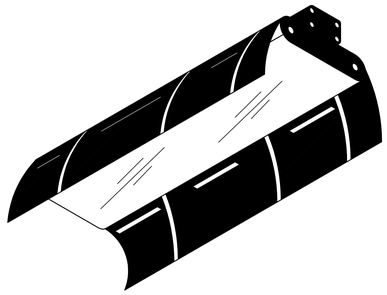
CODE GAUGE STEEL HOUSING, ALL METAL PARTS ARE FINISHED WITH ELECTROSTATICALLY DEPOSITED, THERMALLY SET POLYESTER POWDER PAINT AFTER FABRICATION.

AVAILABLE FOR GRID OR FLANGE CEILING TYPES.

CLOSED-CELL NEOPRENE GASKETING BETWEEN THE LENS, DOOR FRAME, HOUSING AND MOUNTING SURFACE.

EXTRUDED ALUMINUM DOOR FRAME FEATURES MINTERED CORNERS.

UL LISTED (STANDARD). UL LISTED FOR WET LOCATIONS FOR COVERED-CEILING APPLICATIONS
FIXTURE SHALL HAVE A 0.155 INCH THICK ACRYLIC LENS, A19 PATTERN, WITH TWO 32 WATT T8 LAMPS.



2 LIGHTING DETAILS - ELECTRICAL LIGHTING TEMPLATE 'B2'
N.T.S.

SPECIFICATIONS AND FEATURES:

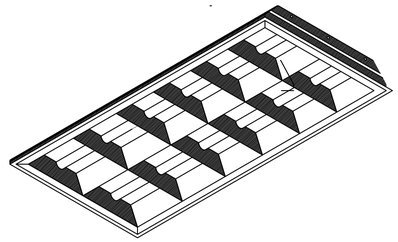
SOLID TOP 10% UPLIGHT OR 10% UPLIGHT REFLECTOR IS DIE EMBOSSED, CONSTRUCTED OF HEAVY GAUGE COLD ROLLED STEEL AND PAINTED AFTER FABRICATION BAKED WHITE ENAMEL FINISH STANDARD, PORCELAIN AVAILABLE. PRESSURE - LOCK LAMP HOLDERS ENCLOSED IN A SNAP TURRET HOUSING HOUSING.

BALLAST - THERMALY PROTECTED, RESETTING, CLASS P, HPF, NON-PCB UL LISTED CSA CERTIFIED BALLAST STANDARD, SOUND RATING DEPENDS ON LAMP BALLAST COMBINATION.

WIRING AND ELECTRICAL - AWM, TFN AND THHN WIRE USED THROUGHOUT, RATED FOR REQUIRED TEMPERATURE.

MOUNTING - FOR UNIT OR ROW INSTALLATIONS, SURFACE OR SUSPENDED MOUNTING.

TWO 32 WATT T8 LAMPS.



3 LIGHTING DETAILS - ELECTRICAL LIGHTING TEMPLATE 'D'
N.T.S.

SPECIFICATIONS AND FEATURES:

ATTRIBUTES: DESIGNED AND OPTIMIZED FOR USE WITH CEE (CONSORTIUM FOR ENERGY EFFICIENCY) QUALIFIED, HIGH-LUMEN T8 LAMPS AND ENERGY-EFFICIENT ELECTRONIC BALLAST.

HIGHLY REFLECTIVE SURFACES COMBINE WITH EFFICIENT DESIGN TO PRODUCE UP TO 86% PHOTOMETRIC EFFICIENCY AND LUMINARE EFFICIENCY RATING (LER) OF UP TO 86 USING LISTED LAMPS AND BALLAST.

CONSTRUCTION: ROBUST DESIGN, PRECISION-TOOLING AND AUTOMATED ASSEMBLY COMBINE TO CREATE THE INDUSTRY'S STRONGEST LOUVER. ROTARY SOCKETS PROVIDE FOR SIMPLE LAMP INSERTION AND POSITIVE ENGAGMENT INTO LAMP CONTACTS. MECHAICAL LIGHT SEAL REQUIRES NO FOAM GASKETING. INTERGRAL T-BAR CLIPS SECURE FIXTURE TO T-BAR SYSTEM. HOUSING FORMED OF COLD ROLLED STEEL.

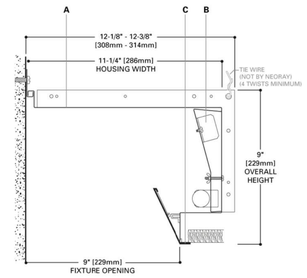
FINISH: FIVE-STAGE IRON-PHOSPHATE PRE TREATMENT ENSURES SUPERIOR PAINT ADHESION AND RUST RESISTANCE. HOUSING PAINTED AFTER FABRIICATION WITH ENVIRONMENTALLY FRIENDLY, HIGH GLOSS, VERY HIGH REFLECTIVITY POLYESTER POWDER COAT.

OPTICAL: MECHANICAL SHIELDING IS PROVIDED WITH ANGLED LENGHT BLADES, AND LINEAR FACETED CROSS BAFFLES. CONTOURED HOUSING EFFICIENTLY DIRECTS LIGHT DOWNWARD. LAMP CUT-OUT MAXIMIZE SHIELDING EVEN IN SHALLOW PLENUM APPLCATIONS AND SOFTENS LIGHT DISTRIBUTION TO DELIVER A BALANCED AMOUNT OF LIGHT TO BOTH VERTICAL AND HORIZINTAL SURFACES. THE FIXTURE SHALL MEET IES RP-1 MINIMUM LUMINANCE CRITERIA FOR VDT APPLICATIONS.

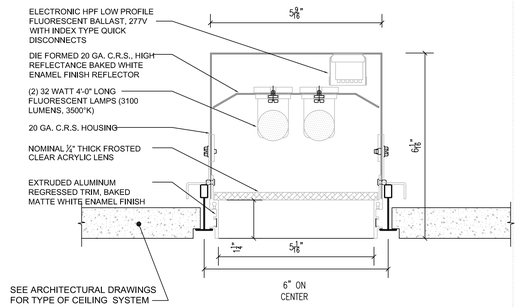
ELECRICAL SYSTEMS: STANDARD BALLAST IS HIGH-EFFICIENCY, CEE QUALIFIED, PROGRAM-START,<10% THD, UNIVERSAL VOLTAGE AND SOUND RATED A.

LISTING: STANDARD UL

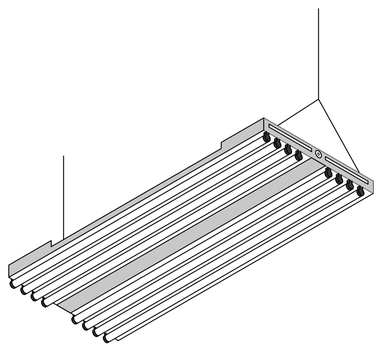
LOUVER: SHALL BE 4 INCH DEEP WITH 16 CELLS AND SHALL BE SEMI-SPECULAR.



6 LIGHTING DETAILS - ELECTRICAL LIGHTING TEMPLATE 'FA11'
N.T.S.



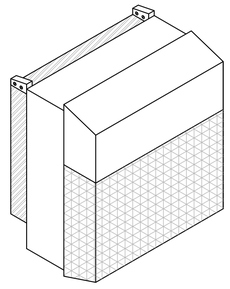
7 LIGHTING DETAILS - ELECTRICAL LIGHTING FIXTURE FA2, FD12 & FD12A
N.T.S.



4 LIGHTING DETAILS - ELECTRICAL LIGHTING TEMPLATE 'AB'
N.T.S.

SPECIFICATION AND FEATURES:

SAME AS TYPE 'AC' BUT WITHOUT A UL WET LOCATION LABEL.



5 LIGHTING DETAILS - ELECTRICAL LIGHTING TEMPLATE 'L'
N.T.S.

SPECIFICATIONS AND FEATURES:

COSTRUCTION: CODE GAUGE STEEL CONSTRUCTION FOR A DURABLE CONSTRUCTION TO WITHSTAND SHIPPING AND JOB SITE HANDLING. END CAPS INCLUDE HEMMED EDGES FOR EASE OF HANDLING. FIX TURE INCLUDES EASY ACCESS TO ELECTRICAL COMPONENTS VIA REMOVAL CHANNEL COVER TOOL-LESS ACCESS WITH ONE ONE-QUARTER-TURN FASTENER. OVERSIZED ACCESS PLATE CONVEMIENTLY MOUNTED ON BACK OF CHANNEL FOR EASY ACCESS TO WIRING COMPARTMENT.

REFLECTOR: YOUR CHOICE OF MULTI-FACETED SPECULAR ALUMINUM WHICH PROVIDES PRECISE CONTROL FOR ABLE LIGHTING OR HIGH MOUNTING HEIGHTS OR WHITE ALUMINUM FOR GENERAL AREA OR LOWER MOUNTING HEIGHTS INCLUDES A 25 YEAR WARRANTY REFLECTOR WARRANTY. REFLECTORS SRE AVAILABLE IN SOLID TOP OR WITH UPRIGHT COMPONENT. REFLECTORS ARE SECURELY MONTED TO FIXTURE HOUSING WITH SCREWS.REFLECTOR REMOVAL IS NOT REQUIRED TO GAIN ACCESS TO ELECTRICAL COMPONENTS.

PERFORMANCE: WITH AN OPTICAL SYSTEM CUSTOM DESIGNED FOR MAXIMUM PERFORMANCE WHEN USING T5HO LAMPS VERSABAY PROVIDES EXCELLENT DISTRIBUTION WITH FIXTURE EFFICIENCIES IN EXCESS OF 99% AND SPACING CRITERIA OF 0.8 FOR NARROW DISTRIBUTION, AND 1.3 FOR WIDE DISTRIBUTION.

BALLAST AND ELECTRICAL: ENERGY EFFICIENT ELECTRONIC, THERMALLY PROTECTED, CLASS - P, HPF NON-PCB, SOUND RATED A BALLAST, UL LISTED WIRE USED THROUGHOUT ROTARY ANTI-VIBRATION SOCKETS REDUCE LAMP DISCONNECT DUE TO VIBRATION OR INCIDENTAL CONTACT.

FINISH: STEEL SURFACE ARE PAINTED WITH HIGH GLOSS BAKED WHITE ENAMEL, APPLIED OVER IRON PHOSPHATE PRE-TREATMENT FOR MAXIMUM ADHESION AND RUST RESISTANCE.

MOUNTING: FIXTURE TO BE SUSPENDED 6" FROM SOLID SURFACE. MOUNTING OPTIONS INCLUDE AIRCRAFT CABLE, TONG HANGER, PIPE HANGER OR CHAIN.

CERTIFICATION: FIXTURE BEAR UL DAMP LOCATION LISTING FOR 65C. CSA CERTIFICATION AVAILABLE, USEE SUFFIX CSA.

8 LIGHTING DETAILS - ELECTRICAL LIGHTING TEMPLATE 'W1'
N.T.S.

SPECIFICATIONS AND FEATURES:

CONSTRUCTION: LOW COPPER CONTENT DIE CAST ALUMINUM HOUSING PROVIDE BASE CORROSION PROTECTED. SINGLE, LATCH MECHANISM FOR TOOL-LESS RELAMPING. CONCEALED HINGES. THE EFFECTIVE PROJECTED AREA (EPA) SHALL NOT EXCEED 2.08 SQUARE FEET.

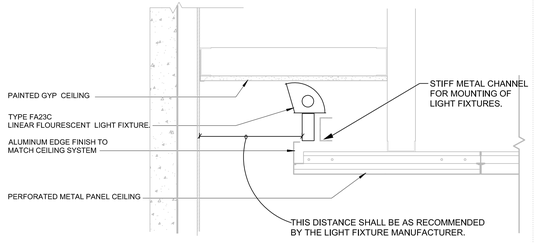
FINISH: ELECTROSTATICALLY APPLIED AND BAKED ON POLYESTER POWDER COAT PAINT FOR SUPERIOR CORROSION RESISTANCE.

OPTICAL SYSTEM: FULLY PRIMATIC, LOW GLARE BOROSILICATE GLASS REFRACTOR THAT IS NON-YELLOWING AND RESISTS ENVIRONMENTAL CONTAMINATION, FLUTED SPECULAR ALUMINUM INNER REFRACTOR.

ELECTRICAL SYSTEM: HOLOPHANE MANUFACTURED HIGH POWER FACTOR, COPPER WOUND BALLAST THAT PROVIDES FULL RATED WATTAGE TO THE LAMP . RELIABLE STARTING TO -40°F. A INOPERATIVE OR MISSING LAMP AND AUTOMATICALLY REMOVES ITSELF FROM THE FROM THE CIRCUT, PREVENTING DAMAGE TO THE BALLAST. A UNITIZED ASSEMBLY WITH QUICK DISCONNECTS FOR EASE OF MAINTENANCE IS AVAILABLE. LAMP SUPPORT IS PORCELAIN ENCLOSED SOCKET WITH NICKEL PLATED LAMP GRID SCREW SHELL.

INSTALLATION: WALL MOUNT WITH SURFACE WIRING OR MOUNT OVER STANDARD JUNCTION BOX. FIXTURE IS THRU-WIRE CAPABLE. POLE MOUNT WITH APPROPRIATE TENON ADAPTOR, A SUSPENSION BRACKET FOR MOUNTING THE FIXTURE FROM A HORIZONTAL SURFACE IS ALSO AVAILABLE.

LISTINGS: UL/CUL LISTED FOR WET LOCATIONS



9 LIGHTING DETAILS - MOUNTING DETAIL FOR FIXTURE TYPE 'FA23C'
N.T.S.

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A380 GATE F3 RECONFIGURATION
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CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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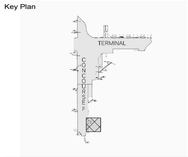
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

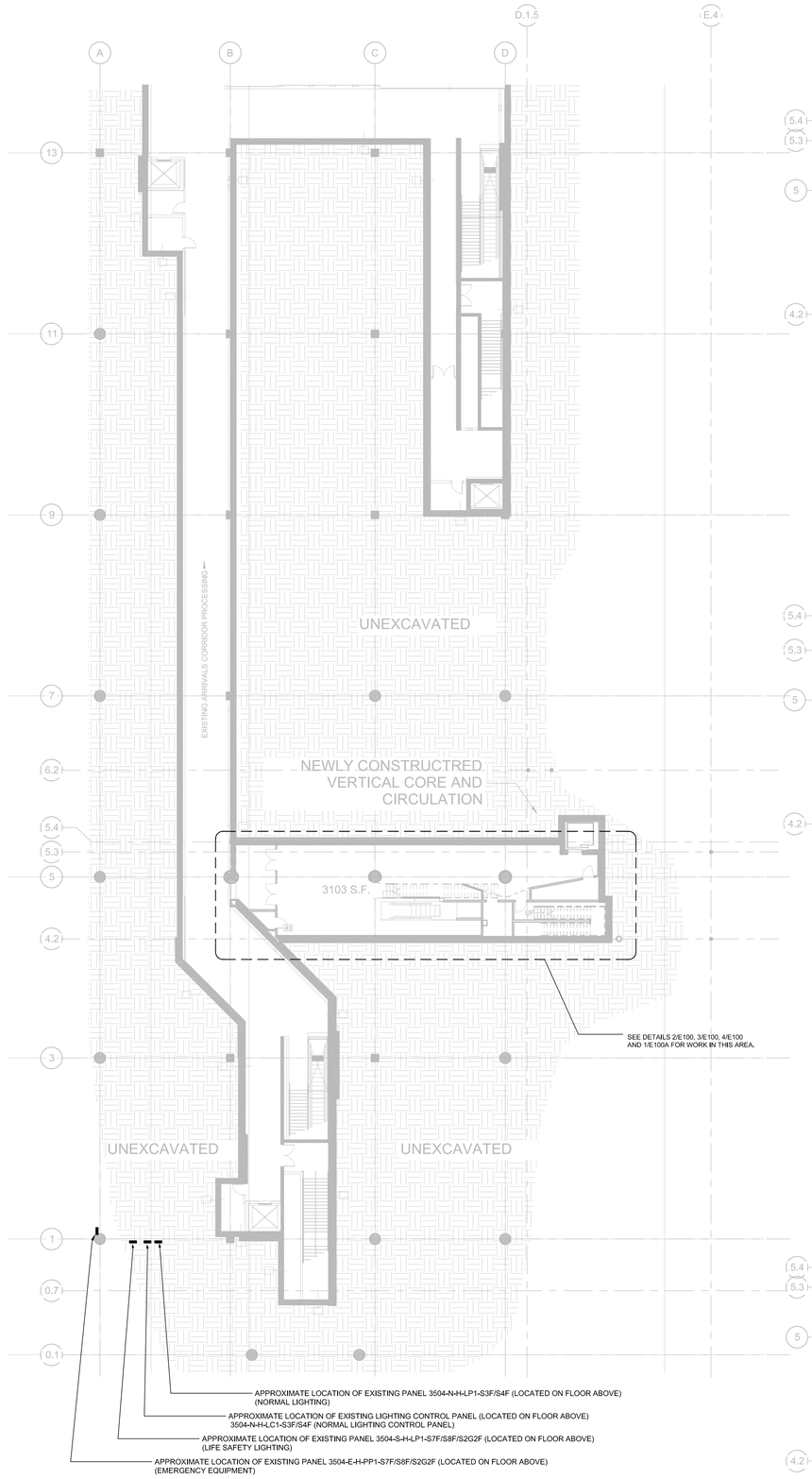
Sheet Title

ELECTRICAL LIGHT FIXTURE DETAILS

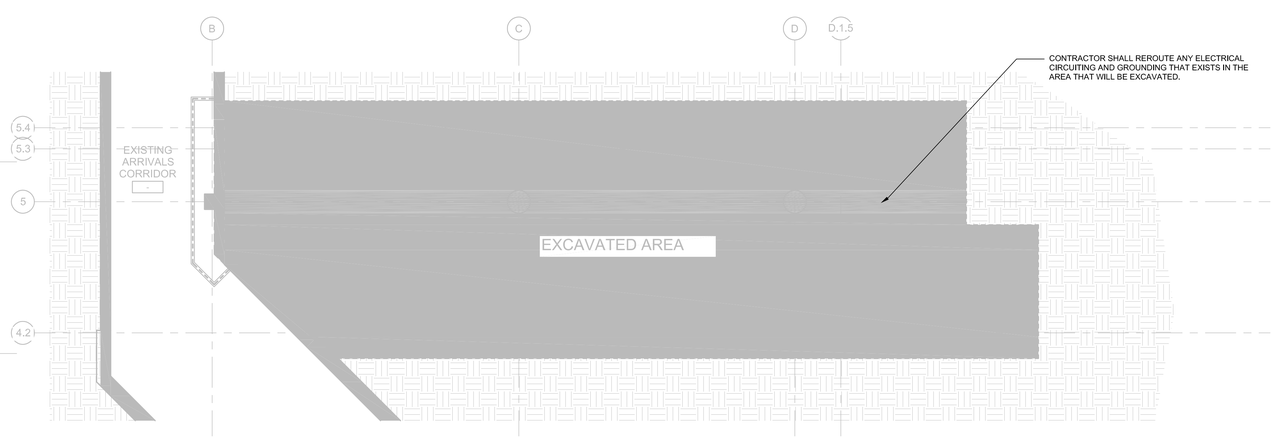
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

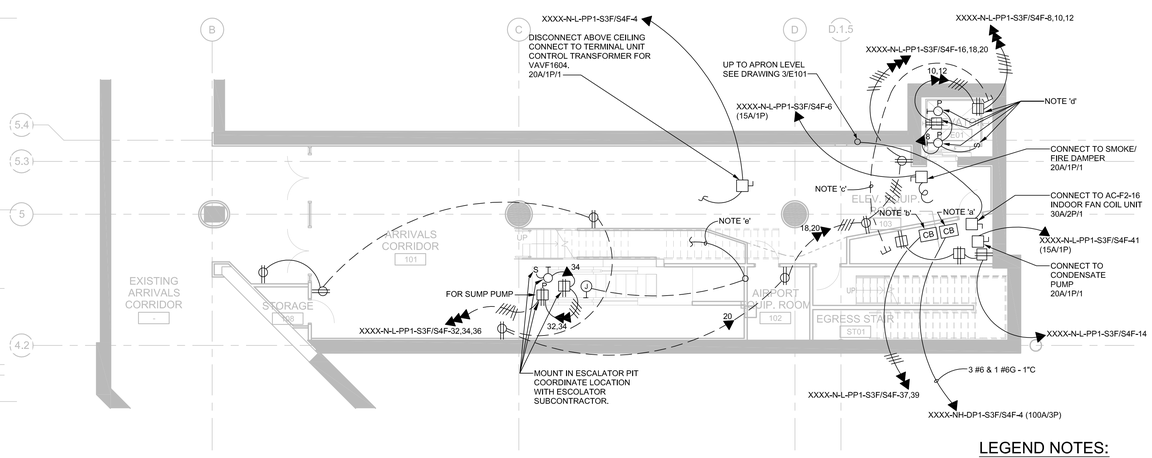
E001



1 OVERALL FLOOR PLAN - ARRIVALS LEVEL
1/16" = 1'-0"



2 ARRIVALS LEVEL - ELECTRICAL DEMO PLAN
1/8" = 1'-0"



3 ARRIVALS LEVEL - ELECTRICAL POWER PLAN
1/8" = 1'-0"

LEGEND NOTES:
(APPLY THIS SHEET ONLY)

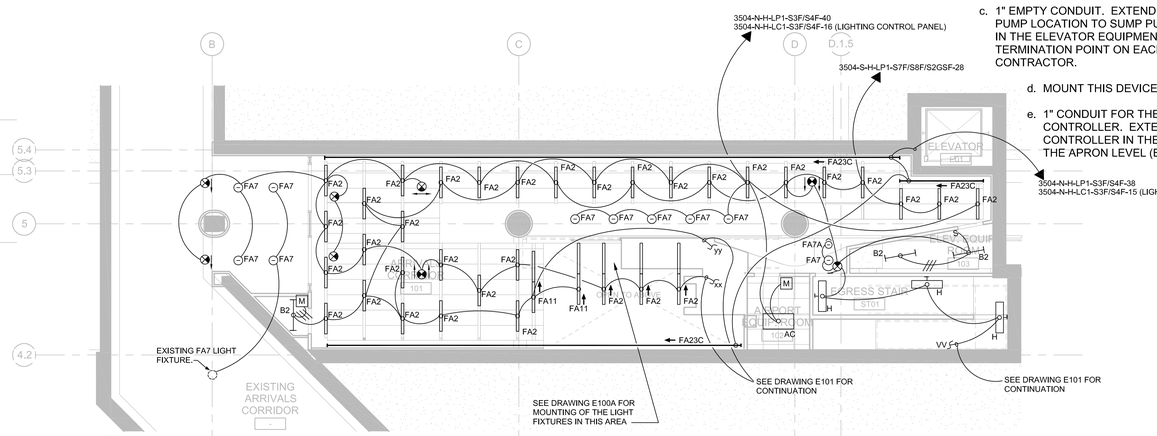
a. ENCLOSED SHUNT TRIP TYPE 100 AMP / 3 POLE CIRCUIT BREAKER THATSHALL BE CONNECTED TO THE ELEVATOR MOTOR/CONTROLLER. THE SHUNT TRIP FEATURE SHALL BE CONTROLLED BY HEAT DETECTORS IN THE ELEVATOR MACHINE ROOM AND IN THE ELEVATOR SHAFT. THE HEAT DETECTORS SHALL OPEN THE ENCLOSED SHUNT TRIP CIRCUIT BREAKER BEFORE ANY SPRINKLER HEAD PUTS WATER INTO EITHER THE ELEVATOR SHAFT OR THE ELEVATOR MACHINE ROOM. 30 HP MOTOR.

b. TWO 20A/1P ENCLOSED CIRCUIT BREAKERS THAT SHALL FEED THE ELEVATOR CAR. THE TWO CIRCUIT BREAKERS SHALL HAVE THE ABILITY TO BE CONNECTED WITH A TIE HANDLE. ONE CIRCUIT SHALL BE A SPARE.

c. 1" EMPTY CONDUIT. EXTEND FROM ELEVATOR SUMP PUMP LOCATION TO SUMP PUMP CONTROLLER LOCATION IN THE ELEVATOR EQUIPMENT ROOM. COORDINATE TERMINATION POINT ON EACH END WITH THE PLUMBING CONTRACTOR.

d. MOUNT THIS DEVICE AT 6'-0" AFF.

e. 1" CONDUIT FOR THE ESCALATOR SUMP PUMP CONTROLLER. EXTEND UP TO SUMP PUMP CONTROLLER IN THE JANITORIAL CLOSET ON THE APRON LEVEL (E101).



4 ARRIVALS LEVEL - ELECTRICAL LIGHTING PLAN
1/8" = 1'-0"

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Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p

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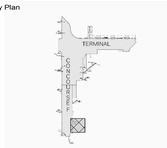
Key Plan



Professional Seals

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3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

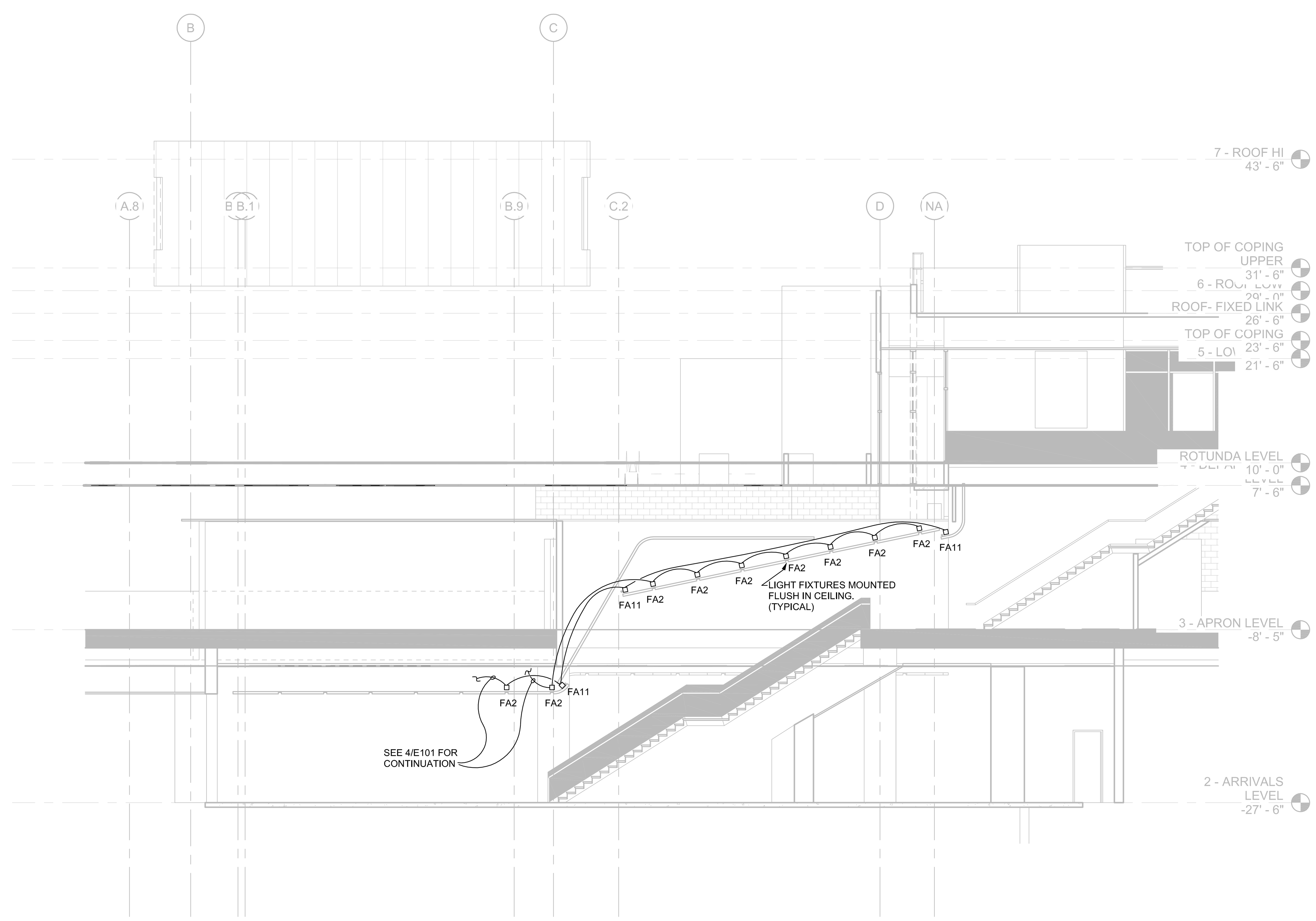
Sheet Title

ARRIVALS LEVEL: ELECTRICAL POWER, LIGHTING & DEMO PLANS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

E100



1 FLOOR PLAN - ARRIVALS/APRON LEVEL - ELECTRICAL LIGHTING SECTION

1/8" = 1'-0"

0 2 4 8 16 FT.

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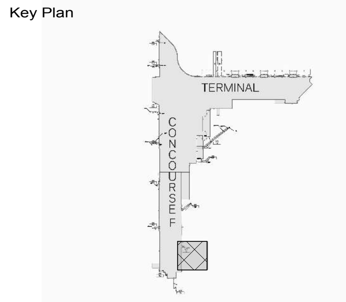
Key Plan



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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

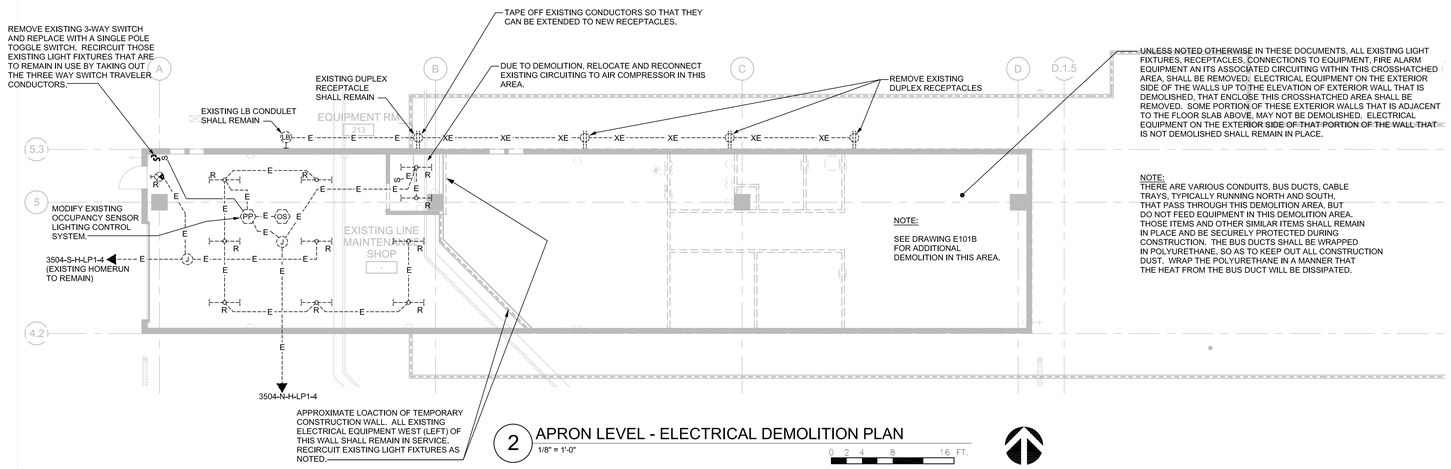
Sheet Title

ARRIVALS/ APRON LEVEL: ELECTRICAL LIGHTING PLAN - SECTION

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

E100A

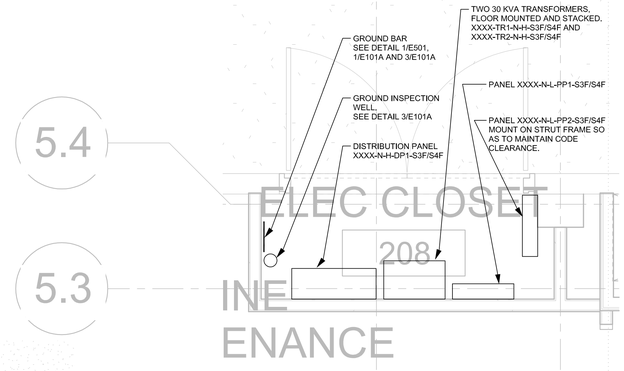


UNLESS NOTED OTHERWISE IN THESE DOCUMENTS, ALL EXISTING LIGHT FIXTURES, RECEPTACLES, CONNECTIONS TO EQUIPMENT, FIRE ALARM EQUIPMENT AN ITS ASSOCIATED CIRCUITING WITHIN THIS CROSSHATCHED AREA, SHALL BE REMOVED; ELECTRICAL EQUIPMENT ON THE EXTERIOR SIDE OF THE WALLS UP TO THE ELEVATION OF EXTERIOR WALL THAT IS DEMOLISHED, THAT ENCLOSE THIS CROSSHATCHED AREA SHALL BE REMOVED. SOME PORTION OF THESE EXTERIOR WALLS THAT IS ADJACENT TO THE FLOOR SLAB ABOVE, MAY NOT BE DEMOLISHED. ELECTRICAL EQUIPMENT ON THE EXTERIOR SIDE OF THAT PORTION OF THE WALL THAT IS NOT DEMOLISHED SHALL REMAIN IN PLACE.

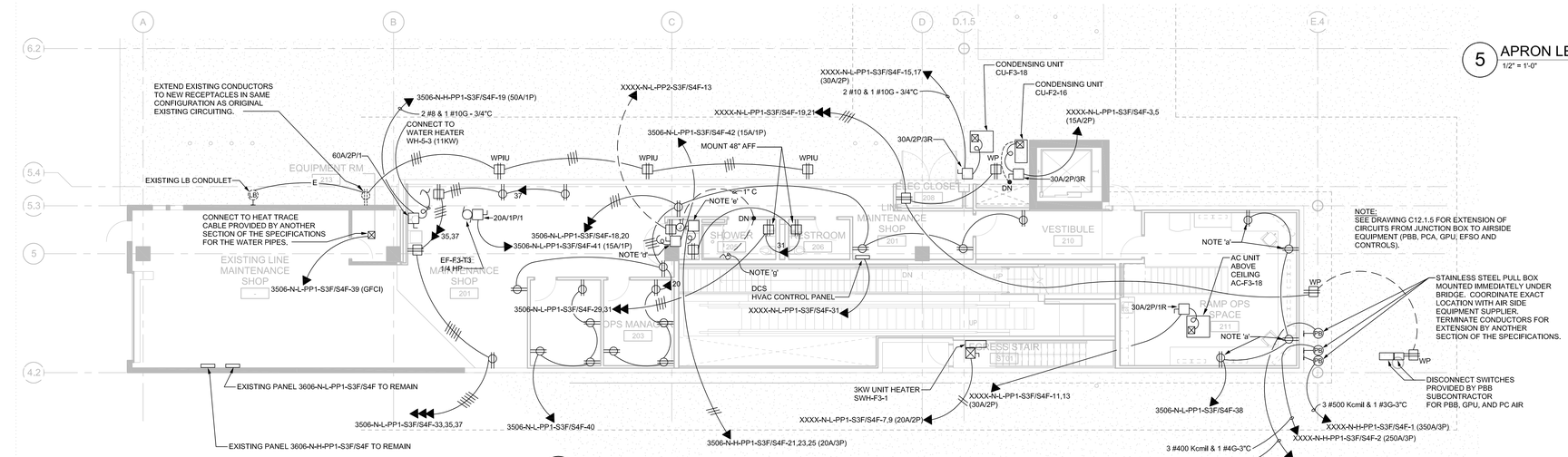
NOTE:
THERE ARE VARIOUS CONDUITS, BUS DUCTS, CABLE TRAYS, TYPICALLY RUNNING NORTH AND SOUTH, THAT PASS THROUGH THIS DEMOLITION AREA, BUT DO NOT FEED EQUIPMENT IN THIS DEMOLITION AREA. THOSE ITEMS AND OTHER SIMILAR ITEMS SHALL REMAIN IN PLACE AND BE SECURELY PROTECTED DURING CONSTRUCTION. THE BUS DUCTS SHALL BE WRAPPED IN POLYURETHANE, SO AS TO KEEP OUT ALL CONSTRUCTION DUST. WRAP THE POLYURETHANE IN A MANNER THAT THE HEAT FROM THE BUS DUCT WILL BE DISSIPATED.

NOTE:
SEE DRAWING E101B FOR ADDITIONAL DEMOLITION IN THIS AREA.

2 APRON LEVEL - ELECTRICAL DEMOLITION PLAN
1/8" = 1'-0"



5 APRON LEVEL - ELECTRICAL ROOM POWER - PART PLAN
1/2" = 1'-0"



NOTE:
SEE DRAWING C12.1.5 FOR EXTENSION OF CIRCUITS FROM JUNCTION BOX TO AIRSIDE EQUIPMENT (PBB, PCA, GPU, EFSO AND CONTROLS).

3 APRON LEVEL - ELECTRICAL POWER PLAN
1/8" = 1'-0"

LEGEND NOTES:
(APPLY THIS SHEET ONLY)

a. MOUNT WITH CENTER OF OUTLET 10 INCHES ABOVE COUNTERTOP.

b. MOUNT RECEPTACLE INSIDE OF NICHE FOR MICROWAVE.

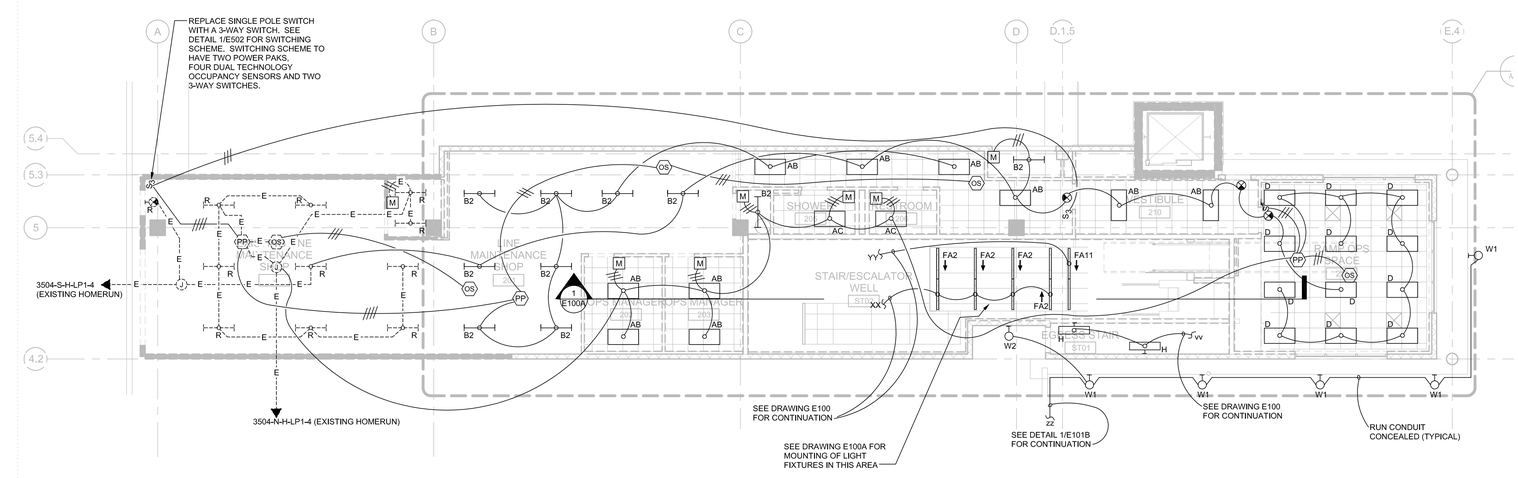
c. CAST IRON FLOOR BOX.

d. 20A/1P/1 DISCONNECT SWITCH. CONNECT TO 1/12 HP CIRCULATING PUMP #CP-1.

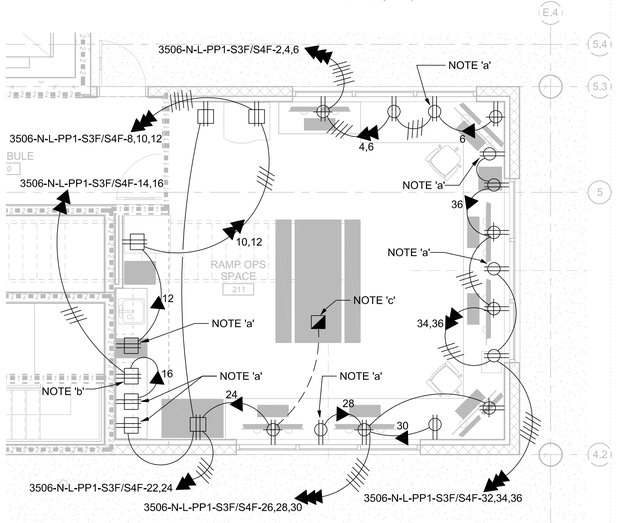
e. 30A/3P/1 DISCONNECT SWITCH. CONNECT TO WATER HEATER #WH-4-3 (5KW).

f. EXISTING LIGHT FIXTURE THAT IS TO REMAIN.

g. 1" EMPTY CONDUIT FOR ESCALATOR SUMP PUMP SIGNAL CONDUCTORS. EXTEND DOWN TO ESCALATOR SUMP PUMP CONTROLLER ON APRON LEVEL (E100).



4 APRON LEVEL - ELECTRICAL LIGHTING PLAN
1/8" = 1'-0"



6 APRON LEVEL - RAMP OPS SPACE POWER - PART PLAN
1/4" = 1'-0"

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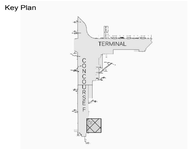
Key Plan



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Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

Sheet Title

APRON LEVEL: ELECTRICAL POWER, LIGHTING & DEMO PLANS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

E101

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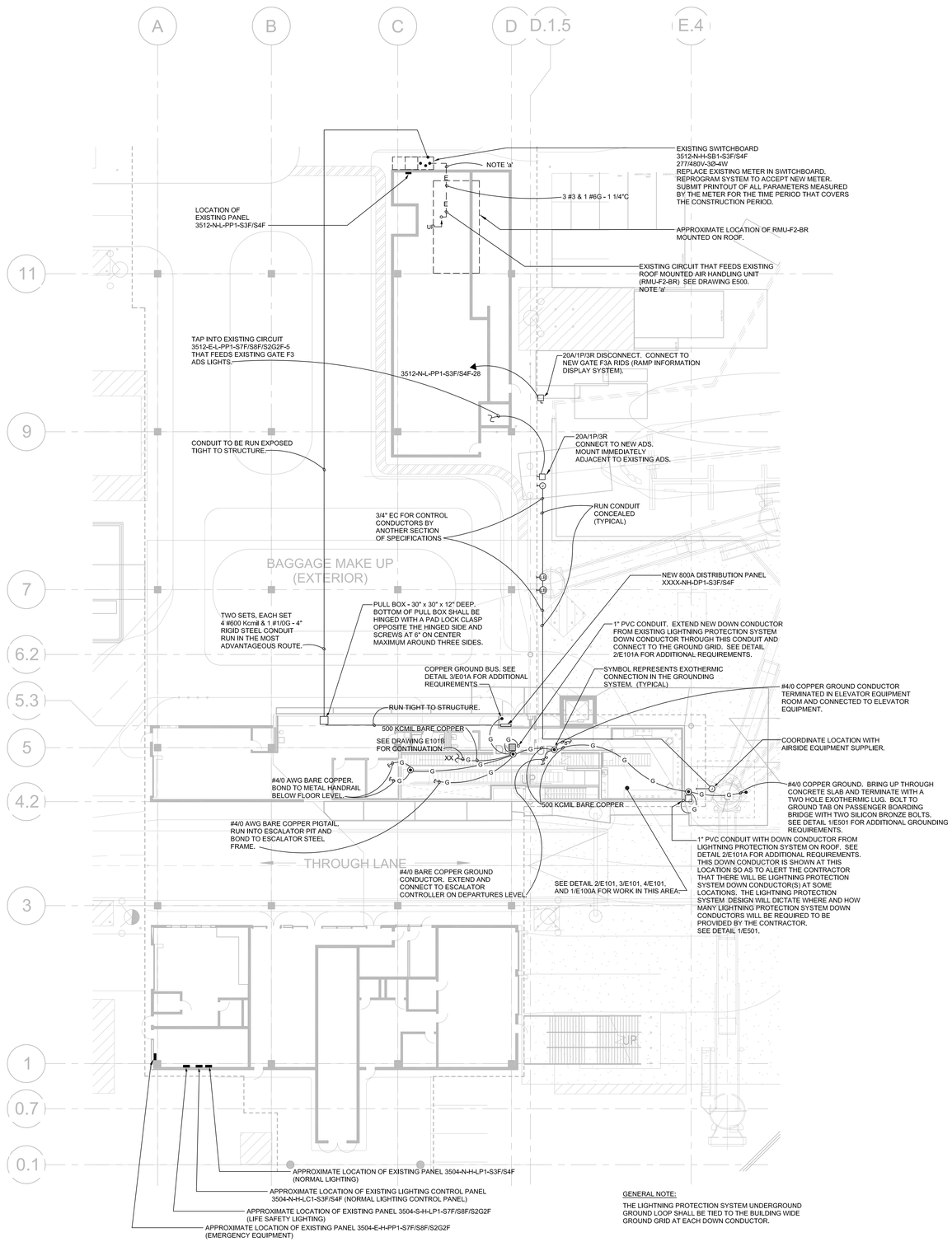
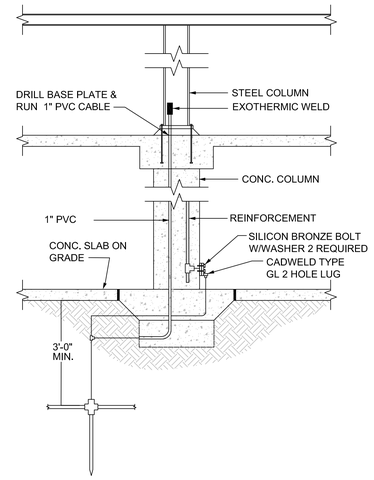


GENERAL NOTE:

THE LIGHTNING PROTECTION SYSTEM UNDERGROUND GROUND LOOP SHALL BE TIED TO THE BUILDING WIDE GROUND GRID AT EACH DOWN CONDUCTOR.

1 OVERALL FLOOR PLAN - APRON LEVEL - ELECTRICAL
1/16" = 1'-0"

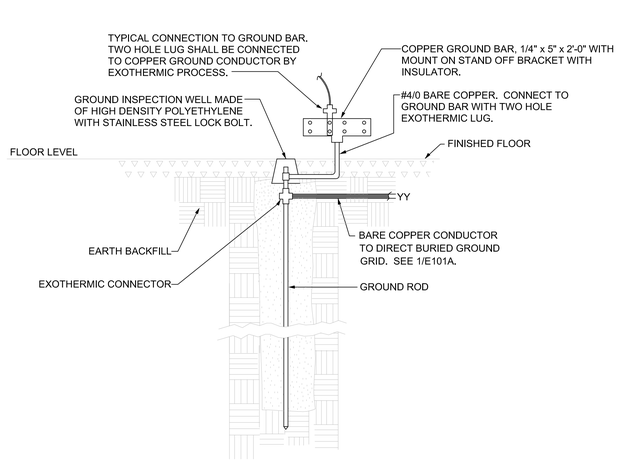
0 4 8 16 32 FT.



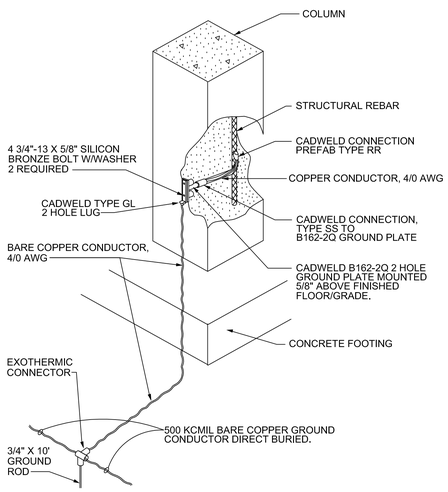
2 OVERALL FLOOR PLAN - COLUMN GROUND AND LIGHTNING PROTECTION DOWN CONDUCTOR - ELECTRICAL DETAIL
NOT TO SCALE

LEGEND NOTES:
(APPLY THIS SHEET ONLY)

a. REMOVE EXISTING CONDUCTORS FROM THE SUPPLY POINT (CIRCUIT BREAKER) TO THE EXISTING LOAD. PROVIDE NEW CONDUCTORS SIZE AND NUMBER AS NOTED, INTO THE COMPLETED CONDUIT RUN.



3 OVERALL FLOOR PLAN - GROUNDING ROD - ELECTRICAL DETAIL
NOT TO SCALE



4 OVERALL FLOOR PLAN - COLUMN GROUND - ELECTRICAL DETAIL
NOT TO SCALE

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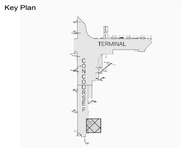
Key Plan



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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

Sheet Title

APRON LEVEL:
ELECTRICAL
POWER PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

E101 A

5/30/2014 10:35:24 AM

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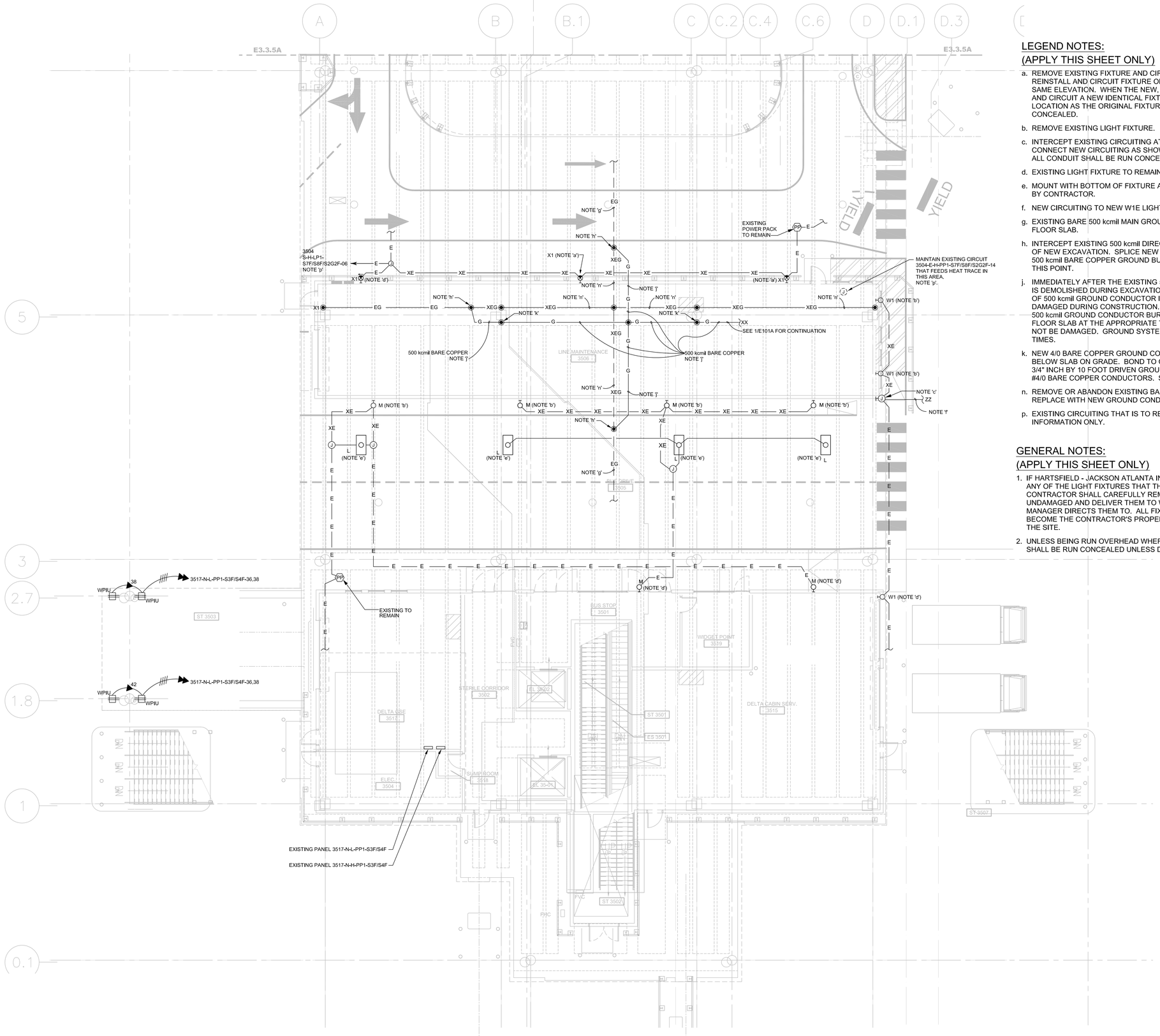

1 FLOOR PLAN - APRON LEVEL - ELECTRICAL NEW/DEMO
1/8" = 1'-0"
0 2 4 8 16 FT.

LEGEND NOTES:
(APPLY THIS SHEET ONLY)

a. REMOVE EXISTING FIXTURE AND CIRCUITING BEFORE WALL IS DEMOLISHED. REINSTALL AND CIRCUIT FIXTURE ON TEMPORARY CONSTRUCTION WALL AT SAME ELEVATION. WHEN THE NEW, FINAL WALL IS CONSTRUCTED, INSTALL AND CIRCUIT A NEW IDENTICAL FIXTURE AT THE SAME ELEVATION AND LOCATION AS THE ORIGINAL FIXTURE. ALL FINAL CONDUIT SHALL BE RUN CONCEALED.

b. REMOVE EXISTING LIGHT FIXTURE.

c. INTERCEPT EXISTING CIRCUITING AT THE MOST ADVANTAGEOUS LOCATION. CONNECT NEW CIRCUITING AS SHOWN ON DETAIL 4/E101 AT THIS LOCATION. ALL CONDUIT SHALL BE RUN CONCEALED.

d. EXISTING LIGHT FIXTURE TO REMAIN.

e. MOUNT WITH BOTTOM OF FIXTURE AT 12'-0". NEW FIXTURE PROVIDED BY CONTRACTOR.

f. NEW CIRCUITING TO NEW W1E LIGHT FIXTURES SEE DRAWING E101.

g. EXISTING BARE 500 kcmil MAIN GROUND BUS BURRIED IN EARTH BELOW FLOOR SLAB.

h. INTERCEPT EXISTING 500 kcmil DIRECT BURRIED GROUND BUS AT EDGE OF NEW EXCAVATION. SPLICE NEW 500 kcmil BARE COPPER TO EXISTING 500 kcmil BARE COPPER GROUND BUS WITH EXOTHERMIC PROCESS AT THIS POINT.

j. IMMEDIATELY AFTER THE EXISTING 500 kcmil GROUNDING CONDUCTOR IS DEMOLISHED DURING EXCAVATION, INSTALL A NEW TEMPORARY RUN OF 500 kcmil GROUND CONDUCTOR IN A MANNER THAT IT WILL NOT BE DAMAGED DURING CONSTRUCTION. INSTALL A PERMANENT RUN OF 500 kcmil GROUND CONDUCTOR BURIED A MINIMUM OF THREE FEET BELOW FLOOR SLAB AT THE APPROPRIATE TIME DURING CONSTRUCTION SO AS TO NOT BE DAMAGED. GROUND SYSTEM MUST REMAIN OPERATIONAL AT ALL TIMES.

k. NEW 4/0 BARE COPPER GROUND CONDUCTOR BURRIED AT LEAST 3 FEET BELOW SLAB ON GRADE. BOND TO COLUMN AS SHOWN AND PROVIDE ONE 3/4" INCH BY 10 FOOT DRIVEN GROUND RODS BONDED TO COLUMN WITH #4/0 BARE COPPER CONDUCTORS. SEE DETAIL 4/E101A.

n. REMOVE OR ABANDON EXISTING BARE COPPER GROUND CONDUCTOR. REPLACE WITH NEW GROUND CONDUCTOR AS SHOWN.

p. EXISTING CIRCUITING THAT IS TO REMAIN. IT IS SHOWN FOR INFORMATION ONLY.

GENERAL NOTES:
(APPLY THIS SHEET ONLY)

1. IF HARTSFIELD - JACKSON ATLANTA INTERNATIONAL AIRPORT (HJAIA) WANTS ANY OF THE LIGHT FIXTURES THAT THE CONTRACTOR IS TO REMOVE, THE CONTRACTOR SHALL CAREFULLY REMOVE THESE PARTICULAR FIXTURES UNDAMAGED AND DELIVER THEM TO WHATEVER LOCATION THE HJAIA PROJECT MANAGER DIRECTS THEM TO. ALL FIXTURES THAT HJAIA DOES NOT WANT, SHALL BECOME THE CONTRACTOR'S PROPERTY AND BE PROMTLY REMOVED FROM THE SITE.

2. UNLESS BEING RUN OVERHEAD WHERE THERE IS NO CEILING, ALL CONDUIT SHALL BE RUN CONCEALED UNLESS DETAILED OTHERWISE.

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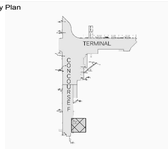

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Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

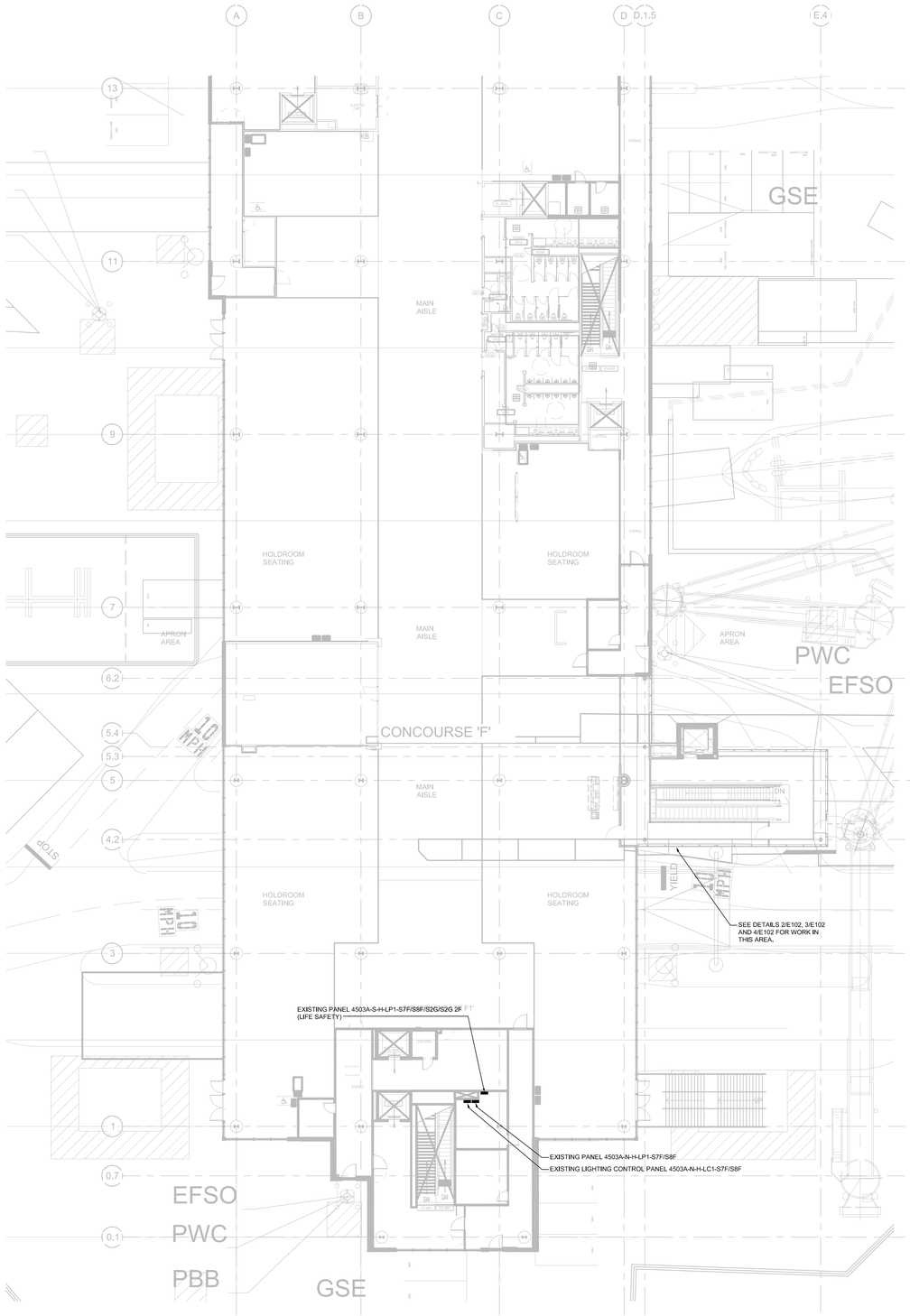
Sheet Title

APRON LEVEL: ELECTRICAL DEMO / NEW LIGHTING PLAN

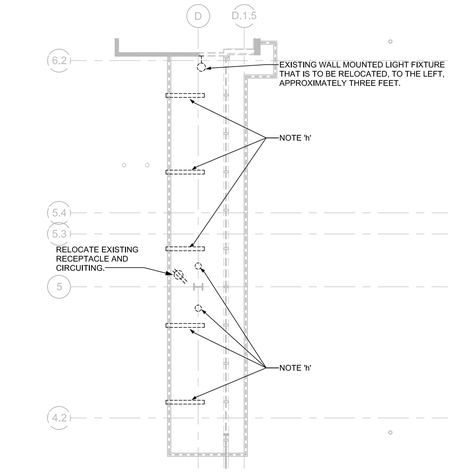
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

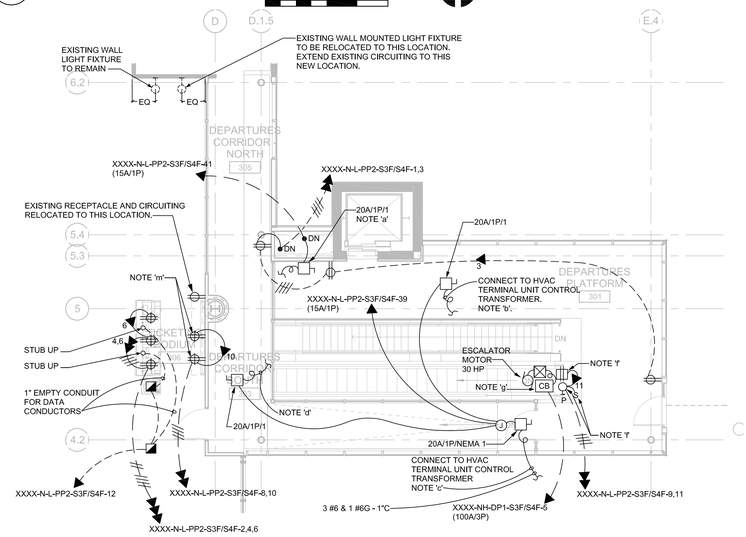
E101B



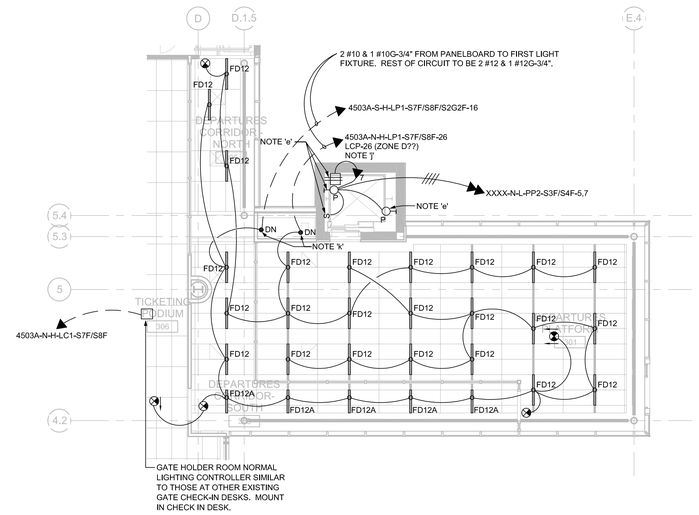
1 OVERALL PLAN - DEPARTURES LEVEL
1/16" = 1'-0"



2 DEMO PLAN- DEPARTURES LEVEL - ELECTRICAL
1/8" = 1'-0"



3 DEPARTURES LEVEL - POWER PLAN
1/8" = 1'-0"



4 DEPARTURES LEVEL - LIGHTING PLAN
1/8" = 1'-0"

LEGEND NOTES:
(APPLY THIS SHEET ONLY)

a. CONNECT TO FIRE/SMOKE DAMPER.

b. CONNECT TO CONTROL TRANSFORMER FOR VAV-F-16-01

c. CONNECT TO CONTROL TRANSFORMER FOR VAV-F-16-02

d. CONNECT TO CONTROL TRANSFORMER FOR VAV-F-16-03

e. MOUNT AT TOP OF SHAFT. COORDINATE EXACT LOCATION WITH ELEVATOR EQUIPMENT.

f. MOUNT IN ESCALATOR PIT. COORDINATE EXACT LOCATION WITH ELEVATOR EQUIPMENT.

g. 100A/3P ENCLOSED SHUNT TRIP CIRCUIT BREAKER. CONNECT TO ESCALATOR CONTROLLER. MOUNT IN ESCALATOR PIT AND COORDINATE EXACT LOCATION WITH ESCALATOR EQUIPMENT. SHUNT TRIP SHALL BE CONTROLLED BY EITHER OF THE TWO SMOKE DETECTORS LOCATED IN THE ESCALATOR PITS.

h. REMOVE THIS EXISTING LIGHT FIXTURE. MAINTAIN CIRCUITING TO ALL LIGHT FIXTURES THAT ARE TO REMAIN. WHERE NECESSARY, PROVIDE A NEW TWO LAMP BALLAST IN THE FIXTURES THAT ARE TO REMAIN WHEN A SHARED FOUR LAMP BALLAST IS IN THE FIXTURE THAT IS BEING REMOVED.

j. CONTRACTOR SHALL COORDINATE WHAT LIGHTING CONTROL ZONE EACH NEW LIGHTING CIRCUIT IS CONTROLLED WITH. EXTEND THIS CIRCUIT THROUGH LIGHTING CONTROL RELAY IN EXISTING LIGHTING CONTROL PANEL 4503-N-H-LC1-S7F/S8F.

k. RUN CIRCUITING DOWN TO CEILING OF APRON LEVEL, ACROSS TO WHERE PANEL IS LOCATED ON THE DEPARTURE LEVEL AND THEN UP THROUGH SLAB TO PANEL.

m. MOUNT AT HEIGHT AS DIRECTED BY ARCHITECT.

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CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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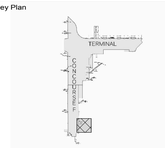
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

Sheet Title

DEPARTURES LEVEL: ELECTRICAL POWER, LIGHTING & DEMO PLANS

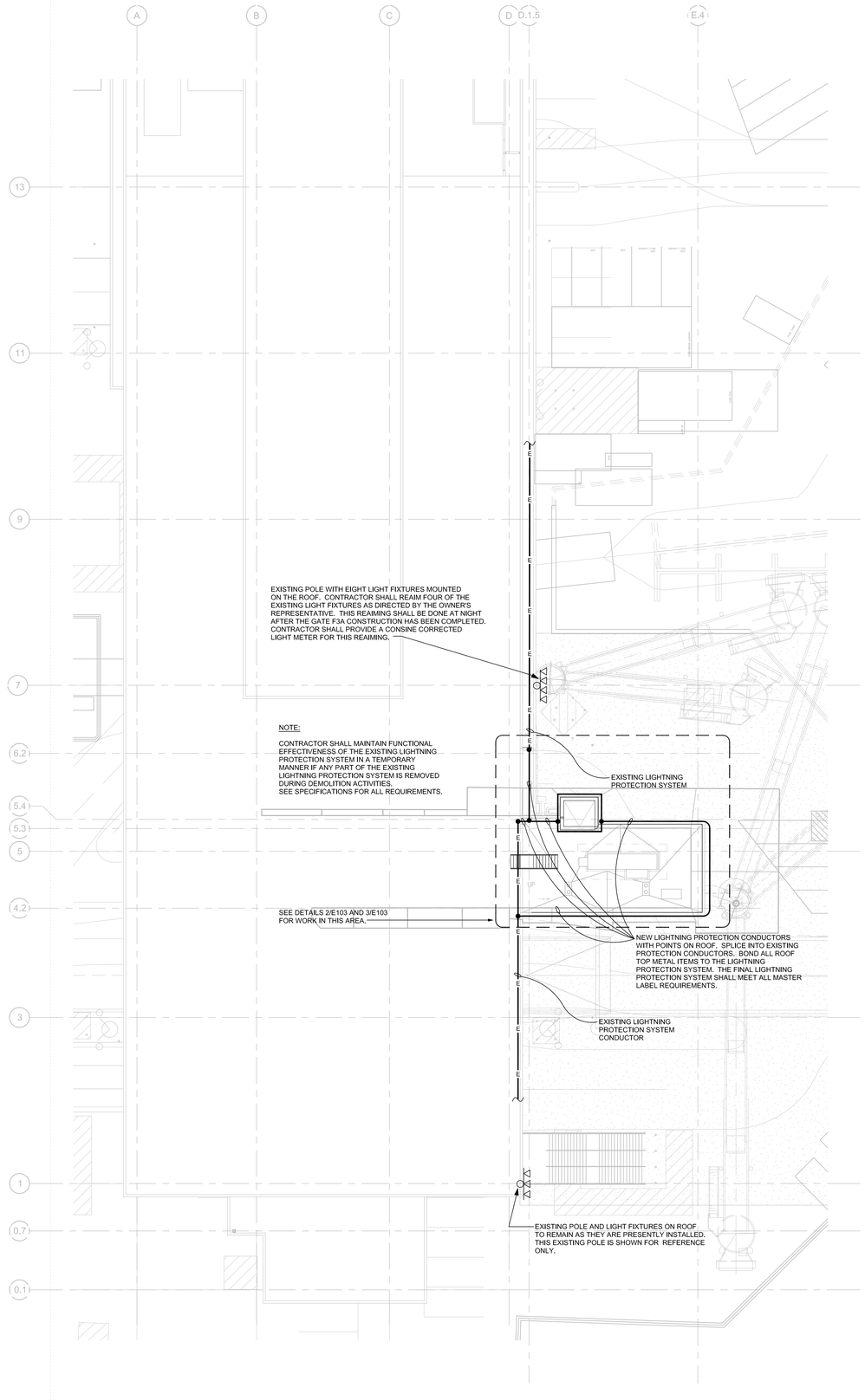
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

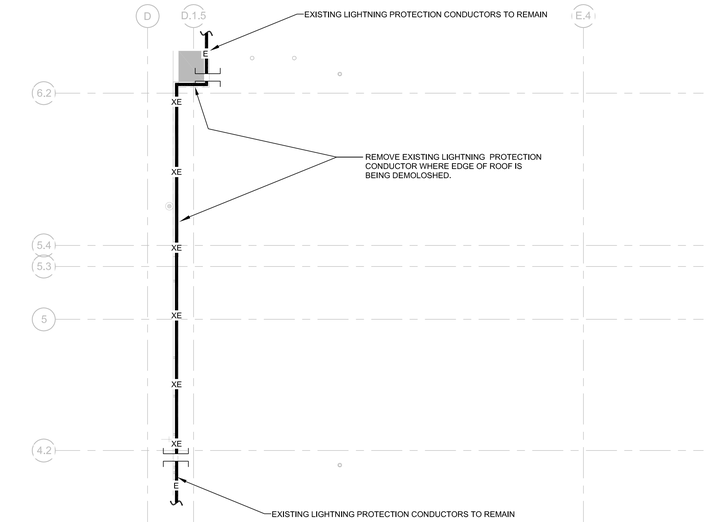
E102

10/1/2014 11:57:43 AM

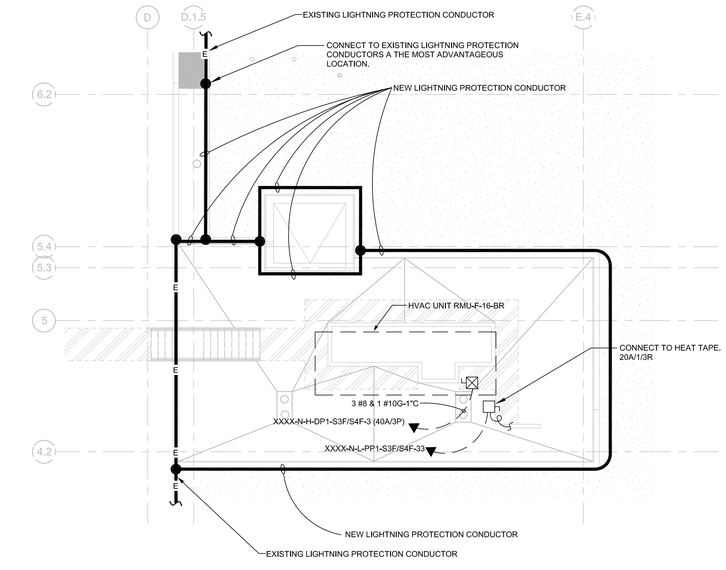
P:\DWGS\14\1401 - HJAIA Gate F3\ELECTRICAL\1401 E102.dwg, 4/13/2015 6:32:03 PM, CutePDF Writer



1 OVERALL ROOF LEVEL - ELECTRICAL
1/16" = 1'-0"



3 ROOF PLAN - DEMO
1/8" = 1'-0"



2 ROOF PLAN
1/8" = 1'-0"

GENERAL NOTE:

1. THIS DRAWING SHOWS THE OVERALL AREA WHERE THE EXISTING LIGHTNING PROTECTION SYSTEM NEEDS TO BE MODIFIED AND WHERE NEW LIGHTNING PROTECTION NEEDS TO BE PROVIDED.
2. THE LIGHTNING PROTECTION SYSTEM GROUND LOOP SHALL BE CONNECTED TO THE BUILDING WIDE GROUND GRID AS PART OF THIS PROJECT.
3. BECAUSE OF THE LIMITED NUMBER OF LOCATIONS WHERE DOWN CONDUCTORS CAN BE RUN IN AN INOBSTRUSIVE MANNER, MORE THAN THE MINIMUM NUMBER OF DOWN CONDUCTORS MAY NEED TO BE PROVIDED BY THE CONTRACTOR. ALL DOWN CONDUCTOR LOCATIONS (WHETHER CONDUCTOR OR BUILDING STEEL) MUST BE ACCEPTED AND APPROVED BY THE ARCHITECT DURING THE SUBMITTAL PROCESS.

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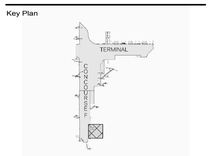
Key Plan



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2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

Sheet Title

ROOF LEVEL: ELECTRICAL PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

E103

10/1/2014 11:57:51 AM

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EXISTING PANEL 3517-N-L-PP1-S3F/S4F

MAINS: 100 MCB | VOLTAGE: 208/120 | WIRE: 4 | MOUNTING: SURFACE
BUS: 100 A | PHASE: 3 | AIC: 10 kA | NEUTRAL BUS: 100% | ENCLOSURE: NEMA 1

CKT #	TRIP POLE	LOAD TYPE	DESCRIPTION	CONNECTED LOAD KVA PH A	PH B	PH C	KVA	DESCRIPTION	LOAD TYPE	TRIP POLE	CKT #
1	20/1	G	WORK STATION	0.7	2.7		2.0	SMALL ELEC. TOOLS	G	20/1	2
3	20/1	B	MISC. RECEPTACLES	2.0		4.0	2.0	MISC. RECEPTACLES	B	20/1	4
5	20/1	B	MISC. RECEPTACLES	2.0			2.0	MISC. RECEPTACLES	B	20/1	6
7	20/1		SPARE					SPACE			8
9	20/1		SPARE					SPACE			10
11	20/1		SPARE					SPACE			12
13	20/1		SPARE					SPACE			14
15	20/1		SPARE					SPACE			16
17	20/1		SPARE				0.2	RECEPT	B	20/1	18
19			SPACE				0.2	RECEPT	B	20/1	20
21			SPACE				0.2	RECEPT	B	20/1	22
23	20/1		SPARE				0.2	RECEPT	B	20/1	24
25	20/1		SPARE				0.2	RECEPT	B	20/1	26
27	20/1		SPARE				0.2	RECEPT	B	20/1	28
29	20/1		SPARE				0.2	RECEPT	B	20/1	30
31	20/1		SPARE				0.2	RECEPT	B	20/1	32
33	20/1		SPARE				0.2	RECEPT	B	20/1	34
35	20/1		SPARE				0.2	CHARGING STATION	G	20/1	36
37	20/1	B	OFFICE RECEPT	0.6			0.2	CHARGING STATION	G	20/1	38
39	20/1	B	OFFICE RECEPT	0.4			0.2	CHARGING STATION	G	20/1	40
41	20/1	B	OFFICE RECEPT	0.8			0.2	CHARGING STATION	G	20/1	42

Panel Load Analysis

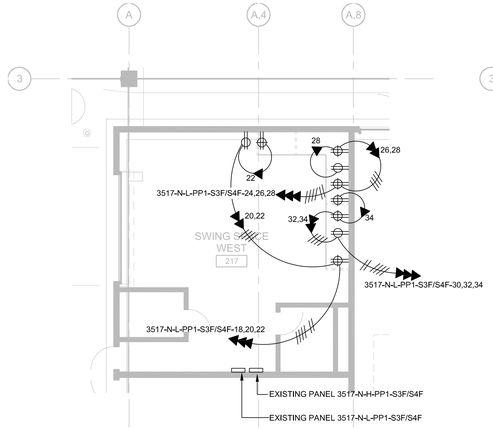
Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference	Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting			Per NEC Article 215.2	E	Other Continuous			Per NEC Article 215.2
B	Receptacles	8.0	8.0	Per NEC Table 220.44	F	Motor			Per NEC Article 430.24
C	Air-Conditioning			Per NEC Article 440.4	G	Other Non-Continuous	2.7	2.7	Per NEC Article 210.19
D	Heating			Per NEC Article 220.51	H	Subpanels			

Phase A Connected Load	2.7	TOTAL DEMAND LOAD	10.7 KVA
Phase B Connected Load	4.0	TOTAL CONNECTED LOAD:	10.7 KVA
Phase C Connected Load	4.0	TOTAL FEEDER LOAD	10.7 KVA

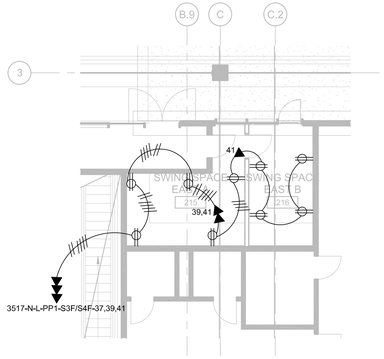
NOTES:

NOTE:

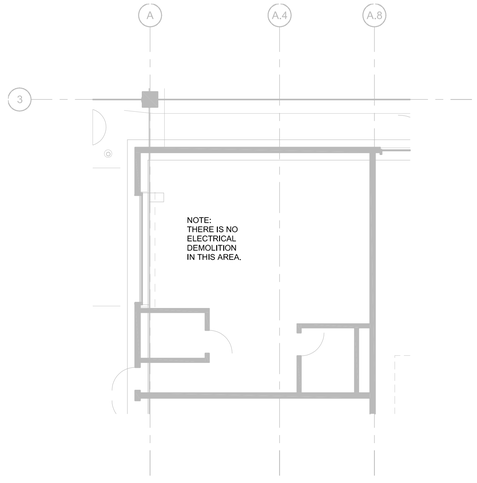
CONTRACTOR SHALL PROVIDE A NEW 20A/1P CIRCUIT BREAKER AT SPACES 18,20,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40 AND 41.



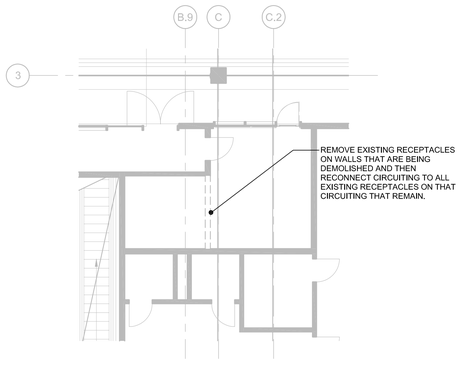
3 WEST SWING SPACE - POWER PLAN
1/8" = 1'-0"
0 2 4 8 16 FT.



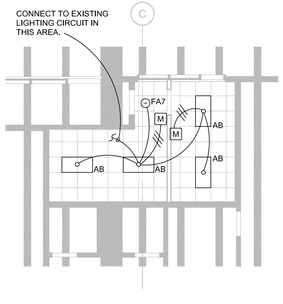
1 SWING SPACE - POWER PLAN
1/8" = 1'-0"
0 2 4 8 16 FT.



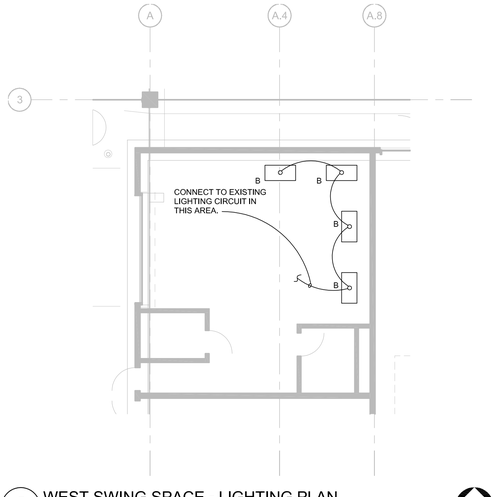
2 WEST SWING SPACE - ELECTRICAL DEMO PLAN
1/8" = 1'-0"
0 2 4 8 16 FT.



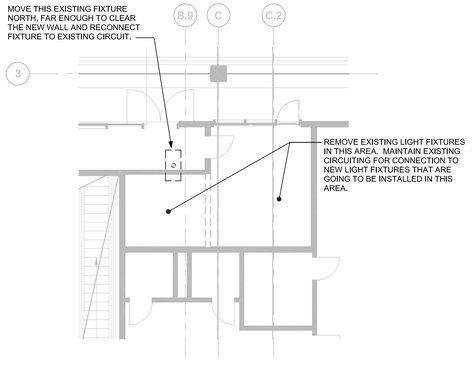
4 SWING SPACE - ELECTRICAL DEMO PLAN
1/8" = 1'-0"
0 2 4 8 16 FT.



5 REFLECTED CEILING PLAN- APRON LEVEL
1/8" = 1'-0"
0 2 4 8 16 FT.



6 WEST SWING SPACE - LIGHTING PLAN
1/8" = 1'-0"
0 2 4 8 16 FT.



7 SWING SPACE - LIGHTING DEMO PLAN
1/8" = 1'-0"
0 2 4 8 16 FT.

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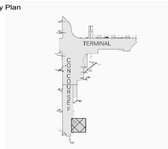
Key Plan



Professional Seals

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2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ | Reviewed by: TWP

Project No: 00.0000.00

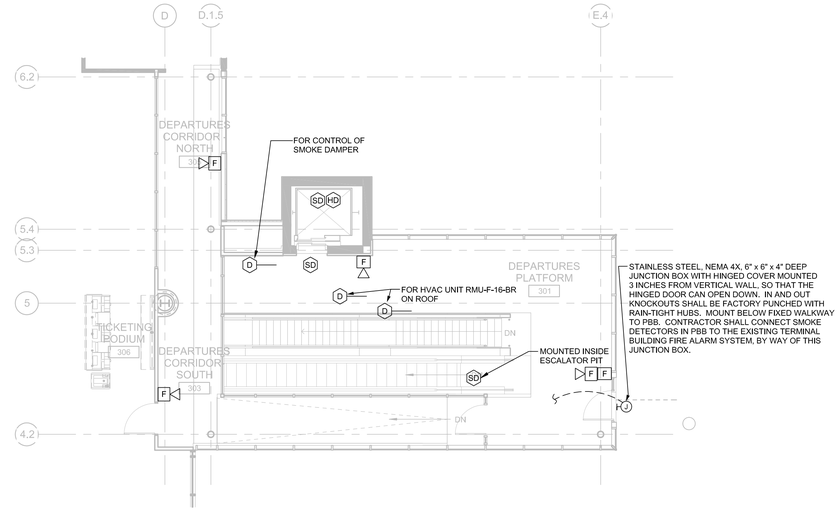
Sheet Title

ELECTRICAL
APRON LEVEL:
SWING PLANS
POWER

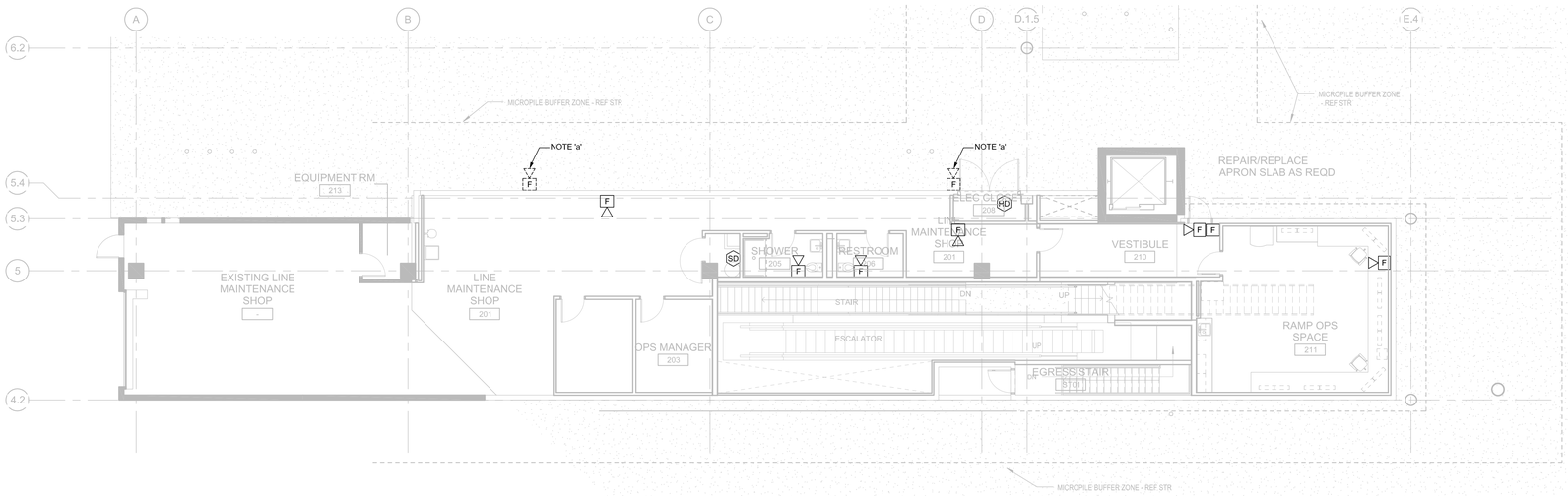
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

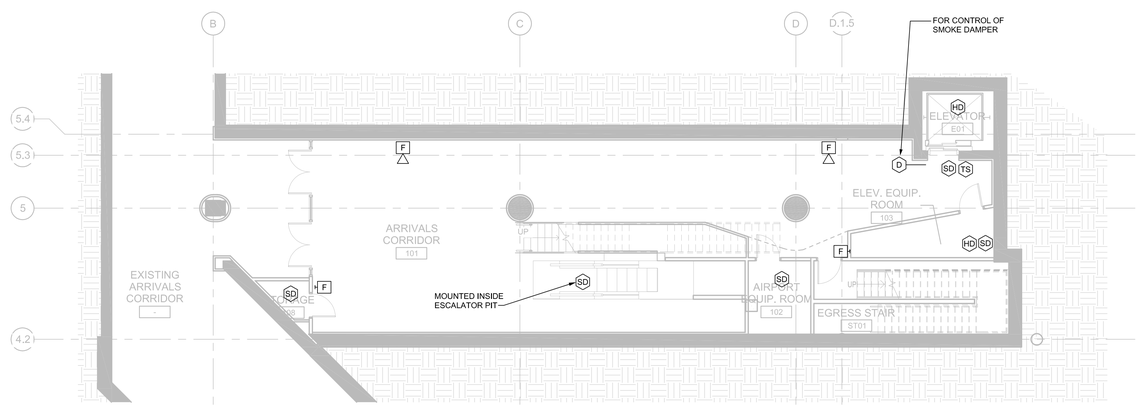
E104



1 DEPARTURES LEVEL - ELECTRICAL FIRE ALARM PLAN
1/8" = 1'-0"



2 APRON LEVEL - ELECTRICAL FIRE ALARM PLAN
1/8" = 1'-0"



3 ARRIVALS LEVEL - ELECTRICAL FIRE ALARM PLAN
1/8" = 1'-0"

LEGEND NOTES:
(APPLY THIS SHEET ONLY)

a. CONTRACTOR SHALL REMOVE EXISTING FIRE ALARM SYSTEM SPEAKER STROBE FROM THIS APPROXIMATE LOCATION BEFORE THE WALL IS DEMOLISHED AND REINSTALL IT ON THE TEMPORARY CONSTRUCTION WALL. WHEN THE NEW FINAL WALL IS BUILT, THE CONTRACTOR SHALL INSTALL A NEW FIRE ALARM SPEAKER/STROBE AT THIS APPROXIMATE LOCATION. ALL FINAL CONDUCT SHALL BE RUN CONCEALED.

GENERAL NOTES:

1. ALL FIRE ALARM SYSTEM CONDUCTORS SHALL BE RUN IN CONDUIT.
2. ALL FIRE ALARM SYSTEM CONDUITS AND JUNCTION BOXES SHALL BE PAINTED RED BEFORE INSTALLATION.
3. CONTRACTOR SHALL PROVIDE ALL ITEMS NEEDED TO MAKE THE FIRE ALARM OPERATE AS IT DID BEFORE THIS CONSTRUCTION BEGAN. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, ANY POWER SUPPLIES, CIRCUIT BOARDS, WIRING, RELAYS, PANELS, AND OTHER ITEMS NECESSARY TO MAKE THE FIRE ALARM SYSTEM OPERATIONAL. CONTRACTOR SHALL MODIFY ALL SOFTWARE, MENUS, SCHEDULES, CONTROL FUNCTIONS AND SIMILAR ITEMS, SO THAT THE FIRE ALARM SYSTEM WILL OPERATE IN THE SAME MANNER AS IT DID BEFORE THIS CONSTRUCTION BEGAN. USE NOMENCLATURE AS APPROVED BY THE HJAIA PROJECT MANAGER.

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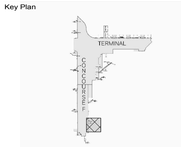

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

Sheet Title

ARRIVALS, APRON, & DEPARTURES LEVEL: ELECTRICAL FIRE ALARM PLANS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

E200

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NEW 800A DISTRIBUTION PANEL XXXX-NH-DP1-S3F/S4F

MAINS: 800A MB **VOLTAGE:** 480/277 **WIRE:** 4 **MOUNTING:** FLOOR
BUS: 800A BUS **PHASE:** 3 **AIC:** 42,000 **ENCLOSURE:** NEMA 1

UNIT #	EQUIPMENT SERVED	CIRCUIT BREAKERS FRAME	CIRCUIT BREAKERS TRIP	CIRCUIT BREAKERS POLES	LOAD kVA CONNECTED	LOAD kVA FEEDER
1	GATE F3A - GPU/400HZ	400	250	3	180.0	180.0
2	GATE F3A - PC AIR	400	350	3	220.0	275.0
3	TRANSFORMER XXXX-TR2-N-H-S3F/S4F	60	60	3	4.3	4.4
4	ELEVATOR	100	100	3	32.0	32.0
5	ESCALATOR	100	100	3	32.0	32.0
6	TRANSFORMER XXXX-TR1-N-H-S3F/S4F	60	60	3	16.0	19.7
7	RMU-F-16-87	60	40	3	8.4	8.4
8	SPARE	100	100	3		
9	SPACE	100		3		
10						
11						
12						
13						
14						
15						
16						
17						

Load Analysis

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference	Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	0.0	0.0	Per NEC Article 215.2	E	Other Continuous	0.0	0.0	Per NEC Article 215.2
B	Receptacles	0.0	0.0	Per NEC Table 220.44	F	Motor	6.4	112	Per NEC Article 430.24
C	Air-Conditioning	228.4	228.4	Per NEC Article 440.4	G	Other Non-Continuous	180	180	Per NEC Article 210.19
D	Heating	0.0		Per NEC Article 220.51	H	Subpanels	20.3	24.1	

		TOTAL DEMAND LOAD	**KVA**
TOTAL CONN. AMPS:	**593** A	TOTAL CONNECTED LOAD:	**492.7 KVA**
TOTAL FEEDER AMPS:	**655** A	TOTAL FEEDER LOAD	**544.5 KVA**

NOTES:

5 / E500 NEW 800A DISTRIBUTION PANEL
N.T.S.

EXISTING SWITCHBOARD 3512-N-H-SB1-S3F/S4F

MAINS: 3000 MCB **VOLTAGE:** 480/277 **WIRE:** 4 **MOUNTING:** FLOOR
BUS: 3000 A **PHASE:** 3 **AIC:** 42,000 **ENCLOSURE:** NEMA 3R

UNIT #	EQUIPMENT SERVED	CIRCUIT BREAKERS FRAME	CIRCUIT BREAKERS TRIP	CIRCUIT BREAKERS POLES	LOAD kVA CONNECTED	LOAD kVA FEEDER
1	GATE F5 - PBB	100	60	3	NON CONINCIDENT	
2	GATE F4 - PBB	100	60	3	NON CONINCIDENT	
3	SPARE	60	60	3		
4	SPACE	60		3		
5	3512-N-H-TR1-S3F/S4F (3512-N-L-DP1)	250	125	3	31.6	32.2
6	GATES F3/F5 - CHARGING STATION	100	70	3	47.0	47.0
7	SPARE	250	225	-	-	-
8	SPARE	250	225	3		
9	RMU-F-02-BR	250	150	3	75.4	75.4
10	SPARE	250	225	3		
11	3512-N-H-PP1-S3F/S4F	250	225	3	105.4	117.3
12	SPARE	250	225	3		
13	CONC F (BAGGAGE MCP-24)	400	400	3	244.4	244.4
14	SPACE	400		3		
15	GATE F5 - GPU/400HZ	250	250	3	180.0	180.0
16	GATE F4 - GPU/400HZ	250	250	3	180.0	180.0
17	GATE F5 - PC AIR	400	350	3	220.0	220.0
18	GATE F3 - GPU/400HZ	250	250	3	180.0	180.0
19	GATE F4 - PC AIR	400	350	3	220.0	220.0
20	GATE F3 - PC AIR	400	350	3	220.0	220.0

Load Analysis

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference	Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	1.2	1.5	Per NEC Article 215.2	E	Other Continuous	28.2	35.3	Per NEC Article 215.2
B	Receptacles	6.9	6.9	Per NEC Table 220.44	F	Motor	345.8	400.8	Per NEC Article 430.24
C	Air-Conditioning	666.6	666.6	Per NEC Article 440.4	G	Other Non-Continuous	607.1	607.1	Per NEC Article 210.19
D	Heating	48.0		Per NEC Article 220.51	H	Subpanels			

		TOTAL DEMAND LOAD	**-- KVA**
TOTAL CONN. AMPS:	**2050.3** A	TOTAL CONNECTED LOAD:	**1703.8 KVA**
TOTAL FEEDER AMPS:	**2067.6** A	TOTAL FEEDER LOAD	**1718.2 KVA**

NOTES:

4 / E500 EXISTING SWITCHBOARD 3512-N-H-SB1-S3F/S4F AS IT EXISTS
N.T.S.

EXISTING SWITCHBOARD 3512-N-H-SB1-S3F/S4F AS MODIFIED

MAINS: 3000 MCB **VOLTAGE:** 480/277 **WIRE:** 4 **MOUNTING:** FLOOR
BUS: 3000 A **PHASE:** 3 **AIC:** 42,000 **ENCLOSURE:** NEMA 3R

UNIT #	EQUIPMENT SERVED	CIRCUIT BREAKERS FRAME	CIRCUIT BREAKERS TRIP	CIRCUIT BREAKERS POLES	LOAD kVA CONNECTED	LOAD kVA FEEDER
1	GATE F5 - PBB	100	60	3		
2	GATE F4 - PBB	100	60	3		
3	SPARE	60	60	3		
4	SPACE	60		3		
5	3512-N-H-TR1-S3F/S4F (3512-N-L-DP1)	250	125	3	31.6	32.2
6	GATES F3/F5 - CHARGING STATION	100	70	3	47.0	47.0
7	XXXX-N-H-DP1-S3F/S4F	800	800	3	492.7	544.5
8	NOT USED					
9	NOT USED					
10	NOT USED					
11	3512-N-H-PP1-S3F/S4F	250	225	3	105.4	117.3
12	RMU-F-02-BR	250	150	3	75.4	75.4
13	CONC F (BAGGAGE MCP-24)	400	400	3	244.4	244.4
14	SPACE	60		3		
15	GATE F5 - GPU/400HZ	250	250	3	180.0	180.0
16	GATE F4 - GPU/400HZ	250	250	3	180.0	180.0
17	GATE F5 - PC AIR	400	350	3	220.0	220.0
18	GATE F3 - GPU/400HZ	250	250	3	180.0	180.0
19	GATE F4 - PC AIR	400	350	3	220.0	220.0
20	GATE F3 - PC AIR	400	350	3	220.0	220.0

Load Analysis

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference	Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	-	-	Per NEC Article 215.2	E	Other Continuous	-	-	Per NEC Article 215.2
B	Receptacles	-	-	Per NEC Table 220.44	F	Motor	-	-	Per NEC Article 430.24
C	Air-Conditioning	-	-	Per NEC Article 440.4	G	Other Non-Continuous	-	-	Per NEC Article 210.19
D	Heating	-		Per NEC Article 220.51	H	Subpanels			

		TOTAL DEMAND LOAD	**KVA**
TOTAL CONN. AMPS:	**2643** A	TOTAL CONNECTED LOAD:	**2196.5 KVA**
TOTAL FEEDER AMPS:	**2723** A	TOTAL FEEDER LOAD	**2262.7 KVA**

NOTES:

3 / E500 EXISTING SWITCHBOARD 3512-N-H-SB1-S3F/S4F AS MODIFIED
N.T.S.

LOAD CALCULATIONS:

1. THE MAXIMUM LOAD ON EXISTING SWITCHBOARD 3512-N-H-SB1-S3F/S4F IS 750 KW AS MEASURED BY THE CURRENT TRANSFORMERS INSIDE THE SWITCHBOARD ON OCTOBER 23, 2014.

   ASSUME A POWER FACTOR OF 0.8:
   750 kW / 0.8 pf = 937.5 KVA
   937.5 KVA / (√3 x 480 VOLTS) = 1,128.2A

   1,128.2 AMPS IS THE GREATEST POSSIBLE LOAD THAT HAS BEEN ON THE SWITCHBOARD 3512-N-H-SB1-S3F/S4F SINCE IT WAS INSTALLED ACCORDING TO INTEGRAL SWITCHBOARD METERING.

2. WHEN THE INTERNATIONAL TERMINAL WAS DESIGNED, THE ENGINEERS CALCULATED THE LOAD ON SWITCHBOARD 3512-N-H-SB1-S3F/S4F WAS TO BE:

   a) THE CONNECTED LOAD WAS CALCULATED TO BE 1,703.8 KVA, WHICH EQUATES TO 2,050.3 AMPS.

   b) THE DIVERSIFIED LOAD (NOTED AS BEING THE FEEDER LOAD ON THE INTERNATIONAL TERMINAL AS BUILT DOCUMENTS) IS 1,718.2 KVA. THIS EQUATES TO 2,067.6 AMPS.

   THE DIVERSIFIED LOAD CONSISTS OF :
   (1) ALL CONNECTED LOAD
   (2) PLUS 25% OF THE CONTINUOUS LOAD
   (3) PLUS 25% OF THE LARGEST MOTOR
   (4) MINUS THE SMALLER OF NON-CONCURRENT LOADS (SUCH AS HEAT IN THIS CASE).

3. THE LOAD ON THE NEW 800 AMP DISTRIBUTION PANEL IS:

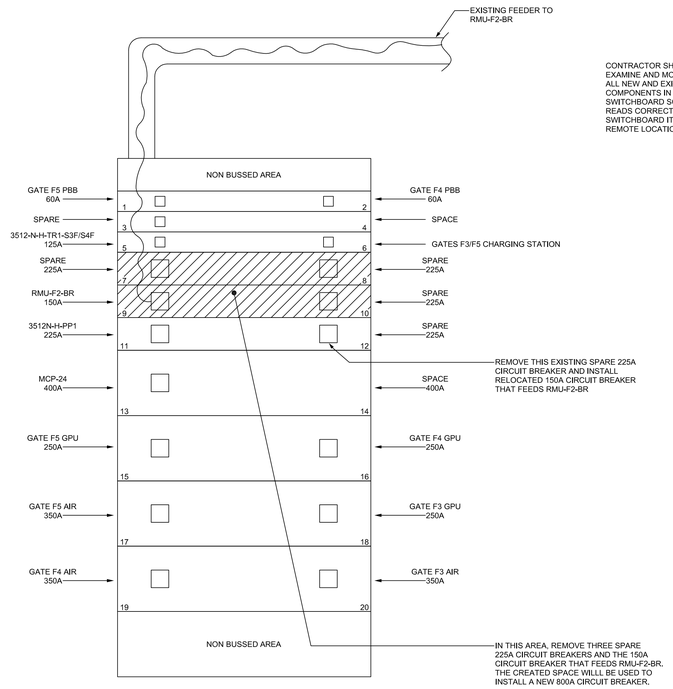
   a) CONTINUOUS LOAD x 25% - 3.8 KVA
   NON- CONTINUOUS LOAD - 492.7 KVA
   PLUS 150% OF LARGEST MOTOR - + 48.0 KVA
   FEEDER LOAD (DIVERSIFIED LOAD) 544.5 KVA

   544.5 KVA /.831 = 655.0 AMPS

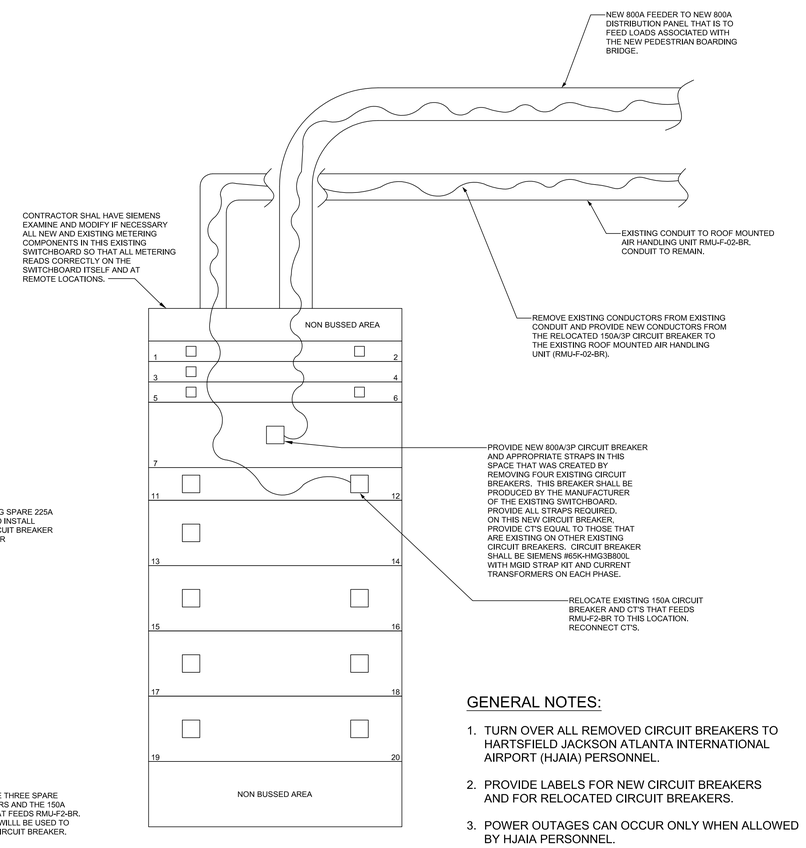
4. TOTAL LOAD ON EXISTING SWITCHBOARD 3512-N-H-SB1-S3F/S4F AFTER THE NEW 800A DISTRIBUTION PANEL 3512-N-H-DP1-S3F/S4F LOAD IS ADDED:

   SB1 - 2,067.6 AMPS
   DP1 - + 655.0 AMPS

   FINAL TOTAL LOAD ON 3512-N-H-SB1-S3F/S4F
   WHICH IS A 3,000A SWITCHBOARD: 2,723.0 AMPS



1 / E500 EXISTING DISTRIBUTION SECTION OF SWTICHBOARD 3512-N-H-SB1-S3F/S4F
N.T.S.



GENERAL NOTES:

1. TURN OVER ALL REMOVED CIRCUIT BREAKERS TO HARTSFIELD JACKSON ATLANTA INTERNATIONAL AIRPORT (HJAIA) PERSONNEL.
2. PROVIDE LABELS FOR NEW CIRCUIT BREAKERS AND FOR RELOCATED CIRCUIT BREAKERS.
3. POWER OUTAGES CAN OCCUR ONLY WHEN ALLOWED BY HJAIA PERSONNEL.

2 / E500 MODIFIED DISTRIBUTION SECTION OF SWTICHBOARD 3512-N-H-SB1-S3F/S4F
N.T.S.

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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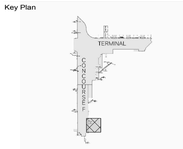
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

Sheet Title

ELECTRICAL DISTRIBUTION AND SWITCHBOARD PANELS & DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

E500

EXISTING PANEL 3512-E-L-PP1-S7F/S8F/S2G2F

MAINS: 50 MCB | VOLTAGE: 208/120 | WIRE: 4 | MOUNTING: SURFACE
BUS: 100 A | PHASE: 3 | AIC: 10 kA | NEUTRAL BUS: 100% | ENCLOSURE: NEMA 1

CKT #	TRIP POLE	LOAD TYPE	DESCRIPTION	CONNECTED LOAD KVA kVA	PH A	PH B	PH C	kVA	DESCRIPTION	LOAD TYPE	TRIP POLE	CKT #
1	20/1	A	FUEL VAULT F3 LIGHTING	0.6	0.6				SPACE			2
3	20/1	G	EFSO #6	0.2		0.2			SPACE			4
5	15/1	A	ADS - GATES F3, F4 AND F3A	0.2			0.2		SPACE			6
7	20/1	G	EFSO #9	0.2	0.2				SPACE			8
9	25/1	D	GATE F4 - PWC HEATERS	2.4		2.4			SPACE			10
11	15/1	F	GATE F4 - PWC MOTOR & LTS	1.3			1.3		SPACE			12
13	25/1	D	GATE F3 - PWC HEATERS	2.4	2.4				SPACE			14
15	15/1	F	GATE F3 - PWC MOTOR & LTS	1.3		1.3			SPACE			16
17	20/1	B	RECEPTS - #3512	0.4			0.4		SPACE			18
19	20/1		SPARE						SPACE			20
21	20/1		SPARE						SPACE			22
23	20/1		SPARE						SPACE			24
25			SPACE						SPACE			26
27			SPACE						SPACE			28
29			SPACE						SPACE			30

Panel Load Analysis

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference	Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	0.7	0.9	Per NEC Article 215.2	E	Other Continuous			Per NEC Article 215.2
B	Receptacles	0.5	0.5	Per NEC Table 220.44	F	Motor	2.6	2.9	Per NEC Article 430.24
C	Air-Conditioning			Per NEC Article 440.4	G	Other Non-Continuous	0.4	0.4	Per NEC Article 210.19
D	Heating	4.8	4.8	Per NEC Article 220.51	H	Subpanels			

Phase A Connected Load	3.2	TOTAL DEMAND LOAD	8.9 KVA
Phase B Connected Load	3.9	TOTAL CONNECTED LOAD:	8.9 KVA
Phase C Connected Load	1.9	TOTAL FEEDER LOAD	9.4 KVA

NOTES:

EXISTING PANEL 3504-E-H-PP1-S7F/S8F/S2G2F

MAINS: 225 MCB | VOLTAGE: 480/277 | WIRE: 4 | MOUNTING: SURFACE
BUS: 225 A | PHASE: 3 | AIC: 14 kA | NEUTRAL BUS: 100% | ENCLOSURE: NEMA 1

CKT #	TRIP POLE	LOAD TYPE	DESCRIPTION	CONNECTED LOAD KVA kVA	PH A	PH B	PH C	kVA	DESCRIPTION	LOAD TYPE	TRIP POLE	CKT #
1	60	F	ELEVATOR - EL 2501	6.8	10.8			4.0	3504-E-H-TR1-S7F/S8F/S2G2F	H	25	2
3		F	**SHUNT TRIP**	6.8		11.6		4.7	(3504-E-L-PP1)	H		4
5	3	F		6.8			9.6	2.8		H	3	6
7	60	F	GATE F2 - PBB	12.5	13.2			0.7	HEAT TRACE #ST3502	D	20/1	8
9		F		12.5		13.7		1.2	HEAT TRACE # 3515	D	20/1	10
11	3	F		12.5			12.6	0.1	HEAT TRACE # 3506	D	20/1	12
13	60	F	GATE F3 - PBB	12.5	13.5			1.0	HEAT TRACE # 3506	D	20/1	14
15		F		12.5		12.5			SPACE			16
17	3	F		12.5			12.5		SPACE			18
19	15	F	FUEL PIT "F2" MOVS	0.8	0.8				SPACE			20
21		F		0.8		0.8			SPACE			22
23	3	F		0.8			0.8		SPACE			24
25	20	A	POLE LIGHTS FOR APRON	2.3	2.3				SPACE			26
27	2	A		2.3		2.3			SPACE			28
29	20/1		SPARE						SPACE			30
31	20/1		SPARE						SPACE			32
33	20/1		SPARE						SPACE			34
35	20/1		SPARE						SPACE			36
37	20/1		SPARE		12.5			12.5	GATE F3A PBB	F	60	38
39	20/1		SPARE			12.5		12.5		F		40
41	20/1		SPARE				12.5	12.5		F	3	42

Panel Load Analysis

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference	Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	5.4	6.7	Per NEC Article 215.2	E	Other Continuous			Per NEC Article 215.2
B	Receptacles	2.4	2.4	Per NEC Table 220.44	F	Motor	100.3	109.7	Per NEC Article 430.24
C	Air-Conditioning			Per NEC Article 440.4	G	Other Non-Continuous	1.1	1.1	Per NEC Article 210.19
D	Heating	7.9	7.9	Per NEC Article 220.51	H	Subpanels			

Phase A Connected Load	53.2	TOTAL DEMAND LOAD	154.5 KVA
Phase B Connected Load	53.4	TOTAL CONNECTED LOAD:	154.5 KVA
Phase C Connected Load	48.0	TOTAL FEEDER LOAD	165.3 KVA

NOTES:

NOTE:
PROVIDE A NEW 60A/3P CIRUCIT BREAKER AT THIS LOCATION.

SHORT CIRCUIT RATING	
PANEL NAME	MINIMUM AIC RATING
XXXX-N-H-DP1-S3F/S4F	33,834 AIC
XXXX-N-L-PP1-S3F/S4F	10,000 AIC
XXXX-N-L-PP2-S3F/S4F	10,000 AIC

NEW PANEL XXXX-N-L-PP1-S3F/S4F

MAINS: 100A MCB | VOLTAGE: 208Y/120 | WIRE: 4 | WITH INTEGRAL TVSS | MOUNTING: SURFACE
BUS: 100 A | PHASE: 3 | AIC: 10 kA | NEUTRAL BUS: 100% | ENCLOSURE: NEMA 1

CKT #	TRIP POLE	LOAD TYPE	DESCRIPTION	CONNECTED LOAD KVA kVA	PH A	PH B	PH C	kVA	DESCRIPTION	LOAD TYPE	TRIP POLE	CKT #
1	20/1		SPARE		0.2			0.2	VAV UNIT CONTROLS - DEPART	B	20/1	2
3	15	C	AC-F2-16	0.9		1.1		0.2	VAV UNIT CONTROLS - ARRIVAL	E	15/1	4
5	2			0.9			1.0	0.1	SMOKE DAMPER	F	15/1	6
7	20	D	UNIT HEATER	1.6	1.7			0.1	ELEVATOR PIT LIGHT	A	20/1	8
9	2			1.6		2.4		0.8	ELEVATOR PIT SUMP	F	20/1	10
11	30	C	AC-F3-18 INDOOR UNIT	2.1			2.3	0.2	ELEVATOR RECEPTACLE	B	20/1	12
13	2			2.1	2.5			0.4	ELEVATOR ROOM	B	20/1	14
15	30	C	AC-F3-18 OUTDOOR UNIT	1.7		2.1		0.4	ARRIVALS LEVEL RECEPTACLE	B	20/1	16
17	2			1.7			1.9	0.2	ARRIVALS LEVEL RECEPTACLE	B	20/1	18
19	20/1	B	APRON LEVEL RECEPTACLE	0.4	1.0			0.6	ARRIVALS LEVEL RECEPTACLE	B	20/1	20
21	20/1	B	APRON LEVEL RECEPTACLE	0.6		0.6		-	SPARE	-	20/1	22
23	20/1	-	SPARE	-			–	-	SPARE	-	20/1	24
25	20/1	-	SPARE	-				-	SPARE	-	20/1	26
27	20/1	-	SPARE	-				-	SPARE	-	20/1	28
29	20/1	B	GATE F3A FUEL SHUT OFF	0.1			0.1	-	SPARE	-	20/1	30
31	20/1	E	DCS CONTROL PANEL	0.4	0.6			0.2	ESCALATOR PIT RECEPTACLE	B	20/1	32
33	20/1	E	HEAT TAPE ON ROOF	0.5		0.7		0.2	ESCALATOR PIT LIGHT	A	20/1	34
35	20/1		SPARE				0.4	0.4	ESCALATOR PIT SUMP PUMP	F	20/1	36
37	20/1	A	ELEVATOR CAR LIGHTS	0.3	0.3				SPARE		20/1	38
39	20/1	A	ELEVATOR CAR LIGHTS	0.3		0.3			SPARE		20/1	40
41	20/1	F	CONDENSATE PUMP	0.1			0.1		SPARE		20/1	42

Panel Load Analysis

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference	Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	0.9	1.1	Per NEC Article 215.2	E	Other Continuous	1.3	1.7	Per NEC Article 215.2
B	Receptacles	2.0	2.0	Per NEC Table 220.44	F	Motor	1.4	1.4	Per NEC Article 430.24
C	Air-Conditioning	7.6	13.9	Per NEC Article 440.4	G	Other Non-Continuous			Per NEC Article 210.19
D	Heating	3.2	0.0	Per NEC Article 220.51	H	Subpanels			

Phase A Connected Load	6.3 KVA	TOTAL DEMAND LOAD	-- KVA
Phase B Connected Load	7.2 KVA	TOTAL CONNECTED LOAD:	16.0 KVA
Phase C Connected Load	5.3 KVA	TOTAL FEEDER LOAD	19.7 KVA

NOTES: CIRCUIT BREAKER 33 SHALL BE GFCI TYPE.
PANEL SHALL HAVE INTEGRAL TVSS.

NEW PANEL XXXX-N-L-PP2-S3F/S4F

MAINS: 100A MCB | VOLTAGE: 208Y/120 | WIRE: 4 | WITH INTEGRAL TVSS | MOUNTING: SURFACE
BUS: 100 A | PHASE: 3 | AIC: 10 kA | NEUTRAL BUS: 100% | ENCLOSURE: NEMA 1

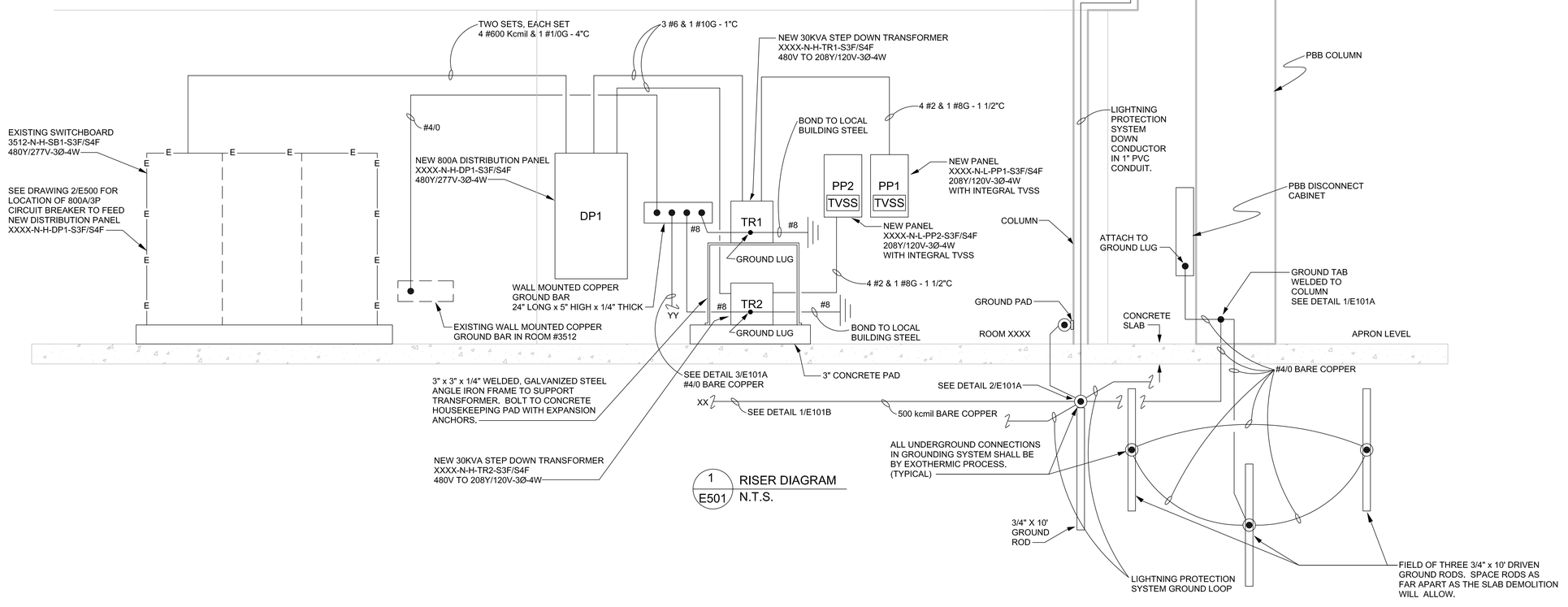
CKT #	TRIP POLE	LOAD TYPE	DESCRIPTION	CONNECTED LOAD KVA kVA	PH A	PH B	PH C	kVA	DESCRIPTION	LOAD TYPE	TRIP POLE	CKT #
1	20/1	B	DEPARTURE LEVEL RECEPT.	0.4	0.8			0.4	CHECK IN DESK RECEPT.	B	20/1	2
3	20/1	B	DEPARTURE LEVEL RECEPT.	0.6		1.0		0.4	CHECK IN DESK RECEPT.	B	20/1	4
5	20/1	A	ELEVATOR SHAFT LIGHT	0.1			0.5	0.4	CHECK IN DESK RECEPT.	B	20/1	6
7	20/1	B	ELEVATOR SHAFT RECEPT.	0.2	0.6			0.4	CHECK IN DESK RECEPT.	B	20/1	8
9	20/1	A	ESCALATOR WELL LIGHTS	0.1		0.5		0.4	CHECK IN DESK RECEPT.	B	20/1	10
11	20/1	B	ESCALATOR WELL RECEPT.	0.2			0.6	0.4	CHECK IN DESK RECEPT.	B	20/1	12
13	20/1	E	ESCALATOR PUMP CONTROL PNL	0.1	0.1			--	SPARE	-	20/1	14
15	20/1	-	SPARE	-		-		--	SPARE	-	20/1	16
17	20/1	-	SPARE	-			-	--	SPARE	-	20/1	18
19	20/1	-	SPARE	-				--	SPARE	-	20/1	20
21	20/1	-	SPARE	-				--	SPARE	-	20/1	22
23	20/1	-	SPARE	-				--	SPARE	-	20/1	24
25	20/1	-	SPARE	-				--	SPARE	-	20/1	26
27	20/1	-	SPARE	-				--	SPARE	-	20/1	28
29	20/1	-	SPARE	-				--	SPARE	-	20/1	30
31	20/1	-	SPARE	-				--	SPARE	-	20/1	32
33	15/1	-	SPARE	-				--	SPARE	-	20/1	34
35	15/1	-	SPARE	-				--	SPARE	-	20/1	36
37	15/1	-	SPARE	-				--	SPARE	-	20/1	38
39	15/1	G	SPARE	-		0.2		--	SPARE	-	20/1	40
41	15/1	G	SPARE	-			0.1	--	SPARE	-	20/1	42

Panel Load Analysis

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference	Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	0.2	0.3	Per NEC Article 215.2	E	Other Continuous			Per NEC Article 215.2
B	Receptacles	3.8	3.8	Per NEC Table 220.44	F	Motor	--	--	Per NEC Article 430.24
C	Air-Conditioning	--	--	Per NEC Article 440.4	G	Other Non-Continuous	0.3	0.3	Per NEC Article 210.19
D	Heating	--	--	Per NEC Article 220.51	H	Subpanels			

Phase A Connected Load	1.4 KVA	TOTAL DEMAND LOAD	-- KVA
Phase B Connected Load	1.7 KVA	TOTAL CONNECTED LOAD:	4.3 KVA
Phase C Connected Load	1.2 KVA	TOTAL FEEDER LOAD	4.4 KVA

NOTES: PANEL SHALL HAVE INTEGRAL TVSS.



1 / E501 RISER DIAGRAM
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CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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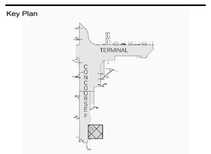
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ | Reviewed by: TWP

Project No: 00.0000.00

Sheet Title

ELECTRICAL
PANELBOARDS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

E501

PANEL 3506-N-H-PP1-S3F/S4F (EXISTING): DELTA SPACE

MAINS: 225 MCB **VOLTAGE:** 480Y/277 **WIRE:** 4 **MOUNTING:** SURFACE
BUS: 225 A **PHASE:** 3 **AIC:** 14 kA **NEUTRAL BUS:** 100% **ENCLOSURE:** NEMA 1

CKT #	TRIP POLE	LOAD TYPE	DESCRIPTION	CONNECTED LOAD KVA kVA	PH A	PH B	PH C	kVA	DESCRIPTION	LOAD TYPE	TRIP POLE	CKT #
1	50/3	-	3506-N-H-TR1	-	5.3			--	SPACE	-	20/1	2
						5.6		--	SPACE	-	20/1	4
							4.7	--	SPACE	-	20/1	6
7	20/1	-	SPARE	-	-			--	SPACE	-	20/1	8
9	20/1	-	SPARE	-		-		--	SPACE	-	20/1	10
11	20/1	-	SPARE	-			-	--	SPACE	-	20/1	12
13	20/1	-	SPARE	-	-			--	SPACE	-	20/1	14
15	20/1	-	SPARE	-		-		--	SPACE	-	20/1	16
17	20/1	-	SPARE	-			-	--	SPACE	-	20/1	18
19	50/1	-	WH-5-3	11.10	11.1			--	SPACE	-	20/1	20
21	20/3	-	WH-4-3	5.0		1.7		--	SPACE	-	20/1	22
							1.7	--	SPACE	-	20/1	24
					1.7			--	SPACE	-	20/1	26
27	20/3	-	COMPRESSOR	2.77		0.9		--	SPACE	-	20/1	28
				-			0.9	--	SPACE	-	20/1	30
				-	0.9			--	SPACE	-	20/1	32
33	20/1	-	SPACE	-				--	SPACE	-	20/1	34
35	20/1	-	SPACE	-				--	SPACE	-	20/1	36
37	20/1	-	SPACE	-				--	SPACE	-	20/1	38
39	20/1	-	SPACE	-				--	SPACE	-	20/1	40
41	20/1	-	SPACE	-				--	SPACE	-	20/1	42

Panel Load Analysis

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference	Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	--	--	Per NEC Article 215.2	E	Other Continuous			Per NEC Article 215.2
B	Receptacles	--	--	Per NEC Table 220.44	F	Motor	2.8	7.0	Per NEC Article 430.24
C	Air-Conditioning	--	--	Per NEC Article 440.4	G	Other Non-Continuous	16.1	16.1	Per NEC Article 210.19
D	Heating	--	--	Per NEC Article 220.51	H	Subpanels	15.6	15.6	

Phase A Connected Load	19 KVA	**TOTAL DEMAND LOAD**	**-- KVA**
Phase B Connected Load	8.2 KVA	TOTAL CONNECTED LOAD:	**34.5 KVA**
Phase C Connected Load	7.3 KVA	TOTAL FEEDER LOAD	**38.7 KVA**

NOTES:

PANEL 3506-N-L-PP1-S3F/S4F (EXISTING): DELTA SPACE

MAINS: 100/3 MCB **VOLTAGE:** 208Y/120 **WIRE:** 4 **MOUNTING:** SURFACE
BUS: 100 A **PHASE:** 3 **AIC:** 10kA **NEUTRAL BUS:** 100 % **ENCLOSURE:** NEMA 1

CKT #	TRIP POLE	LOAD TYPE	DESCRIPTION	CONNECTED LOAD KVA kVA	PH A	PH B	PH C	kVA	DESCRIPTION	LOAD TYPE	TRIP POLE	CKT #
1	20/1	B	DEDICATED RECEPTACLES	0.2	0.6-			0.4	RECEPTACLES	B	20/1	2
3	20/1	B	DEDICATED RECEPTACLES	0.2		0.6		0.4	RECEPTACLES	B	20/1	4
5	20/1	B	DEDICATED RECEPTACLES	0.2			0.6	0.4	RECEPTACLES	B	20/1	6
7	20/1	B	DEDICATED RECEPTACLES	0.2	1.0			0.8	RECEPTACLES	B	20/1	8
9	20/1	B	DEDICATED RECEPTACLES	0.2		1.0		0.8	RECEPTACLES	B	20/1	10
11	20/1	B	DEDICATED RECEPTACLES	0.2			1.0	0.8	RECEPTACLES	B	20/1	12
13	20/1	B	DEDICATED RECEPTACLES	0.2	1.0			0.8	RECEPTACLES	B	20/1	14
15	20/1	B	DEDICATED RECEPTACLES	0.2		0.4		0.2	RECEPTACLES	B	20/1	16
17	20/1	B	DEDICATED RECEPTACLES	0.2			1.4	1.2	RECEPTACLES	B	20/1	18
19	20/1	B	RECEPTACLES	0.2	1.0			0.8	RECEPTACLES	B	20/1	20
21	20/1	B	SPARE	-		0.4		0.4	RECEPTACLES	B	20/1	22
23	20/1	B	SPARE	-			0.2	0.2	RECEPTACLES	B	20/1	24
25	20/1	B	SPARE	-	0.4			0.4	RECEPTACLES	B	20/1	26
27	20/1	B	EXTERIOR RECEPTACLES	0.6		0.8		0.2	RECEPTACLES	B	20/1	28
29	20/1	B	RECEPTACLES	0.2			0.4	0.2	RECEPTACLES	B	20/1	30
31	20/1	B	RECEPTTACLES	0.4	0.8			0.4	RECEPTACLES	B	20/1	32
33	20/1	B	RECEPTACLES	0.4		1.2		0.8	RECEPTACLES	B	20/1	34
35	20/1	B	RECEPTACLES	0.4			0.8	0.4	RECEPTACLES	B	20/1	36
37	20/1	B	RECEPTACLES	0.1	0.5			0.4	RECEPTACLES	B	20/1	38
39	20/1	E	HEAT TAPE	0.6		1.4		0.8	RECEPTACLES	B	20/1	40
41	15/1	F	EXHAUST FAN EF-F3-T3	0.2			0.3	0.1	CIRCULATING PUMP	F	15/1	42

Panel Load Analysis

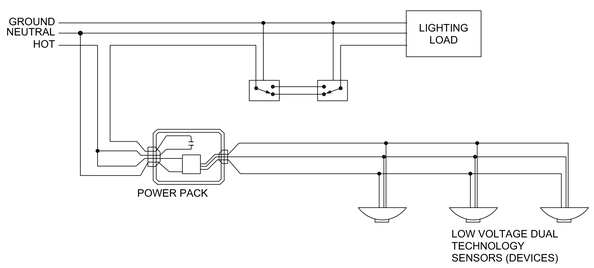
Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference	Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	--	--	Per NEC Article 215.2	E	Other Continuous			Per NEC Article 215.2
B	Receptacles	14.7	12.9	Per NEC Table 220.44	F	Motor	0.1	0.1	Per NEC Article 430.24
C	Air-Conditioning	--	--	Per NEC Article 440.4	G	Other Non-Continuous	0.3	0.6	Per NEC Article 210.19
D	Heating	--	--	Per NEC Article 220.51	H	Subpanels			

Phase A Connected Load	5.3 KVA	**TOTAL DEMAND LOAD**	**-- KVA**
Phase B Connected Load	5.6 KVA	TOTAL CONNECTED LOAD:	**15.1 KVA**
Phase C Connected Load	4.7 KVA	TOTAL FEEDER LOAD	**13.6 KVA**

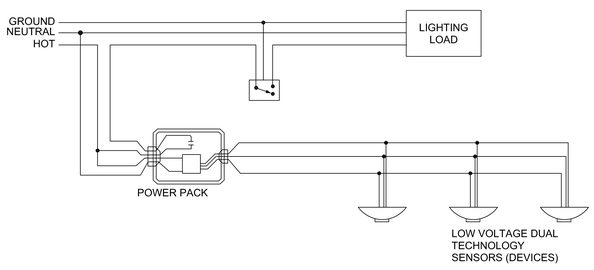
NOTES: BREAKER #39 SHALL BE A GFCI TYPE BREAKER.

NOTE:

IN EXISTING PANEL 3506-N-L-PP1-S3F/S4F, CONTRACTOR SHALL PROVIDE A 15A/1P CIRCUIT BREAKER AT POLES 41 AND 42 AND SHALL PROVIDE A GFCI TYPE CIRCUIT BREAKER AT POLE 39.



ONE CIRCUIT WITH 3-WAY SWITCHING



ONE CIRCUIT WITH SINGLE SWITCHING

DETAIL NOTES:

1. ALL SENSOR LOCATIONS ARE APPROXIMATE, REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS PRIOR TO INSTALLATION.
2. FIELD ADJUST PROPER SENSITIVITY & TIME DELAY SETTINGS, RECOMMENDED PLACEMENT, AND FIELD VERIFY NUMBER OF CIRCUITS WITHIN RESPECT TO POWER PLACEMENT.
3. FIELD VERIFY REQUIRED NUMBER OF POWER PACKS PER ROOM AS FOLLOWS:
   - ONE POWER PACK IS REQUIRED FOR EACH CIRCUIT TO BE CONTROLLED.
   - ONE POWER PACK IS REQUIRED FOR EVERY THREE SENSORS IN THE ZONE.
   - IF MULTIPLE CIRCUITS ARE TO BE CONTROLLED BY A SENSOR, AN AUXILLARY RELAY CAN BE USED IN CONJUNCTION WITH THE POWER PACK.
   - THE MAXIMUM NUMBER OF SENSORS THAT CAN BE PUT ON A POWER PACK IS TO BE REDUCED BY ONE FOR EACH SLAVE PACK USED.

1 / E502 CEILING MOUNT OCCUPANCY SENSOR LOCAL SWITCHING OVERRIDE DETAIL
N.T.S.

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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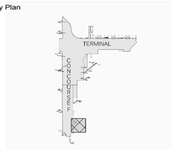
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ Reviewed by: TWP

Project No: 00.0000.00

Sheet Title

ELECTRICAL
DELTA SPACE
PANELBOARDS
& DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

E502

EXISTING PANEL 3504-N-H-LP1-S3F/S4F

MAINS: MLO | VOLTAGE: 480/277 | WIRE: 4 | MOUNTING: SURFACE
BUS: 100 A | PHASE: 3 | AIC: 35 kA | NEUTRAL BUS: 200% | ENCLOSURE: NEMA 1

CKT #	TRIP POLE	LOAD TYPE	DESCRIPTION	kVA	PH A	PH B	PH C	kVA	DESCRIPTION	LOAD TYPE	TRIP POLE	CKT #
				CONNECTED LOAD KVA								
1	20/1	A	DELTA CABIN SERV - 3515A	0.3	1.8			1.5	BUS DRIVE - 3505	A	20/1	2
3	20/1	A	DELTA GSE-3517	0.4		0.7		0.3	LINE MAINTENANCE - 3506	A	20/1	4
5	20/1	A	OUTBOUND - 3507	1.9			3.5	1.5	OUTBOUND - 3507	A	20/1	6
7	20/1	A	CORRIDOR-3502	0.3	1.5			1.2	STERILE CORR-2502 (ZONE C17)	A	20/1	8
9	20/1	A	CORRIDOR-2502 (ZONE C16)	1.3		1.3			SPACE			10
11	20/1	A	CORRIDOR-2502 (ZONE C16)	1.3			1.3		SPACE			12
13	20/1		SPARE						SPACE			14
15	20/1		SPARE						SPACE			16
17	20/1		SPARE						SPACE			18
19			SPACE						SPACE			20
21			SPACE						SPACE			22
23			SPACE						SPACE			24
25			SPACE						SPACE			26
27			SPACE						SPACE			28
29			SPACE						SPACE			30
31			SPACE						SPACE			32
33			SPACE						SPACE			34
35			SPACE						SPACE			36
37			SPACE		3.6			3.6	GATE F3A - ARRIVAL	A	20/1	38
39			SPACE			1.2		1.2	GATE F3A - ARRIVAL	A	20/1	40
41			SPACE						SPACE			42

NOTE 'b'

Panel Load Analysis

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	14.8	18.5	Per NEC Article 215.2
B	Receptacles			Per NEC Table 220.44
C	Air-Conditioning			Per NEC Article 440.4
D	Heating			Per NEC Article 220.51
E	Other Continuous			Per NEC Article 215.2
F	Motor			Per NEC Article 430.24
G	Other Non-Continuous			Per NEC Article 210.19
H	Subpanels			

Phase A Connected Load	6.9	TOTAL DEMAND LOAD	14.8	KVA
Phase B Connected Load	3.2	TOTAL CONNECTED LOAD:	14.8	KVA
Phase C Connected Load	4.8	TOTAL FEEDER LOAD	18.5	KVA

NOTES:

EXISTING PANEL 3504-S-H-LP1-S7F/S8F/S2G2F

MAINS: 50 MCB | VOLTAGE: 480/277 | WIRE: 4 | MOUNTING: SURFACE
BUS: 100 A | PHASE: 3 | AIC: 14 kA | NEUTRAL BUS: 200% | ENCLOSURE: NEMA 1

CKT #	TRIP POLE	LOAD TYPE	DESCRIPTION	kVA	PH A	PH B	PH C	kVA	DESCRIPTION	LOAD TYPE	TRIP POLE	CKT #
				CONNECTED LOAD KVA								
1	20/1	A	ELECT.(3504). BUS DRIVE (3505)	0.8	0.9			0.2	DELTA CABIN SERV - 3515A.02	A	20/1	2
3	20/1	A	ST 3502 & 2502	0.4		0.6		0.2	AIRLINE OPS - 3506	A	20/1	4
5	20/1	A	CORRIDOR-3502	0.2			0.8	0.6	OUT BOUND BAG - 3507	A	20/1	6
7	20/1	A	ST-3501	0.5	0.8			0.3	CORRIDOR-2502 (ZONE C15)	A	20/1	8
9	20/1	A	CORRIDOR-2404	0.7		2.0		1.3	CORRIDOR-2404	A	20/1	10
11	20/1	A	CORRIDOR-2404	1.2			2.1	0.9	APRON WALKWAY LIGHT	A	20/1	12
13	20/1		SPARE		1.1			1.1	APRON WALKWAY LIGHT	A	20/1	14
15	20/1		SPARE						SPACE			16
17	20/1		SPARE						SPACE			18
19	20/1		SPARE						SPACE			20
21	20/1		SPARE						SPACE			22
23	20/1		SPARE						SPACE			24
25	20/1		SPARE						SPACE			26
27	20/1		SPARE			1.8		1.8	GATE F3A - ARRIVAL	A	20/1	28
29	20/1		SPARE						SPACE			30

NOTE 'b'

Panel Load Analysis

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	10.2	12.8	Per NEC Article 215.2
B	Receptacles			Per NEC Table 220.44
C	Air-Conditioning			Per NEC Article 440.4
D	Heating			Per NEC Article 220.51
E	Other Continuous			Per NEC Article 215.2
F	Motor			Per NEC Article 430.24
G	Other Non-Continuous			Per NEC Article 210.19
H	Subpanels			

Phase A Connected Load	2.8	TOTAL DEMAND LOAD	10.2	KVA
Phase B Connected Load	4.4	TOTAL CONNECTED LOAD:	10.2	KVA
Phase C Connected Load	2.9	TOTAL FEEDER LOAD	12.8	KVA

NOTES:

EXISTING PANEL 3504 N-H-LC1-S3F/S4F

RELAY NO.	CIRCUIT	ZONE NUMBER	NOTES
1		SPARE	
2		SPARE	
3		SPARE	
4		SPARE	
5	3504-N-H-LP1-S3F/S4F-5	3BH-2	
6	3504-N-H-LP1-S3F/S4F-6	3BH-2	
7	3504-N-H-LP1-S3F/S4F-8	C17	
8	3504-S-H-LP1-S7F/S8F/S2G2F-12	AWW-1	PROVIDE FAIL SAFE N.C. RELAY
9	3504-N-H-LP1-S3F/S4F-9	C16	
10	3504-S-H-LP1-S7F/S8F/S2G2F-14	AWW-1	PROVIDE FAIL SAFE N.C. RELAY
11	3504-N-H-LP1-S3F/S4F-11	C16	
12	3504-E-H-PP1-S7F/S8F/S2G2F-25,27	AAL-1	PROVIDE 20A, 480V, 2-POLE CONTACTOR, FAIL SAFE, N.C.
13		SPARE	
14		SPARE	
15	3504-N-H-LP1-S3F/S4F-38	NOTE 'a'	
16	3504-N-H-LP1-S3F/S4F-40	NOTE 'a'	

EXISTING PANEL 4503A-N-H-LP1-S7F/S8F

MAINS: 100 MCB | VOLTAGE: 480/277 | WIRE: 4 | MOUNTING: SURFACE
BUS: 100 A | PHASE: 3 | AIC: 35 kA | NEUTRAL BUS: 200% | ENCLOSURE: NEMA 1

CKT #	TRIP POLE	LOAD TYPE	DESCRIPTION	kVA	PH A	PH B	PH C	kVA	DESCRIPTION	LOAD TYPE	TRIP POLE	CKT #
				CONNECTED LOAD KVA								
1	20/1	A	ROOM - 4501, 4502, 4503	0.3	0.4			0.1	CONCESSIONS-4506	A	20/1	2
3	20/1	A	CONCESSIONS - 4506	0.1		0.2		0.1	PUBLIC AREA LTG (ZONE D34A)	A	20/1	4
5	20/1	A	HOLD RM-4522 (ZONE D22)	1.0			2.3	1.3	HOLD RM-4522 (ZONE D24)	A	20/1	6
7	20/1	A	CORRIDOR-4523 (ZONE D26)	1.4	1.8			0.4	PUBLIC AREA LTG (ZONE D34)	A	20/1	8
9	20/1	A	PUBLIC AREA LTG (ZONE D28)	0.3		0.8		0.5	PUBLIC AREA LTG (ZONE D25)	A	20/1	10
11	20/1	A	DEP GEN CIR. - 4505	0.1			0.7	0.6	HOLD ROOM - 4504 (ZONE D28)	A	20/1	12
13	20/1	A	HOLD ROOM - 4504 (ZONE D65)	0.2	0.4			0.2	DEP GEN CIR. - 4505	A	20/1	14
15	20/1	A	DEP GEN CIRC-4505 (ZONE D22)	0.9		1.6		0.8	DEP GEN CIR. - 4505(ZONE D24)	A	20/1	16
17	20/1	A	HOLD ROOM-4504 (ZONE D22)	0.6			1.3	0.7	HOLD ROOM-4504 (ZONE D24)	A	20/1	18
19	20/1	A	DEP GEN CIRC-4505 (ZONE D24)						SPACE			20
21	20/1		SPARE						SPACE			22
23	20/1		SPARE						SPACE			24
25	20/1		SPARE		0.7			0.7	GATE F3A - LIGHT	A	20/1	26
27	20/1		SPARE						SPACE			28
29	20/1		SPARE						SPACE			30
31			SPACE						SPACE			32
33			SPACE						SPACE			34
35			SPACE						SPACE			36
37			SPACE						SPACE			38
39			SPACE						SPACE			40
41			SPACE						SPACE			42

NOTE 'b'

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	10.3	12.8	Per NEC Article 215.2
B	Receptacles			Per NEC Table 220.44
C	Air-Conditioning			Per NEC Article 440.4
D	Heating			Per NEC Article 220.51
E	Other Continuous			Per NEC Article 215.2
F	Motor			Per NEC Article 430.24
G	Other Non-Continuous			Per NEC Article 210.19
H	Subpanels			

Phase A Connected Load	3.3	TOTAL DEMAND LOAD	10.3	KVA
Phase B Connected Load	2.6	TOTAL CONNECTED LOAD:	10.3	KVA
Phase C Connected Load	4.4	TOTAL FEEDER LOAD	12.8	KVA

LOCATION:

EXISTING PANEL 4503A-S-H-LP1-S7F/S8F/S2G2F

MAINS: 50 MCB | VOLTAGE: 480/277 | WIRE: 4 | MOUNTING: SURFACE
BUS: 100 A | PHASE: 3 | AIC: 14 kA | NEUTRAL BUS: 200% | ENCLOSURE: NEMA 1

CKT #	TRIP POLE	LOAD TYPE	DESCRIPTION	kVA	PH A	PH B	PH C	kVA	DESCRIPTION	LOAD TYPE	TRIP POLE	CKT #
				CONNECTED LOAD KVA								
1	20/1	A	ROOM - 4501, 4502, 4503	0.6	0.7			0.1	INTERVIEW - 4502A	A	20/1	2
3	20/1	A	CONCESSIONS - 4506	0.1		0.1		0.1	INTERVIEW - 4521A	A	20/1	4
5	20/1	A	PUBLIC AREA LTG (ZONE D23)	2.8			4.0	1.2	PUBLIC AREA LTG (ZONE D27)	A	20/1	6
7	20/1	A	CORRIDOR ELEV - 4502	0.1	1.3			1.2	GENERAL CIRC. (ZONE D23)	A	20/1	8
9	20/1	A	HOLD ROOM - 4504 (ZONE D23)	0.8		0.8			SPACE			10
11	20/1		SPARE						SPACE			12
13	20/1		SPARE						SPACE			14
15	20/1		SPARE			1.7		1.7	GATE F3A - LIGHT	A	20/1	16
17	20/1		SPARE						SPACE			18
19	20/1		SPARE						SPACE			20
21	20/1		SPARE						SPACE			22
23	20/1		SPARE						SPACE			24
25			SPACE						SPACE			26
27			SPACE						SPACE			28
29			SPACE						SPACE			30

NOTE 'b'

Panel Load Analysis

Load Type	Description	Conn. KVA	Feeder KVA	2005 NEC Reference
A	Lighting	8.5	10.6	Per NEC Article 215.2
B	Receptacles			Per NEC Table 220.44
C	Air-Conditioning			Per NEC Article 440.4
D	Heating			Per NEC Article 220.51
E	Other Continuous			Per NEC Article 215.2
F	Motor			Per NEC Article 430.24
G	Other Non-Continuous			Per NEC Article 210.19
H	Subpanels			

Phase A Connected Load	1.9	TOTAL DEMAND LOAD	8.5	KVA
Phase B Connected Load	2.6	TOTAL CONNECTED LOAD:	8.5	KVA
Phase C Connected Load	4.0	TOTAL FEEDER LOAD	10.6	KVA

NOTES:

EXISTING PANEL 4503A-N-H-LC1-S7F/S8F

RELAY NO.	CIRCUIT	ZONE NUMBER	NOTES
1		SPARE	
2		SPARE	
3		SPARE	
4		SPARE	
5	4503A-N-H-LP1-S7F/S8F-5	D22	
6	4503A-N-H-LP1-S7F/S8F-6	D24	
7	4503A-N-H-LP1-S7F/S8F-7	D26	
8	4503A-N-H-LP1-S7F/S8F-8	D34	
9	4503A-N-H-LP1-S7F/S8F-9	D28	
10	4503A-N-H-LP1-S7F/S8F-10	D25	
11		SPARE	
12	4503A-N-H-LP1-S7F/S8F-12	D28	
13	4503A-N-H-LP1-S7F/S8F-13	D65	
14		SPARE	
15	4503A-N-H-LP1-S7F/S8F-15	D22	
16	4503A-N-H-LP1-S7F/S8F-16	D24	
17	4503A-N-H-LP1-S7F/S8F-17	D22	
18	4503A-N-H-LP1-S7F/S8F-18	D24	
19	4503A-N-H-LP1-S7F/S8F-19	D24	
20		SPARE	
21		SPARE	
22		SPARE	
23		SPARE	
24		SPARE	
25		SPACE	
26	4503A-N-H-LP1-S7F/S8F-26	NOTE 'a'	
27		SPACE	
28		SPACE	
29		SPACE	
30		SPACE	

COM*check* Software Version 4.0.0

Interior Lighting Compliance Certificate

Section 1: Project Information

Energy Code: **2009 IECC**
Project Type: **New Construction**

Construction Site:
Atlanta , GA

Owner/Agent:
Hartsfield Jackson Atlanta International Airport
Atlanta , GA

Designer/Contractor:
Tim Pullin
Davis Pullin Associates
1513 East Cleveland Ave
Building 100A, Suite 205
Atlanta, GA 30344
404.763.1040

Section 2: Interior Lighting and Power Calculation

A Area Category	B Floor Area (ft2)	C Allowed Watts / ft2	D Allowed Watts (B x C)
Line Maintenance shop (Transportation)	1825	1	1825
Stair/Escalator (Transportation)	835	1	835
Ramp OPS space (Transportation)	529	1	529
Elev Equip Rm (Transportation)	63	1	63
Airport Equip Rm (Transportation)	77	1	77
Departures Platform (Transportation)	653	1	653
Egress Stair (Transportation)	243	1	243
Elevator (Transportation)	74	1	74
Ticket podium (Transportation)	79	1	79
vestible (Transportation)	168	1	168
restroom (Transportation)	50	1	50
shower (Transportation)	58	1	58
Ops Manager (Transportation)	125	1	125
Elec closet (Transportation)	31	1	31
Departures Corridor - South (Transportation)	404	1	404
Departures Corridor - North (Transportation)	525	1	525
Arrivals Corridor (Transportation)	1982	1	1982
Ops Manager (Transportation)	124	1	124
janitor (Transportation)	19	1	19
		Total Allowed Watts =	7864

Section 3: Interior Lighting Fixture Schedule

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Line Maintenance shop (Transportation 1825 sq.ft.)				
Linear Fluorescent 1: AB: 48" T8 32W: Electronic:	2	4	61	244
Linear Fluorescent 2: B2: 48" T8 32W: Electronic:	2	6	61	366
Stair/Escalator (Transportation 835 sq.ft.)				
Linear Fluorescent 3: FA2: 48" T8 32W: Electronic:	2	14	61	854
Linear Fluorescent 4: FA11: 48" T8 32W: Electronic:	2	6	61	366
Ramp OPS space (Transportation 529 sq.ft.)				
Linear Fluorescent 5: D: 48" T8 32W: Electronic:	2	12	61	732
Elev Equip Rm (Transportation 63 sq.ft.)				
Linear Fluorescent 6: B2: 48" T8 32W: Electronic:	2	2	61	122
Airport Equip Rm (Transportation 77 sq.ft.)				
Linear Fluorescent 7: AC: 48" T8 32W: Electronic:	2	1	61	61
Departures Platform (Transportation 653 sq.ft.)				
Linear Fluorescent 8: FD12: 48" T8 32W: Electronic:	2	18	61	1098
Egress Stair (Transportation 243 sq.ft.)				
Linear Fluorescent 9: H: 48" T8 32W: Electronic:	2	5	61	305
Ticket podium (Transportation 79 sq.ft.)				
Elevator (Transportation 74 sq.ft.)				
Compact Fluorescent 1: P: Twin Tube 24/28/27W: Electronic:	1	4	32	128
vestible (Transportation 168 sq.ft.)				
Linear Fluorescent 10: AB: 48" T8 32W: Electronic:	2	2	61	122
restroom (Transportation 50 sq.ft.)				
Linear Fluorescent 11: AC: 48" T8 32W: Electronic:	2	1	61	61
shower (Transportation 58 sq.ft.)				
Linear Fluorescent 12: 48" T8 32W: Electronic:	2	1	61	61
Ops Manager (Transportation 125 sq.ft.)				
Linear Fluorescent 13: AB: 48" T8 32W: Electronic:	2	2	61	122
Elec closet (Transportation 31 sq.ft.)				
Linear Fluorescent 15: B2: 48" T8 32W: Electronic:	2	1	61	61
Departures Corridor - South (Transportation 404 sq.ft.)				
Linear Fluorescent 16: 36" T8 25W: Electronic:	2	5	44	220
Departures Corridor - North (Transportation 525 sq.ft.)				
Linear Fluorescent 17: FD12: 48" T8 32W: Electronic:	2	6	61	366
Arrivals Corridor (Transportation 1982 sq.ft.)				
Linear Fluorescent 18: FA2: 48" T8 32W: Electronic:	2	34	61	2074
Compact Fluorescent 2: FA7: Twin Tube 50W: Electronic:	1	2	52	104
Ops Manager (Transportation 124 sq.ft.)				
Linear Fluorescent 14: AB: 48" T8 32W: Electronic:	2	2	61	122
janitor (Transportation 19 sq.ft.)				
Linear Fluorescent 19: B2: 48" T8 32W: Electronic:	2	1	61	61
			Total Proposed Watts =	7650

Section 4: Requirements Checklist

Interior Lighting PASSES. Design 3% better than code.

Lighting Wattage:

☐ 1. Total proposed watts must be less than or equal to total allowed watts.

Allowed Watts	Proposed Watts	Complies
7864	7650	YES

LEGEND NOTES (APPLY THIS DRAWING ONLY

a. CONTRACTOR SHALL COORDINATE WITH THE HJAIA PROJECT MANAGER WHAT ZONE THIS RELAY WILL BE ASSIGNED TO. CONTRACTOR SHALL PROVIDE A NEW RELAY AT THIS LOCATION.

b. CONTRACTOR SHALL PROVIDE A NEW 20A/1P CIRCUIT BREAKER AT THIS LOCATION.

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p
Hartsfield Jackson + Partnership
191 Peachtree Street, NE
Suite 2250
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STANLEY, LOVE-STANLEY P.C.
1056 SPRING STREET, N.W.
ATLANTA, GA 30309-3818
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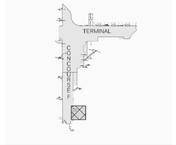
F: (404) 876-6841

Key Plan



Professional Seals

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1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: JEJ | Reviewed by: TWP

Project No: 00.0000.00

Sheet Title

ELECTRICAL
EXISTING
PANELBOARDS
& DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

E503

COMMUNICATIONS LEGEND

NOTES:
1. ALL SYMBOLS ARE NOT NECESSARILY USED ON THESE PLANS.
2. ALL MOUNTING HEIGHTS ARE TO CENTERLINE OF ALL DEVICES AND EQUIPMENT UON.
3. IN GENERAL, SYMBOLS SHOWN WITH LIGHT LINES DENOTE EXISTING WORK, SYMBOLS SHOWN WITH HEAVY LINES DENOTE NEW WORK.

PUBLIC ADDRESS

SPEAKER TYPE (SEE BELOW & SPECIFICATIONS)
- 'A' - 4" (100mm) ROUND CEILING
- 'B' - 8" (200mm) ROUND CEILING
- 'C' - 12" (300mm) ROUND CEILING

S A ##### # — PUBLIC ADDRESS LAY-IN SPEAKER
- PA ZONE
- INITIAL TAP

S A ##### # — EXISTING PUBLIC ADDRESS LAY-IN SPEAKER

SPEAKER TYPE (SEE BELOW & SPECIFICATIONS)
- 'A' -
- 'B' -
- 'C' -

S A ##### # — PUBLIC ADDRESS WALL SPEAKER
- PA ZONE
- INITIAL TAP

S A ##### # — EXISTING PUBLIC ADDRESS WALL SPEAKER

M ### C
- UNIQUE IDENTIFIER
- PUBLIC ADDRESS MICROPHONE
- TYPE (SEE BELOW & SPECIFICATIONS)
  - 'C' - COUNTER MICROPHONE STATION (4 - BUTTON)
  - 'D' - DESKTOP MICROPHONE STATION (12 - BUTTON)
  - 'S' - SLAVE MICROPHONE STATION
  - 'W' - WALL-MOUNTED MICROPHONE STATION (4 - BUTTON), 4'-6" (1370mm) AFF

M ### C — EXISTING PUBLIC ADDRESS MICROPHONE

CONDUIT AND RACEWAY

- CONDUIT RUN CONCEALED IN CEILING OR WALL CONSTRUCTION
- CONDUIT RUN IN FLOOR CONSTRUCTION OR UNDERGROUND DUCTBANK
- CONDUIT RUN EXPOSED
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- FLEXIBLE CONDUIT
- CONDUIT CAPPED FOR FUTURE.
- HOMERUN TO COMM ROOM. NO CONDUIT SIZE DENOTES 1".
- COMMUNICATION CABLE TRAY - REFER TO PLANS FOR SIZE

EVIDS

GIDS X — GIDS DISPLAY
X-##.##.##
- TYPE - SEE GIDS DETAILS
- SEQUENTIAL NUMBER
- SECTOR/AREA NUMBER
- BUILDING FLOOR/LEVEL NUMBER
- FACILITY IDENTIFICATION AS NOTED:
  - A - XXXXXX
  - B - XXXXXX
  - C - XXXXXX

IPX — IP EXTENDER

VX — VGA EXTENDER

WIRELESS

WAP X — WIRELESS ACCESS POINT
- ANTENNA TYPE
  - A - TBD
  - B - TBD
  - C - TBD
  - D - TBD

WAP X — WIRELESS ACCESS POINT - EXISTING

M X — DAS ANTENNA
- ANTENNA TYPE
  - 1 - CELLULAR, 700 MHZ, WIMAX
  - 2 - 1900 MHZ, 700 MHZ, WIMAX
  - 3 - 800 MHZ PUBLIC SAFETY / SMR, AWS

R — REMOTE ACCESS UNIT

JUNCTION AND PULL BOXES

- J — JUNCTION BOX
- P — PULL BOX
- MH — MAINTENANCE HOLE
- H — HAND HOLE

DRAWING REFERENCES

- DETAIL NUMBER
- PLAN DETAIL REFERENCE TITLE
- DRAWING NUMBER
- SECTION NUMBER
- SECTION REFERENCE TITLE
- DRAWING NUMBER
- 1 — KEYED NOTE DESIGNATION
- XXXX — ROOM NUMBER
- NORTH ARROW
- X — DRAWING REVISION

STRUCTURED CABLING

- PORT QUANTITY
- # — IMO TYPE CONFIGURATION
- INFORMATION MEDIA OUTLET

MOUNTING INFORMATION
- SURFACE MOUNT (18"AFF UNLESS NOTED OTHERWISE
- FLOOR MOUNT
- SUB-FLOOR MOUNT
- CEILING MOUNT
- ABOVE CEILING MOUNT

- OPEN FRAME RELAY RACK
- WORKING CLEARANCE TYPICAL
- FLOOR MOUNTED ENCLOSED EQUIPMENT CABINET
- FILL INDICATES CABINET FRONT
- WALL MOUNTED ENCLOSED EQUIPMENT CABINET
- FILL INDICATES CABINET FRONT
- WORKING CLEARANCE TYPICAL
- TMGB — TELECOMMUNICATIONS MAIN GROUNDING BUSBAR, +18" (450mm) AFF
- TGB — TELECOMMUNICATIONS GROUNDING BUSBAR, +18" (450mm) AFF
- BACKBOARD, 3/4" (18mm) THICK PLYWOOD, WIDTH AS SHOWN X 8' (2440mm) HIGH UNLESS OTHERWISE NOTED

TELEPHONE

- T — TELEPHONE DEVICE-VOIP DESKTOP
- T X-X — TELEPHONE DEVICE-VOIP WALL
- T X-X — TELEPHONE DEVICE-DESKTOP EXISTING
- T X-X — TELEPHONE DEVICE-WALL EXISTING

CUPPS

CUPPS — CUPPS WORKSTATION

ABBREVIATIONS

A	-	AMPERE
ACS	-	ACCESS CONTROL SYSTEM
ADA	-	AMERICANS WITH DISABILITIES ACT
AFF	-	ABOVE FINISHED FLOOR
AMP	-	AMPLIFIER
ATB	-	AUTOMATED TICKET AND BOARDING PASS PRINTER
A/V	-	AUDIO/VISUAL
AWG	-	AMERICAN WIRE GAUGE
BGR	-	BOARDING GATE READER WITH RECEIPT PRINTER
BMS	-	BALANCED MAGNETIC SWITCH
BMS	-	BUILDING MANAGEMENT SYSTEM
BIDS	-	BAGGAGE INFORMATION DISPLAY SYSTEM
C	-	CONDUIT
CAT	-	CATEGORY
CATV	-	COMMUNITY ACCESS TELEVISION
CBP	-	CUSTOMS AND BORDER PATROL
CCTV	-	CLOSED CIRCUIT TELEVISION
COMM	-	COMMUNICATIONS
CPU	-	CENTRAL PROCESSING UNIT
CR	-	CARD READER
CUTE	-	COMMON USE TERMINAL EQUIPMENT
CUPPS	-	COMMON USE PASSENGER PROCESSING SYSTEMS
DCP	-	DOCUMENT CONTROL PRINTER
DDC	-	DISPLAY DEVICE CONTROLLER
DEMO	-	DEMOLISH
DN	-	DOWN
DVR	-	DIGITAL VIDEO RECORDING
DWG	-	DRAWING
EA	-	EACH
ELEC	-	ELECTRIC/ELECTRICAL
ELEV	-	ELEVATOR
EMER	-	EMERGENCY
EMT	-	ELECTRICAL METALLIC TUBING
EQ	-	EQUALIZER
EVIDS	-	ELECTRONIC VISUAL INFORMATION DISPLAY SYSTEM
FA	-	FIRE ALARM
FACP	-	FIRE ALARM CONTROL PANEL
FIDS	-	FLIGHT INFORMATION DISPLAY SYSTEM
FO	-	FIBER OPTIC
GC	-	GENERAL CONTRACTOR
GIDS	-	GATE INFORMATION DISPLAY SYSTEM
GND	-	GROUND
GRS	-	GALVANIZED RIGID STEEL
HH	-	HANDHOLE
IC	-	INTERCOM
IDF	-	INTERMEDIATE DISTRIBUTION FRAME
IFP	-	INTELLIGENT FIELD PANEL
IMC	-	INTERMEDIATE METAL CONDUIT
IP	-	INTERNET PROTOCOL
IPTV	-	INTERNET PROTOCOL TELEVISION
I/P	-	INPUT
IR	-	INFRA RED
KP	-	KEYPAD
KVM	-	KEYBOARD/VIDEO/MOUSE UNIT
LAN	-	LOCAL AREA NETWORK
LCD	-	LIQUID CRYSTAL DISPLAY
LED	-	LIGHT EMITTING DIODE
LVL	-	LEVEL
MAG	-	ELECTROMAGNETIC LOCK
MATV	-	MASTER ANTENNA TELEVISION
MCR	-	MAIN COMMUNICATIONS ROOM
MDF	-	MAIN DISTRIBUTION FRAME
MH	-	MAINTENANCE HOLE
MIC	-	MICROPHONE
MMFO	-	MULTIMODE FIBER OPTIC
MSR	-	MAGNETIC STRIPE READER
MUFIDS	-	MULTIUSER FLIGHT INFORMATION DISPLAY SYSTEM
NIC	-	NOT IN CONTRACT
NTS	-	NOT TO SCALE
NVR	-	NETWORK VIDEO RECORDER
OCR	-	OPTICAL CHARACTER READER
O/P	-	OUTPUT
PA	-	PUBLIC ADDRESS
PAZ	-	PUBLIC ADDRESS ZONE TIEBOX
PB	-	PUSH BUTTON
PBX	-	PRIVATE BRANCH EXCHANGE
PC	-	PERSONAL COMPUTER
PIR	-	PASSIVE INFRARED
PP	-	PATCH PANEL
PR	-	PAIR
PRC	-	PARKING REVENUE CONTROL
PTZ	-	PAN/TILT/ZOOM
PVC	-	POLYVINYL CHLORIDE CONDUIT
RCVR	-	RECEIVER
REX	-	REQUEST FOR EXIT
RF	-	RADIO FREQUENCY
RGS	-	RIGID GALVANIZED STEEL
RIDS	-	RAMP INFORMATION DISPLAY SYSTEM
RM	-	ROOM
RU	-	RACK MOUNTED UNIT
SHLD	-	SHIELDED (AS IN CABLE)
SIDA	-	SECURE IDENTIFICATION DISPLAY AREA
TDD	-	TELEPHONE DEVICE FOR THE HEARING IMPAIRED
SMFO	-	SINGLEMODE FIBER OPTIC
TEL	-	TELEPHONE
TYP.	-	TYPICAL
UPS	-	UNINTERRUPTIBLE POWER SUPPLY
VE	-	VOICE EVACUATION
VGA	-	VIDEO GRAPHICS ARRAY
UON	-	UNLESS OTHERWISE NOTED
USB	-	UNIVERSAL SERIAL BUS
WP	-	WEATHERPROOF
WS	-	WORKSTATION
XMTR	-	TRANSMITTER

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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Atlanta, GA 30303
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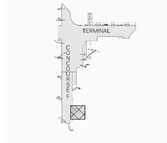
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

COMMUNICATIONS LEGEND AND ABBREVIATIONS

Original drawing is 42 x 30. Do not scale contents of this drawing.

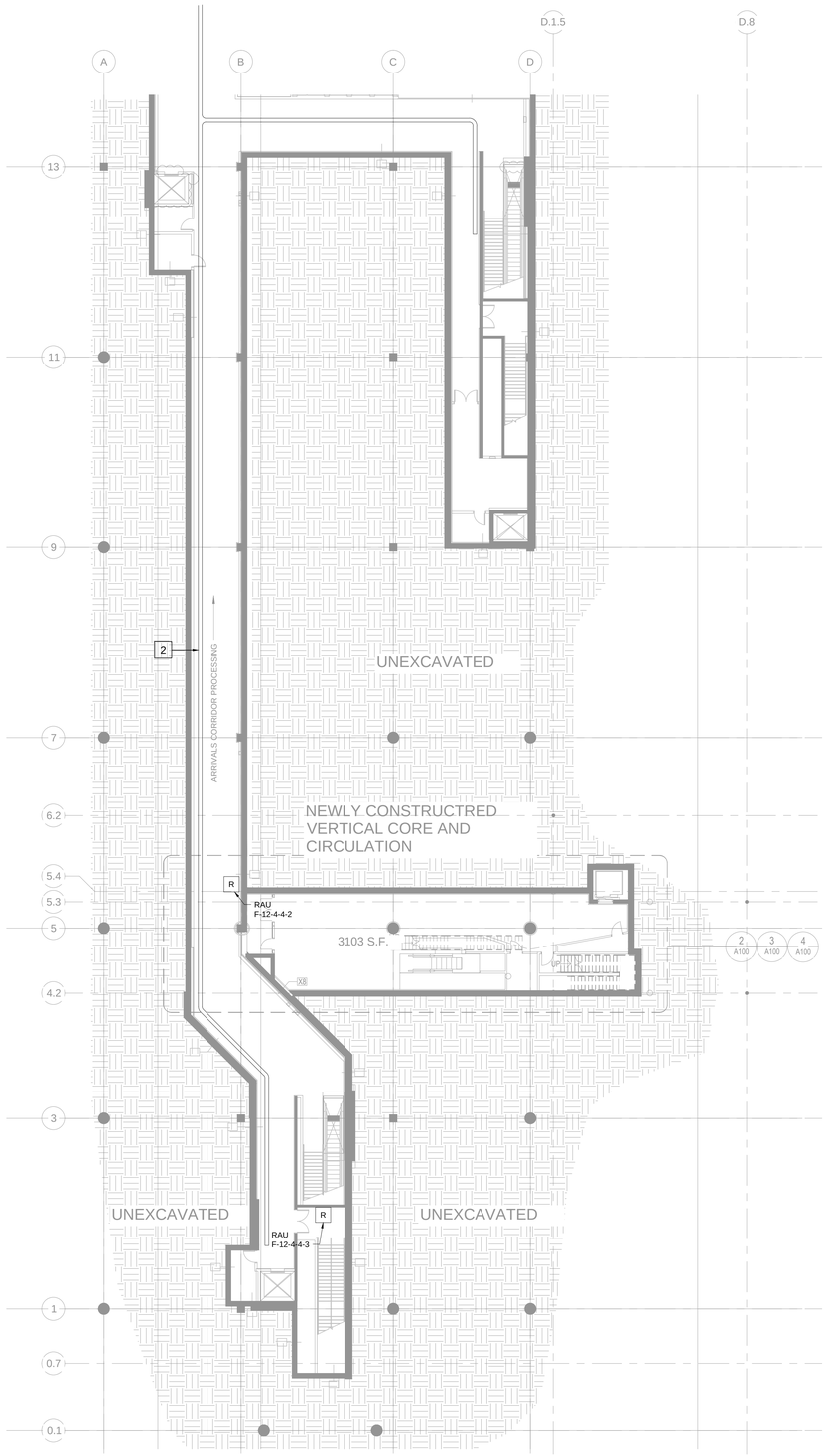
Sheet Number

T001

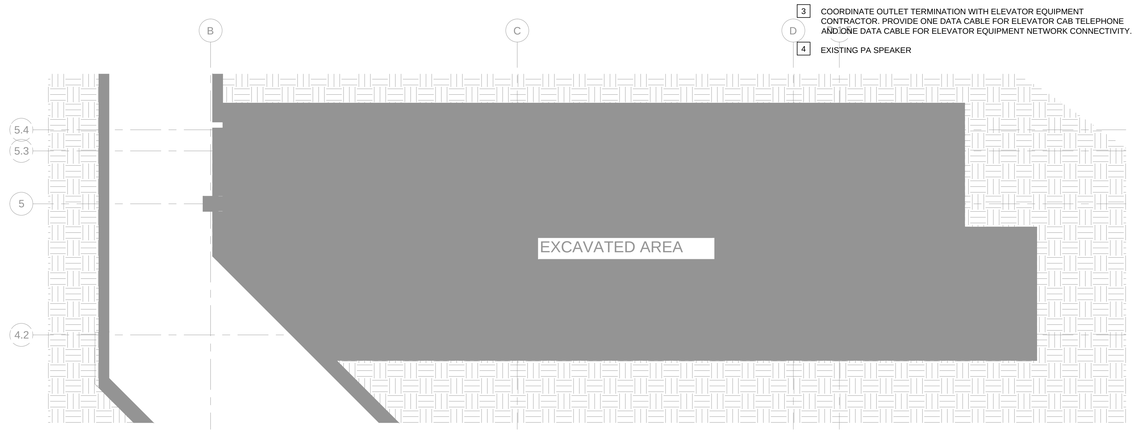
5/30/2014 10:29:30 AM

KEYED NOTES:

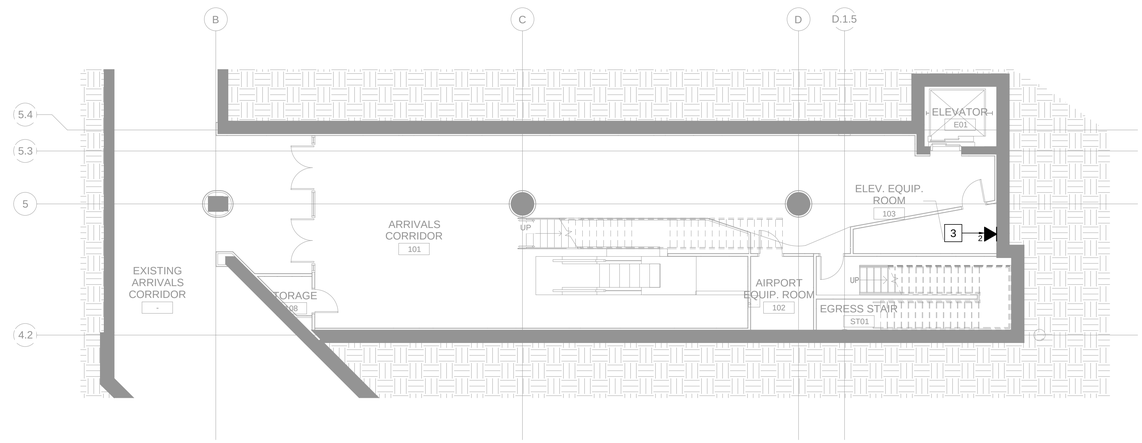
1. CONNECT NEW PA SYSTEM SPEAKERS WITH EXISTING ARRIVALS LEVEL CORRIDOR ZONE.
2. EXISTING 12" WIDE ALUMINUM CABLE TRAY.
3. COORDINATE OUTLET TERMINATION WITH ELEVATOR EQUIPMENT CONTRACTOR. PROVIDE ONE DATA CABLE FOR ELEVATOR CAB TELEPHONE AND ONE DATA CABLE FOR ELEVATOR EQUIPMENT NETWORK CONNECTIVITY.
4. EXISTING PA SPEAKER



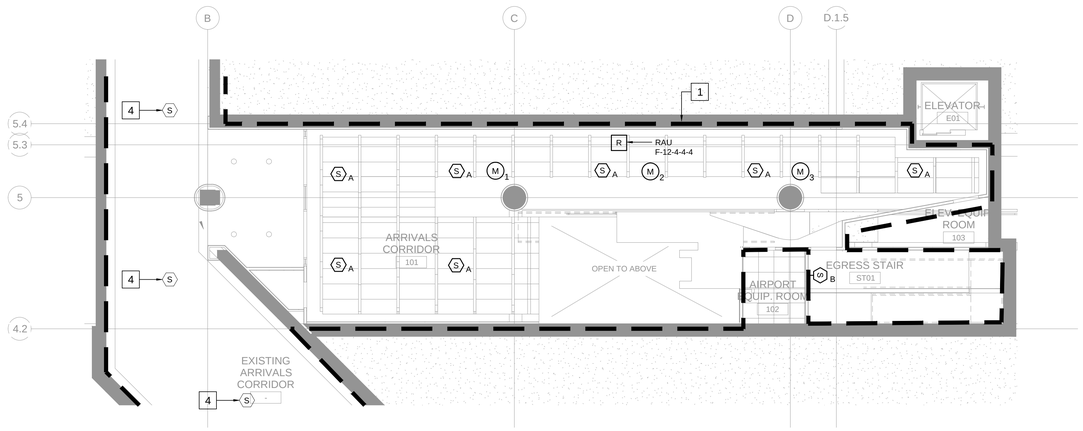
1 TELECOM OVERALL PLAN ARRIVALS LEVEL
1/16" = 1'-0"



2 TELECOM FLOOR PLAN DEMO - ARRIVALS LEVEL
1/8" = 1'-0"



3 TELECOM FLOOR PLAN - ARRIVALS LEVEL
1/8" = 1'-0"



4 TELECOM REFLECTED CEILING PLAN - ARRIVALS LEVEL
1/8" = 1'-0"

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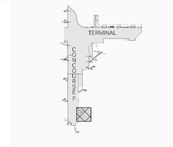
Key Plan



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2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

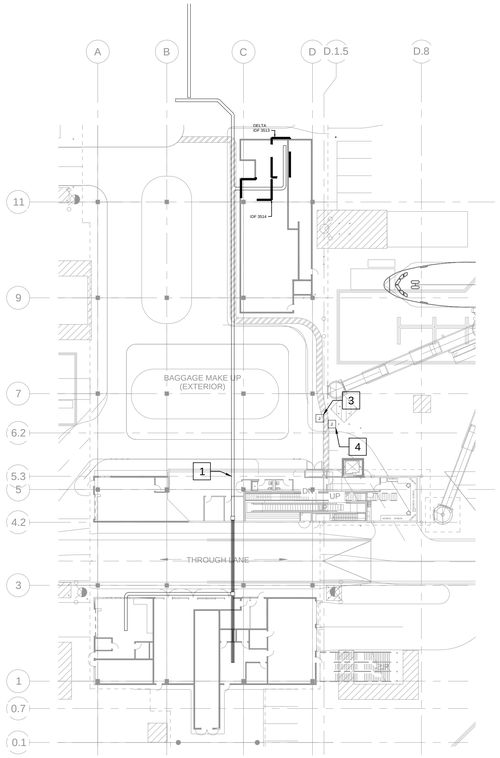
TELECOM FLOOR PLANS DEMO-PROPOSED-RCP ARRIVALS LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

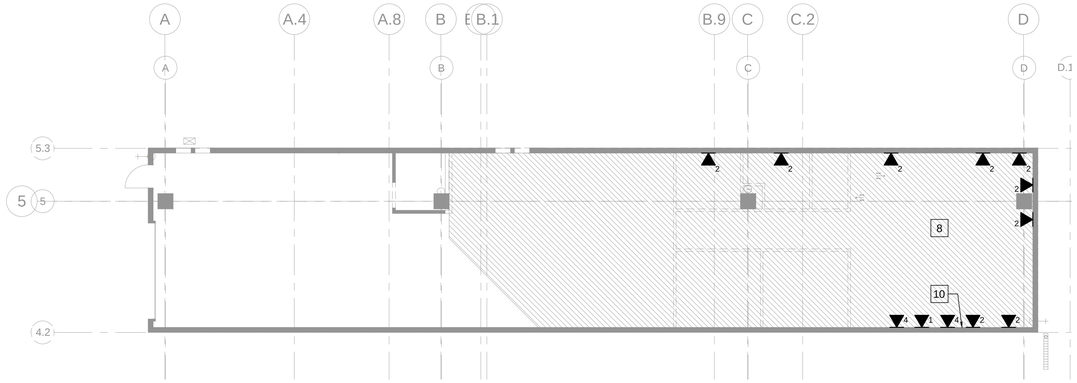
Sheet Number

T100

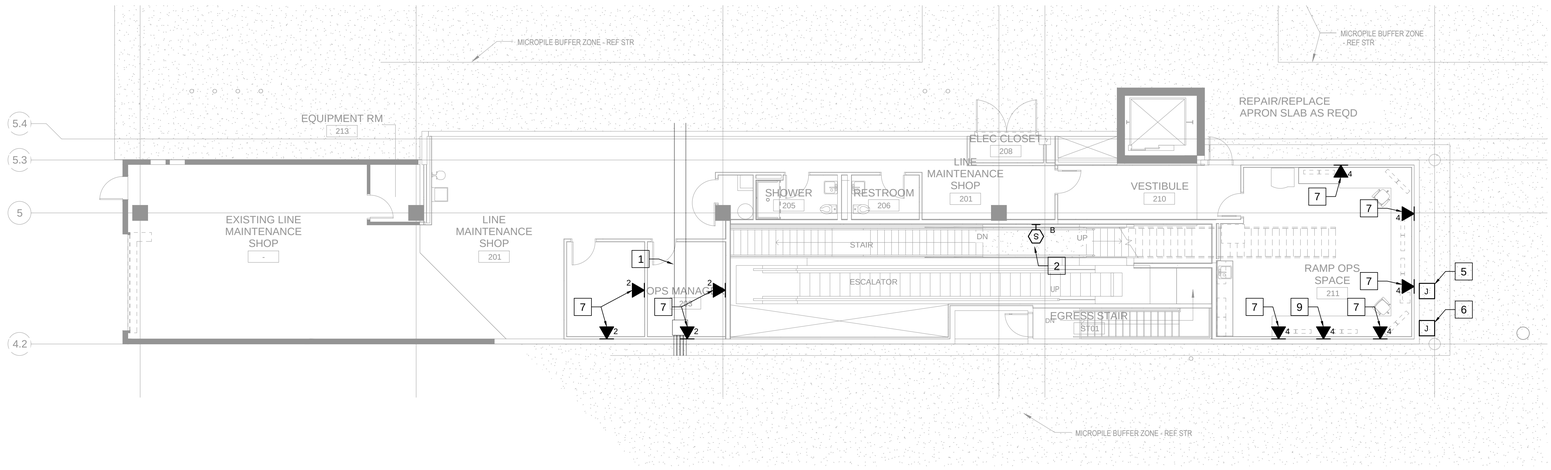
5/30/2014 10:29:30 AM



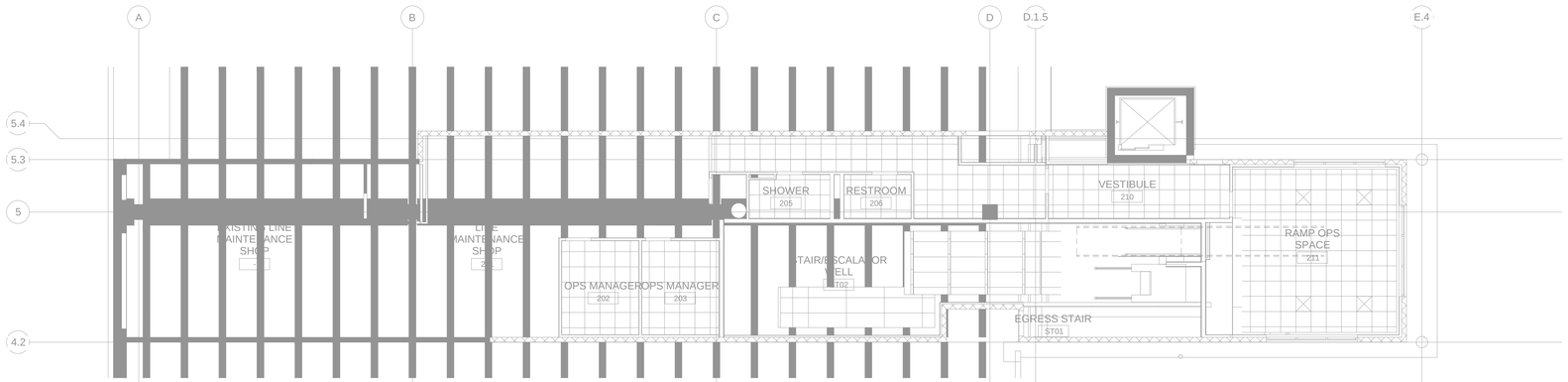
1 TELECOM OVERALL PLAN APRON LEVEL
1/32" = 1'-0"



2 TELECOM FLOOR PLAN DEMO - APRON LEVEL
1/8" = 1'-0"



3 TELECOM FLOOR PLAN - APRON LEVEL
1/8" = 1'-0"



4 TELECOM REFLECTED CEILING PLAN - APRON LEVEL
1/8" = 1'-0"

KEYED NOTES:

1. EXISTING 18" WIDE GALVANIZED STEEL CABLE TRAY. PROTECT DURING CONSTRUCTION.
2. CONNECT SPEAKERS TO ARRIVALS LEVEL PA ZONE.
3. EXISTING JUNCTION BOX FOR JET BRIDGE MONITORING. PROTECT DURING CONSTRUCTION.
4. EXISTING JUNCTION BOX FOR CONNECTION TO JET BRIDGE PHONE. PROTECT DURING CONSTRUCTION.
5. PROVIDE JUNCTION BOX FOR PASSENGER BOARDING BRIDGE MONITORING, AND 3/4" CONDUIT TO CABLE TRAY. PROVIDE (1) CAT 6 CABLE FROM JUNCTION BOX TO IDF 3514. TERMINATE CABLE ON TERMINAL STRIP WITHIN JUNCTION BOX. REFER TO SHEET C12.1.5 FOR CABLE FROM JUNCTION BOX TO PASSENGER BOARDING BRIDGE.
6. PROVIDE JUNCTION BOX FOR PASSENGER BOARDING BRIDGE PHONE, AND 3/4" CONDUIT TO CABLE TRAY. PROVIDE (1) CAT 6 CABLE FROM JUNCTION BOX TO IDF 3514. TERMINATE CABLE ON TERMINAL STRIP WITHIN JUNCTION BOX. REFER TO SHEET C12.1.5 FOR CABLE FROM JUNCTION BOX TO PASSENGER BOARDING BRIDGE.
7. PROVIDE CABLE HOMERUN TO DELTA IDF 3513. COORDINATE CABLE TERMINATIONS WITH DELTA. MOUNT OUTLET AT 18" AFF.
8. DEMO EXISTING DATA OUTLETS WITHIN HATCHED AREA AND REMOVE CABLES TO DELTA IDF. FIELD VERIFY DATA OUTLET QUANTITY AND LOCATIONS.
9. PROVIDE CABLE HOMERUN TO DELTA IDF 3513. COORDINATE CABLE TERMINATIONS WITH DELTA. MOUNT OUTLET AT 80" AFF FOR FLIGHT INFORMATION SCREENS.
10. REMOVE (3) EXISTING DELTA FLIGHT INFORMATION SCREENS AND REINSTALL AS INDICATED ON SHEET T403.

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"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

Hartsfield Jackson + Partnership
191 Peachtree Street, NE
Suite 2250
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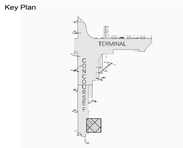
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

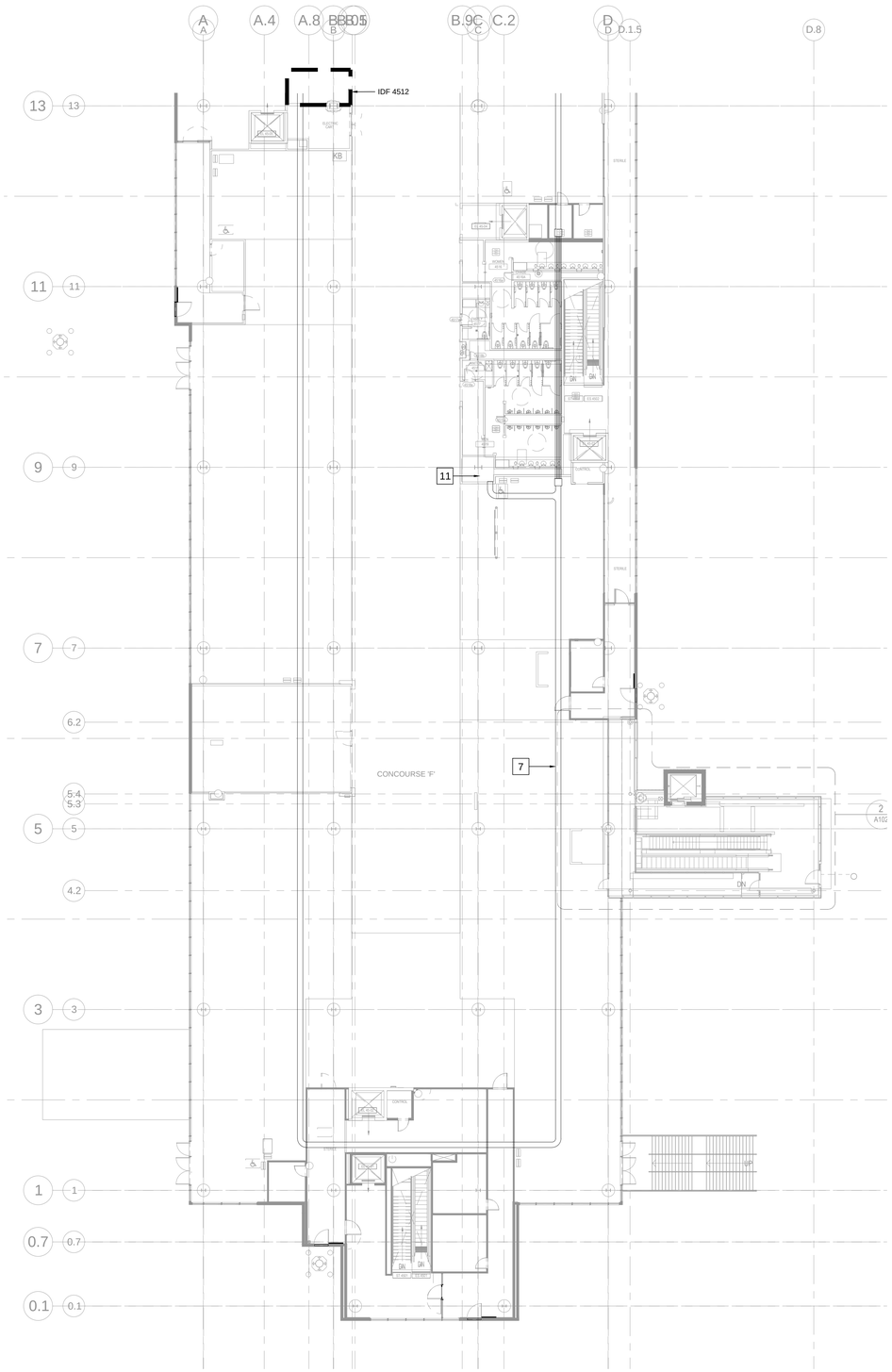
TELECOM
FLOOR PLANS
DEMO-PROPOSED-RCP
APRON LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

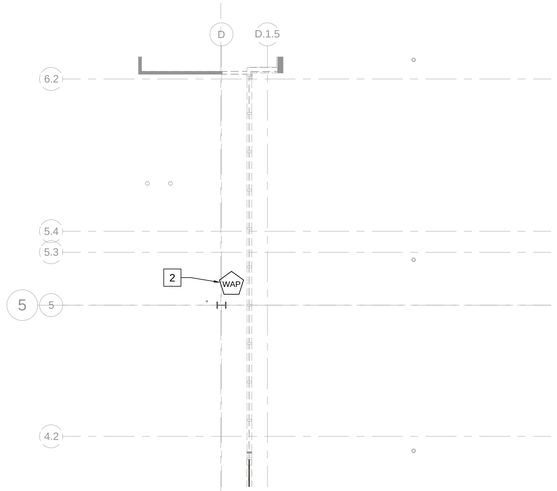
Sheet Number

T101

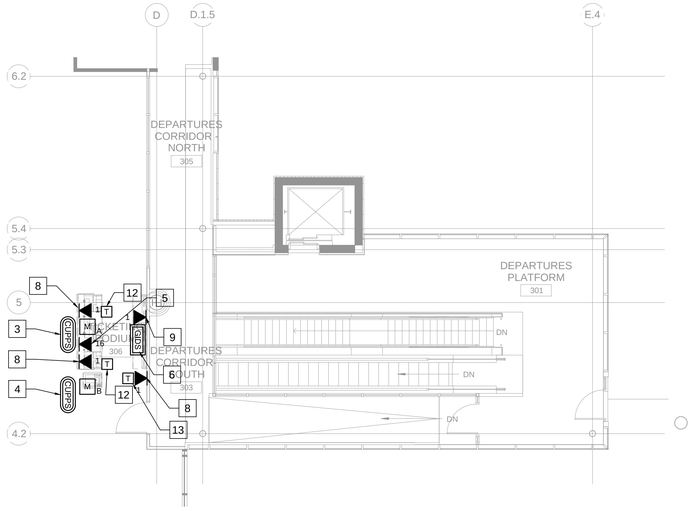
5/30/2014 10:29:30 AM



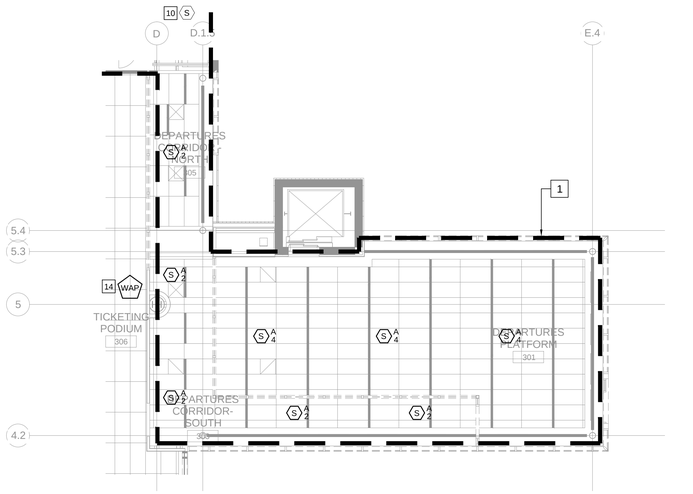
1 TELECOM OVERALL PLAN DEPARTURES LEVEL
1/16" = 1'-0"



2 TELECOM FLOOR PLAN DEMO - DEPARTURES LEVEL
1/8" = 1'-0"



3 TELECOM FLOOR PLAN - DEPARTURES LEVEL
1/8" = 1'-0"



4 TELECOM REFLECTED CEILING PLAN - DEPARTURES LEVEL
1/8" = 1'-0"

KEYED NOTES:

1. ZONE NEW PA SYSTEM SPEAKERS WITH EXISTING ARRIVALS LEVEL CORRIDOR.
2. RELOCATE WAP AND ASSOCIATED DATA CABLING TO NEW LOCATION SHOWN ON DETAIL 4.
3. CUPPS EQUIPMENT SHALL CONSIST OF:
   - (3) WORKSTATIONS (CPU AND 17" MONITOR)
   - (3) KEYBOARDS OCR/MGR
   - (2) AUTOMATIC TICKET/BOARDING PASSPRINTERS.
   - (1) BAG TAG PRINTER
   - (2) UNINTERRUPTIBLE POWER SUPPLY
   - (1) KEY SWITCH
   - (1) DOCUMENT CONTROL PRINTER (AT BACKWALL)
4. CUPPS EQUIPMENT SHALL CONSIST OF:
   - (1) BOARDING GATE READER W/RECEIPT PRINTER)
   - (1) UNINTERRUPTIBLE POWER SUPPLY
5. PROVIDE 16 PORT DATA OUTLET FOR CUPPS EQUIPMENT. ROUTE CABLES TO IDF 3514 IN 1-1/2" CONDUIT TO EXISTING CABLE TRAY.
6. GIDS EQUIPMENT SHALL CONSIST OF:
   - (1) 40" LCD DISPLAY
7. EXISTING 18" WIDE ALUMINUM CABLE TRAY
8. ROUTE CABLE TO IDF 3514 IN 3/4" CONDUIT TO EXISTING CABLE TRAY.
9. ROUTE CABLE TO IDF 4512 IN 3/4" CONDUIT TO EXISTING CABLE TRAY.
10. EXISTING PA SPEAKER. EXTEND SPEAKER CIRCUIT FROM HERE TO SPEAKERS SHOWN IN DETAIL 4.
11. CABLE CHASE TO LEVEL BELOW.
12. DESK MOUNT PHONE HANDSET.
13. WALL MOUNT PHONE HANDSET.
14. RELOCATED WAP.

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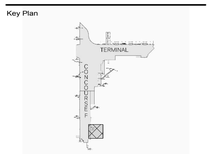

Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

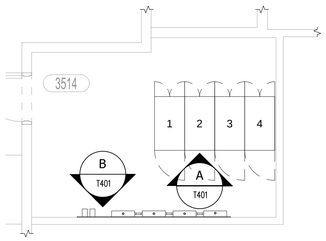
TELECOM
FLOOR PLANS
DEMO-PROPOSED-RCP
DEPARTURES LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

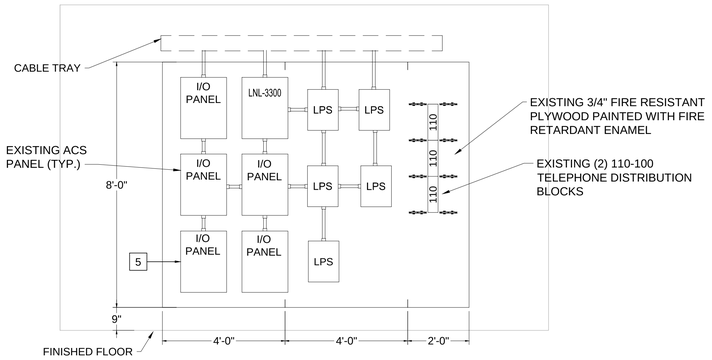
T102

5/30/2014 10:29:30 AM



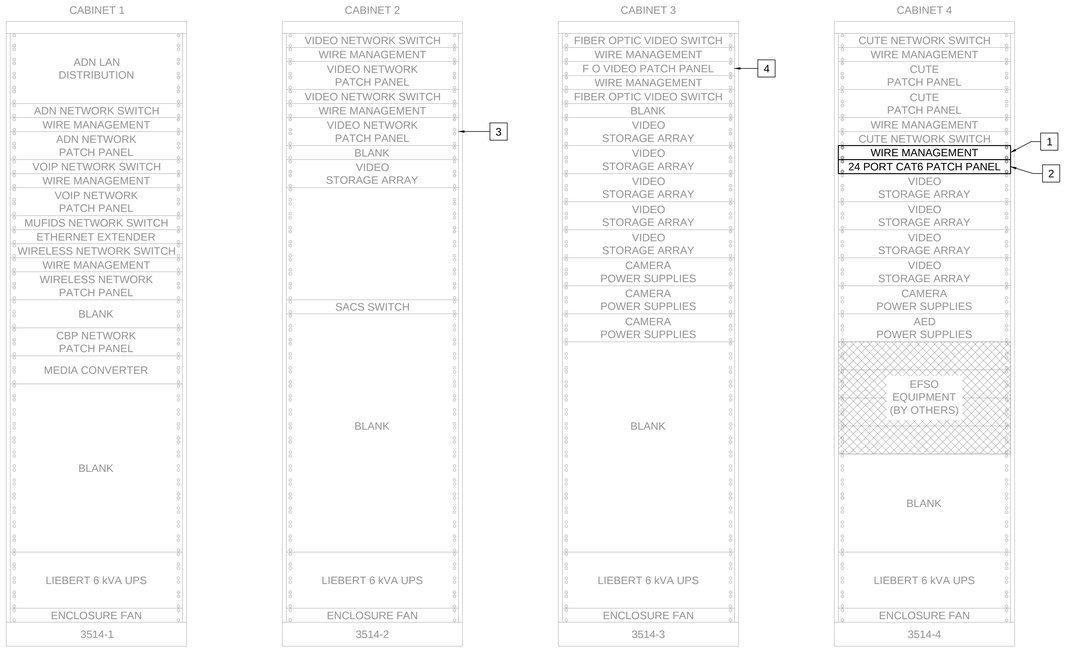
1 IDF ROOM 3514 PLAN VIEW

1/4" = 1'-0"



B IDF ROOM 3514 EAST WALL ELEVATION

1/2" = 1'-0"



A IDF ROOM 3514 RACK ELEVATION

NTS

GENERAL NOTES:

1. FIELD VERIFY EXISTING CONDITIONS. COORDINATE TERMINATIONS AND EQUIPMENT LOCATIONS WITH EXISTING EQUIPMENT.

KEYED NOTES:

1. PROVIDE 1U WIRE MANAGEMENT PANEL.
2. PROVIDE 1U 24 PORT CAT 6 PATCH PANEL. TERMINATE CUTE CAT 6 CABLES ON PATCH PANEL.
3. TERMINATE CAMERA CAT 6 CABLES ON VIDEO NETWORK PATCH PANEL. REFER TO TY DRAWINGS.
4. TERMINATE CAMERA FIBER CABLES ON FO VIDEO PATCH PANEL. REFER TO TY DRAWINGS.
5. TERMINATE ACS CABLING IN I/O PANEL.

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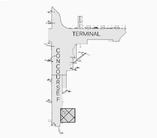

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

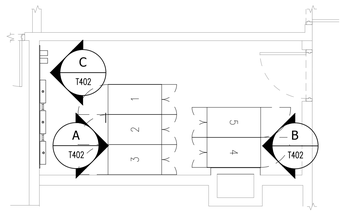
ENLARGED IDF ROOM 3514

Original drawing is 42 x 30. Do not scale contents of this drawing.

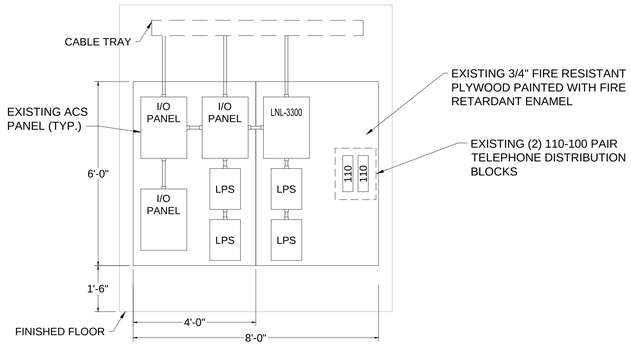
Sheet Number

T401

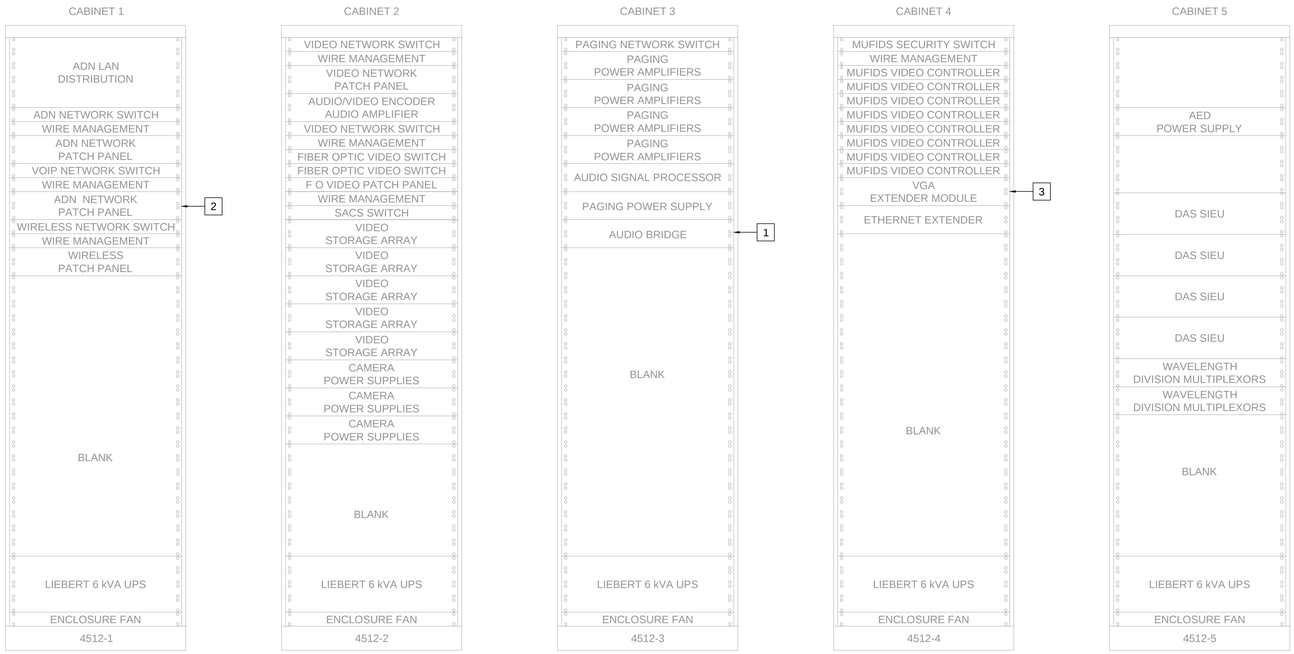
5/30/2014 10:29:30 AM



1 IDF ROOM 4512 PLAN VIEW
1/4" = 1'-0"



C IDF ROOM 4512 west WALL ELEVATION
1/2" = 1'-0"



A IDF ROOM 4512 RACK ELEVATION (FRONT)
NTS

B IDF ROOM 4512 RACK ELEVATION
NTS

GENERAL NOTES:

1. FIELD VERIFY EXISTING CONDITIONS. COORDINATE TERMINATIONS AND EQUIPMENT LOCATIONS WITH EXISTING EQUIPMENT.

KEYED NOTES:

1. TERMINATE MICROPHONE CABLING ON PA SYSTEM AUDIO BRIDGE.
2. TERMINATE TELEPHONE CAT 6 CABLES ON ADN NETWORK PATCH PANEL.
3. TERMINATE MUFIDS CAT 5e CABLE ON VGA EXTENDER MODULE.

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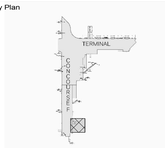

Professional Seals

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3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

ENLARGED
IDF ROOM 4512

Original drawing is 42 x 30. Do not scale contents of this drawing.

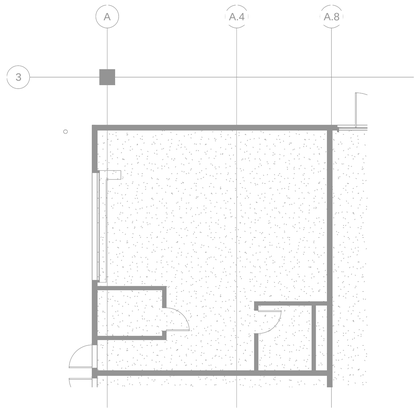
Sheet Number

T402

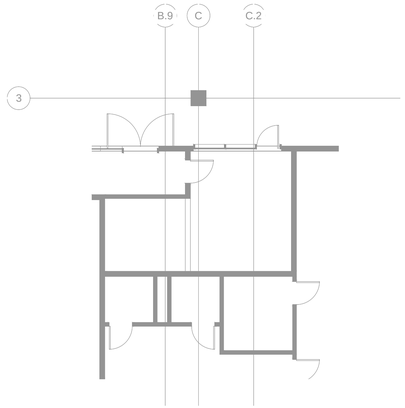
5/30/2014 10:29:30 AM

KEYED NOTES:

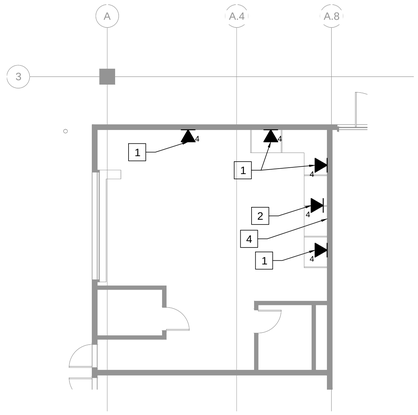
1. PROVIDE CABLE HOMERUN TO DELTA IDF ON THIS SHEET. COORDINATE CABLE TERMINATIONS WITH DELTA. MOUNT OUTLET AT 18" AFF.
2. PROVIDE CABLE HOMERUN TO DELTA IDF ON THIS SHEET. COORDINATE CABLE TERMINATIONS WITH DELTA. MOUNT OUTLET AT 80" AFF FOR FLIGHT INFORMATION SCREENS.
3. EXISTING DELTA IDF.
4. REINSTALL DELTA FLIGHT INFORMATION SCREENS.



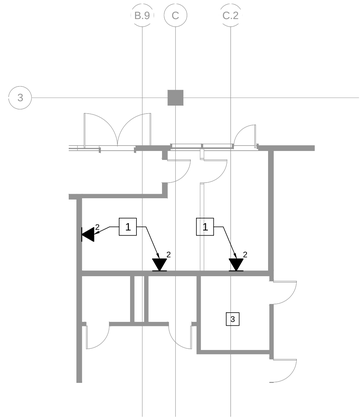
4 WEST SWING SPACE- DEMO PLAN
1/8" = 1'-0"



2 SWING SPACE- DEMO PLAN
1/8" = 1'-0"



3 WEST SWING SPACE PLAN
1/8" = 1'-0"



1 SWING SPACE PLAN
1/8" = 1'-0"

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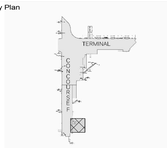

Professional Seals

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1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
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3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

TELECOM
SWING SPACE PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

T403

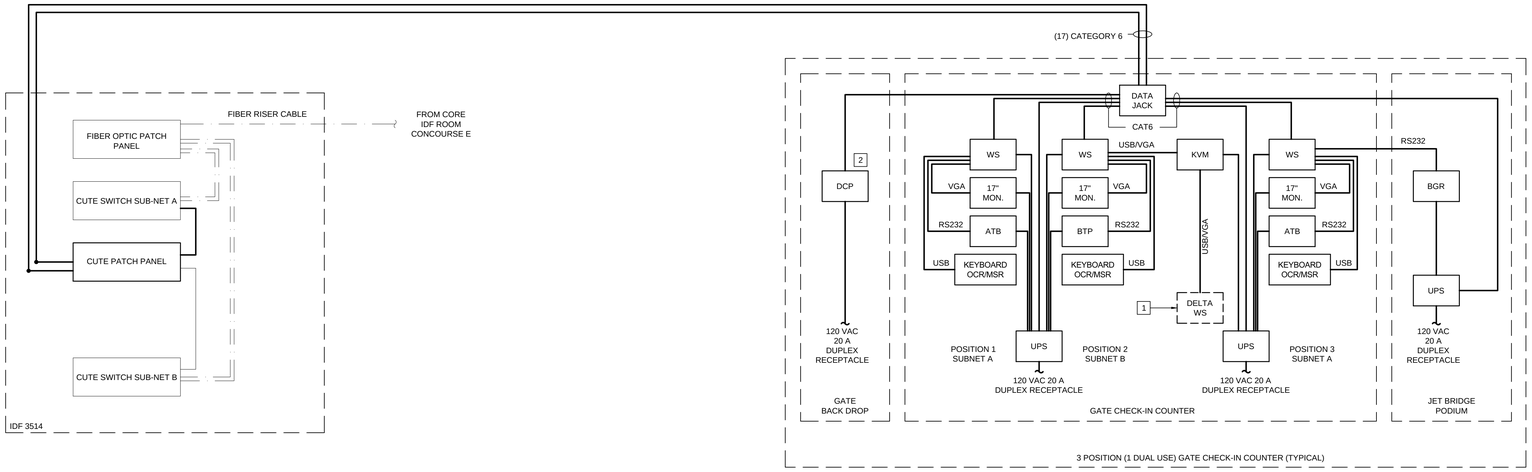
5/30/2014 10:29:30 AM

GENERAL NOTES:

1. PROVIDE ITEMS SHOWN IN DARK LINE WEIGHT. ITEMS IN LIGHT LINE WEIGHT ARE EXISTING.

KEYED NOTES:

1. PROVIDED BY AIRLINE.
2. SHARE WITH CUTE AND AIRLINE WORKSTATIONS.



1 CUPPS BLOCK DIAGRAM
NTS

CITY OF ATLANTA, GEORGIA

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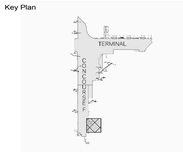


Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

CUPPS
BLOCK DIAGRAM

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

T601

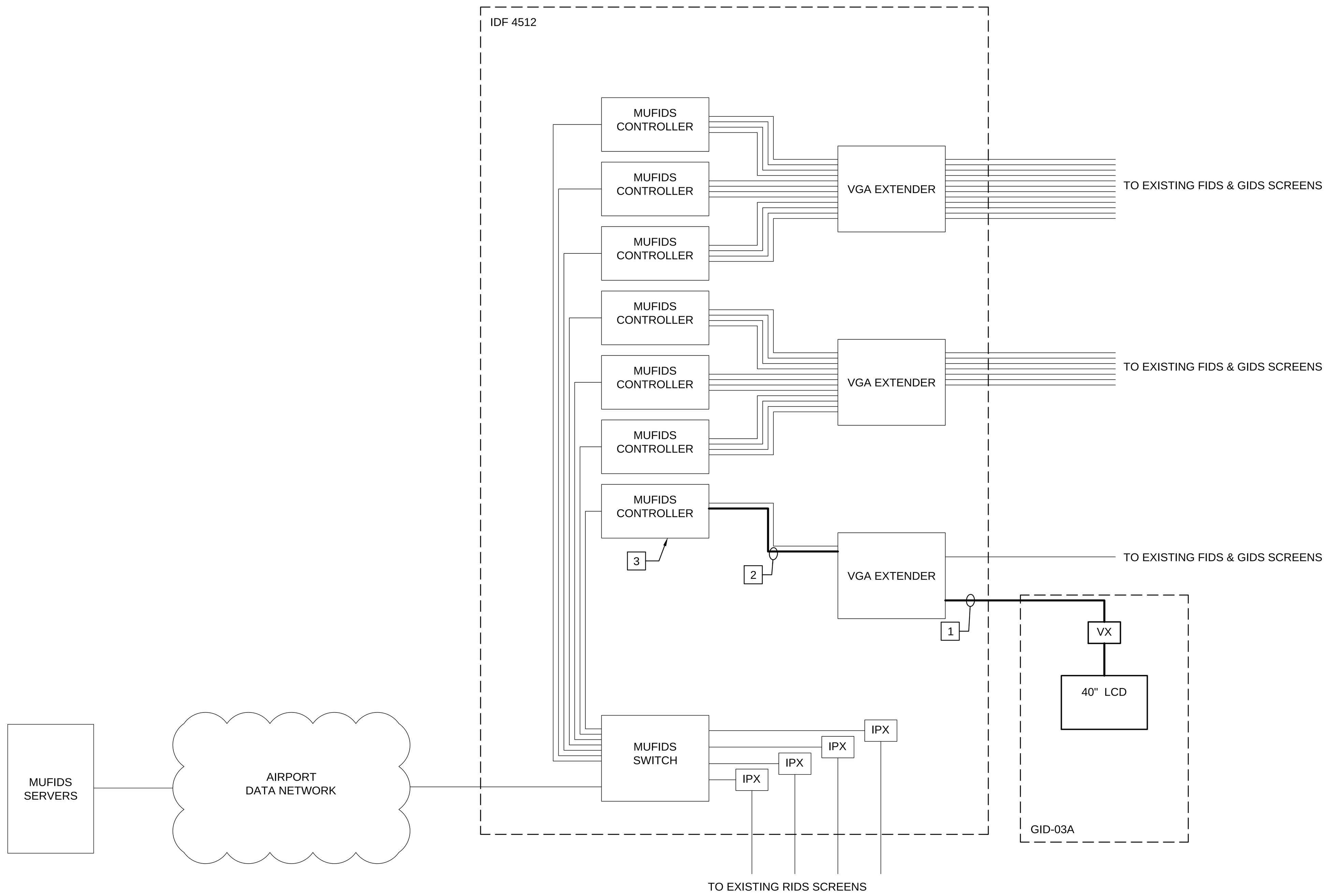
5/30/2014 10:29:30 AM

GENERAL NOTES:

1. PROVIDE ITEMS SHOWN IN DARK LINE WEIGHT. ITEMS IN LIGHT LINE WEIGHT ARE EXISTING.

KEYED NOTES:

1. CAT 5e CABLE. REFER TO FLOOR PLAN.
2. VGA CABLE.
3. PROGRAM MUFIDS CONTROLLER FOR NEW GIDS SCREEN.



1 MUFIDS BLOCK DIAGRAM
NTS

5/30/2014 10:29:30 AM

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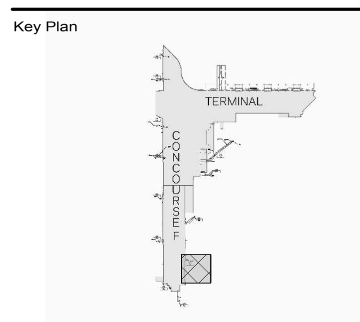

Professional Seals

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

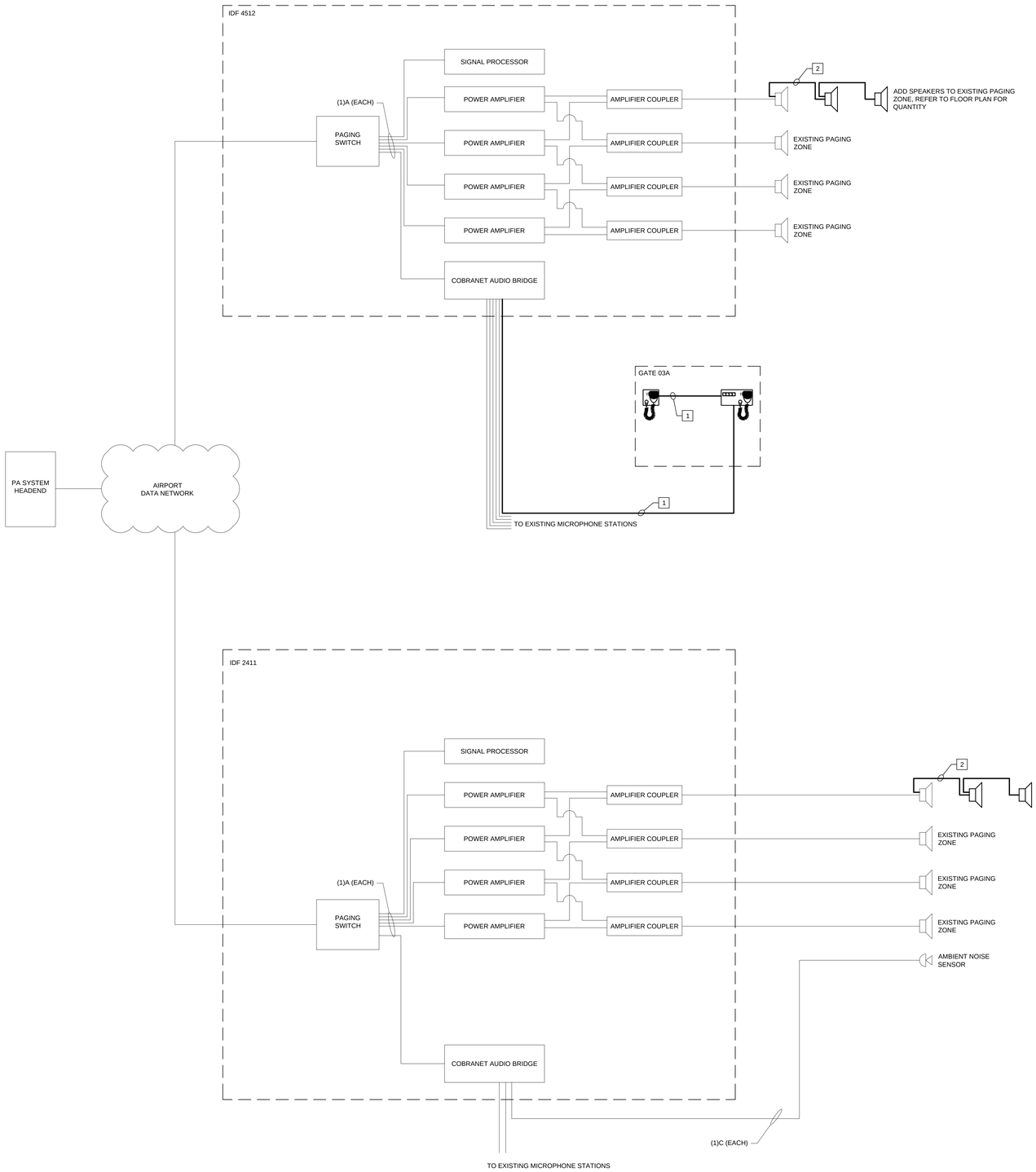
Sheet Title

MUFIDS
BLOCK DIAGRAM

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

T602



1 PUBLIC ADDRESS SYSTEM BLOCK DIAGRAM
NTS

GENERAL NOTES:

1. PROVIDE ITEMS SHOWN IN DARK LINE WEIGHT. ITEMS IN LIGHT LINE WEIGHT ARE EXISTING.

KEYED NOTES:

1. PROVIDE (3) 18AWG 2-CONDUCTOR CABLES FOR MICROPHONE.
2. PROVIDE 14AWG 2-CONDUCTOR CABLE FOR SPEAKER CIRCUIT.

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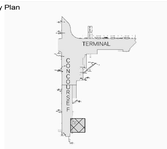

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1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
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3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

PUBLIC ADDRESS SYSTEM BLOCK DIAGRAM

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

T603

5/30/2014 10:29:30 AM

GENERAL NOTES:

1. PROVIDE ITEMS SHOWN IN DARK LINE WEIGHT. ITEMS IN LIGHT LINE WEIGHT ARE EXISTING.

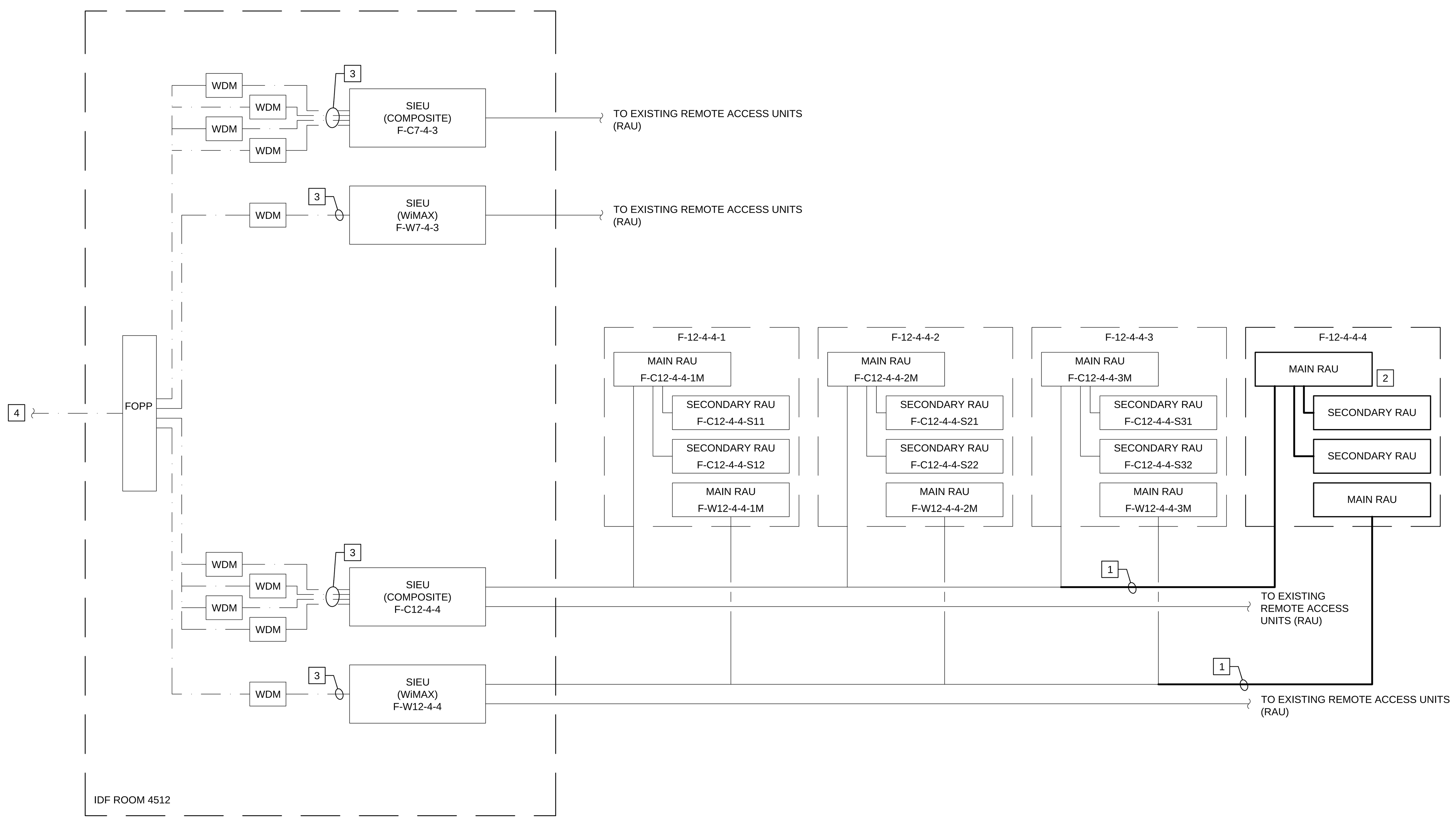
KEYED NOTES:

1 RG-11 COAX PAIR TO EACH MAIN RAU.

2 RAU LOCATION INCLUDES ONE MAIN RAU FOR WiMAX AND ONE MAIN RAU WITH TWO SUPPORT RAUS FOR ALL OTHER BANDS COMBINED.

3 EXISTING FIBER PAIRS.

4 FIBER TO DAS HEAD-END.



1 DISTRIBUTED ANTENNA SYSTEM BLOCK DIAGRAM
NTS

5/30/2014 10:29:30 AM

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Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

Hartsfield Jackson + Partnership
191 Peachtree Street, NE
Suite 2250
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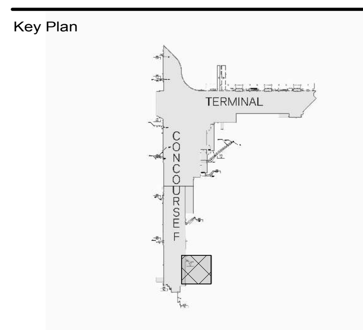
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

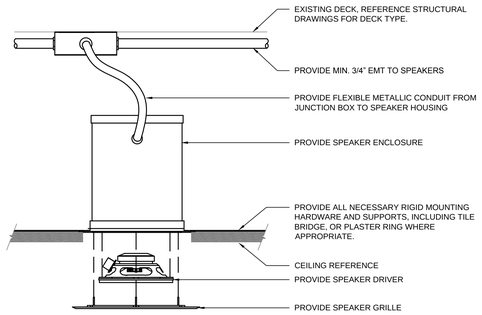
Sheet Title

DISTRIBUTED ANTENNA SYSTEM BLOCK DIAGRAM

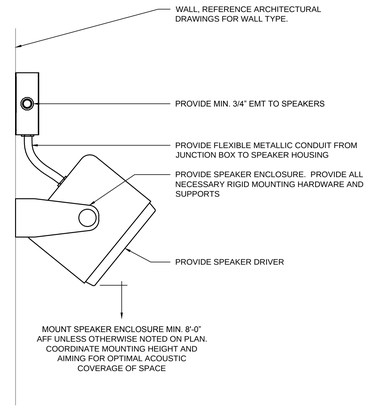
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

T605



1 TYPE A
TYPICAL SPEAKER MOUNTING DETAIL
NTS



2 TYPE B
TYPICAL SPEAKER MOUNTING DETAIL
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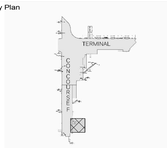

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

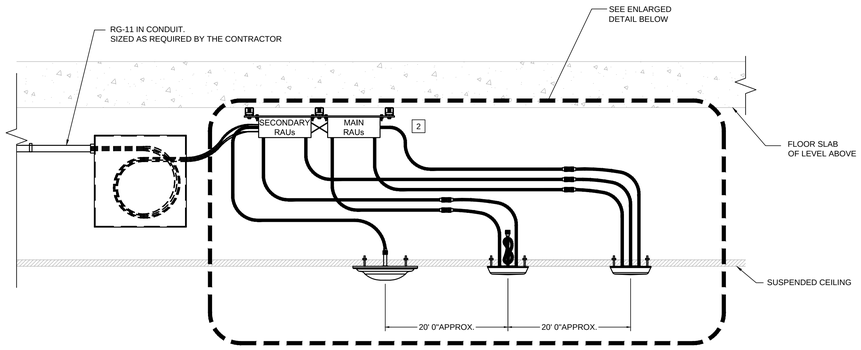
Sheet Title

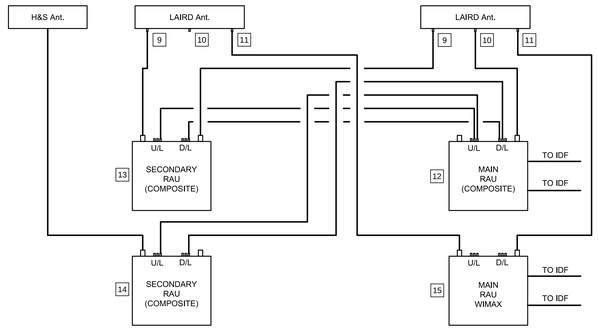
SPEAKER MOUNTING DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

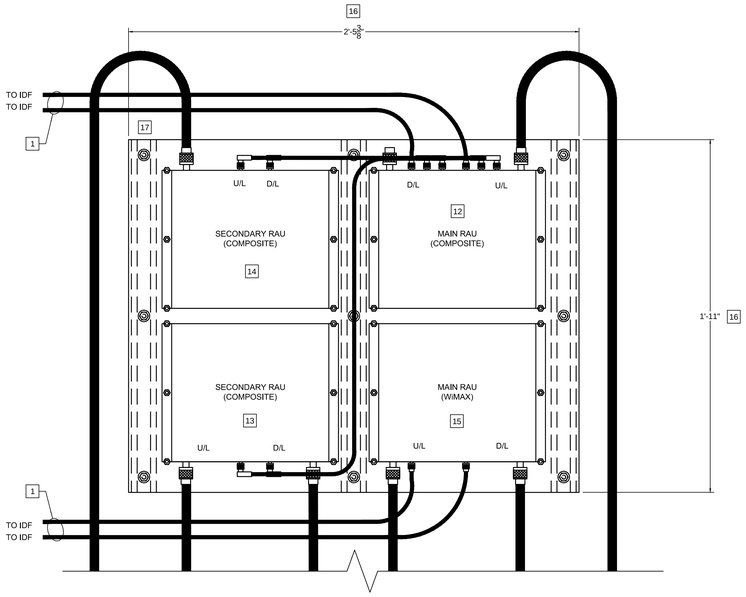
T801

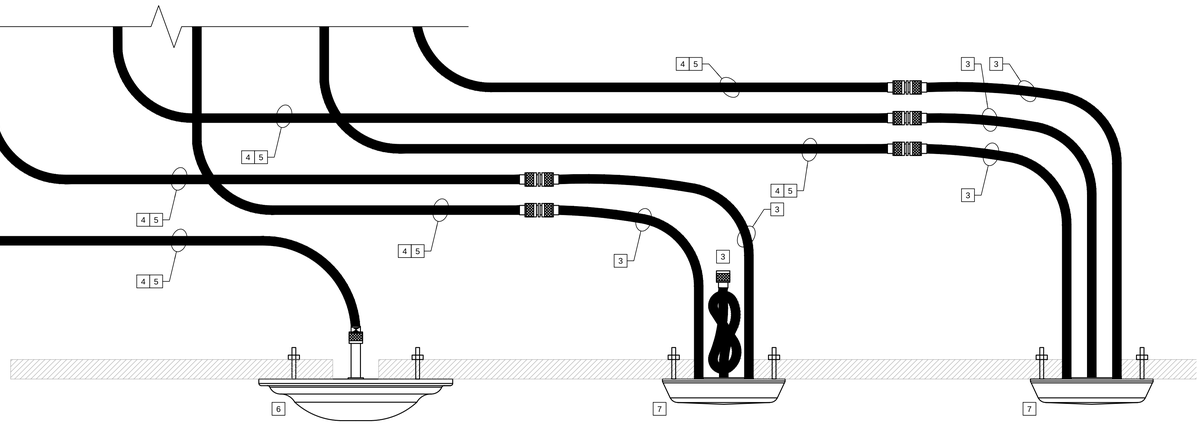




KEYED NOTES:

1. RG-11 CABLE.
2. REMOTE ACCESS UNIT (RAU) MOUNTED ABOVE FINISHED CEILING.
3. 6" JUMPER SUPPLIED WITH LAIRD ANTENNA, TYPE N CONNECTORS..
4. RAU OUTPUT TO ANTENNA, ANDREW 1/4" SUPERFLEX JUMPER CABLE APPROX. 24" LENGTH, N-MALE AT BOTH ENDS. FREE WIRE 1/4" SUPERFLEX TO RAU ANTENNA.
5. CONTRACTOR SHALL PROVIDE APPROVED CABLE RESTRAINT.
6. HUBER & SUHNER ANTENNA MODEL SWA-0860/360/4/0/V_2.
7. LAIRD ANTENNA MODEL SL69273PTL72NM.
8. MINIMUM 18X18X6 JUNCTION BOX SURFACE MOUNTED TO WALL AS REQUIRED.
9. LAIRD ANTENNA INPUT FOR 698-806 MHz AND 1710-2170 MHz.
10. LAIRD ANTENNA INPUT FOR 824-894 MHz AND 1850-1990 MHz.
11. LAIRD ANTENNA INPUT FOR 2500-2700 MHz.
12. CELLULAR AND PCS.
13. 700 MHz MIMO.
14. PS/SMR AND AWS.
15. Wi-MAX.
16. MINIMUM 3/4" FINISHED PLYWOOD WILL BE PAINTED WITH FIRE RETARDANT ENAMEL IN EXPOSED LOCATIONS. DIMENSIONS ARE APPROXIMATE, CONTRACTOR SHALL DETERMINE FINAL SIZE REQUIRED.
17. MOUNTING CHANNEL AND HARDWARE SHALL BE SIZED BY THE CONTRACTOR.





1 REMOTE ACCESS UNIT/ANTENNA MOUNTING DETAIL (INDOOR)
NTS

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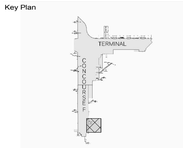
Key Plan



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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

REMOTE ACCESS UNIT MOUNTING DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

T802

5/30/2014 10:29:30 AM

SECURITY LEGEND

NOTE:

1. ALL SYMBOLS ARE NOT NECESSARILY USED ON THESE PLANS.
2. ALL MOUNTING HEIGHTS ARE TO CENTERLINE OF ALL DEVICES AND EQUIPMENT UON.
3. IN GENERAL, SYMBOLS SHOWN WITH LIGHT LINES DENOTE EXISTING WORK, SYMBOLS SHOWN WITH HEAVY LINES DENOTE NEW WORK.

ACCESS CONTROL

TYPE — DOOR TYPE
DOOR # — ACS DOOR DETAIL REFERENCE
ARCHITECTURAL DOOR NUMBER

- BMS — BALANCED MAGNETIC SWITCH
- D — PORTAL INTERFACE BOX
- EP — ELECTRIC PANIC BAR
- MAG — ELECTROMAGNETIC LOCK
- MAG DE — DELAYED EGRESS ELECTRO MAGNETIC LOCK
- PB — PUSHBUTTON
- DA — DURESS ALARM
- V — VISUAL ALARM
- A — AUDIBLE ALARM
- A/V — COMBINATION AUDIBLE/VISUAL ALARM
- H — DOOR HOLD DEVICE (PROVIDED BY 08710)
- PS — POWER SUPPLY
- POWER/ELECTRIC HINGE
- CR — CARD READER
- IFP — INTELLIGENT FIELD PANEL
- CP — CONTROL PANEL (BY DOOR MANUFACTURER)
- KP — KEYPAD
- KS — KEYSWITCH
- CR — CARD READER
- CR — CARD READER WITH KEY PAD
- BIO — BIOMETRIC READER
- BIO — BIOMETRIC / CARD READER / KEY PAD
- ELECTRIFIED HANDSET
- POWER TRANSFER HINGE
- DOOR SECURITY LEVEL
  - HIGHER LEVEL OF SECURITY
  - LOWER LEVEL OF SECURITY
- PANIC HARDWARE
- PANIC HARDWARE WITH DELAYED EGRESS (DE)
- PIR — MOTION DETECTOR
- OVERHEAD DOOR UP/DOWN CONTROL
- MOTOR / CONVEYOR START/STOP STATION
- ELEVATOR FLOOR CONTROL BUTTON PANEL
- ELEVATOR CALL CONTROL BUTTON PANEL
- INTERCOM STATION
- SECURE/SIDA DEMARCATION LINE
- STERILE DEMARCATION LINE
- SECURITY BAR - FILLED DIAMOND INDICATES HIGHER LEVEL OF SECURITY

VIDEO SURVEILLANCE

CAM-XXX — CAMERA TAG
X — CAMERA TYPE

- CCTV CAMERA - FIXED POSITION TYPE
- CCTV CAMERA - PTZ TYPE
- CCTV CAMERA - 360 TYPE
- EXISTING CCTV CAMERA - FIXED POSITION TYPE
- EXISTING CCTV CAMERA - PTZ TYPE
- EXISTING CCTV CAMERA - 360 TYPE

JUNCTION AND PULL BOXES

- J — JUNCTION BOX
- P — PULL BOX
- MH — MAINTENANCE HOLE
- H — HAND HOLE

DRAWING REFERENCES

- DETAIL NUMBER
- PLAN DETAIL REFERENCE TITLE
- DRAWING NUMBER
- SECTION NUMBER
- SECTION REFERENCE TITLE
- DRAWING NUMBER
- 1 — KEYED NOTE DESIGNATION
- XXXX — ROOM NUMBER
- NORTH ARROW
- X — DRAWING REVISION

CONDUIT AND RACEWAY

- CONDUIT RUN CONCEALED IN CEILING OR WALL CONSTRUCTION
- CONDUIT RUN IN FLOOR CONSTRUCTION OR UNDERGROUND DUCTBANK
- CONDUIT RUN EXPOSED
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- FLEXIBLE CONDUIT
- CONDUIT CAPPED FOR FUTURE.
- HOMERUN TO COMM ROOM. NO CONDUIT SIZE DENOTES 1".
- COMMUNICATION CABLE TRAY - REFER TO PLANS FOR SIZE

ABBREVIATIONS

A	-	AMPERE
ACS	-	ACCESS CONTROL SYSTEM
ADA	-	AMERICANS WITH DISABILITIES ACT
AFF	-	ABOVE FINISHED FLOOR
AMP	-	AMPLIFIER
A/V	-	AUDIO/VISUAL
AWG	-	AMERICAN WIRE GAUGE
BMS	-	BALANCED MAGNETIC SWITCH
BMS	-	BUILDING MANAGEMENT SYSTEM
BIDS	-	BAGGAGE INFORMATION DISPLAY SYSTEM
C	-	CONDUIT
CAT	-	CATEGORY
CATV	-	COMMUNITY ACCESS TELEVISION
CBP	-	CUSTOMS AND BORDER PATROL
CCTV	-	CLOSED CIRCUIT TELEVISION
COMM	-	COMMUNICATIONS
CPU	-	CENTRAL PROCESSING UNIT
CR	-	CARD READER
CUTE	-	COMMON USE TERMINAL EQUIPMENT
CUPPS	-	COMMON USE PASSENGER PROCESSING SYSTEMS
DDC	-	DISPLAY DEVICE CONTROLLER
DEMO	-	DEMOLISH
DN	-	DOWN
DVR	-	DIGITAL VIDEO RECORDING
DWG	-	DRAWING
EA	-	EACH
ELEC	-	ELECTRIC/ELECTRICAL
ELEV	-	ELEVATOR
EMER	-	EMERGENCY
EMT	-	ELECTRICAL METALLIC TUBING
EQ	-	EQUALIZER
EVIDS	-	ELECTRONIC VISUAL INFORMATION DISPLAY SYSTEM
FA	-	FIRE ALARM
FACP	-	FIRE ALARM CONTROL PANEL
FIDS	-	FLIGHT INFORMATION DISPLAY SYSTEM
FO	-	FIBER OPTIC
GC	-	GENERAL CONTRACTOR
GIDS	-	GATE INFORMATION DISPLAY SYSTEM
GND	-	GROUND
GRS	-	GALVANIZED RIGID STEEL
HH	-	HANDHOLE
IC	-	INTERCOM
IDF	-	INTERMEDIATE DISTRIBUTION FRAME
IFP	-	INTELLIGENT FIELD PANEL
IMC	-	INTERMEDIATE METAL CONDUIT
IP	-	INTERNET PROTOCOL
IPTV	-	INTERNET PROTOCOL TELEVISION
I/P	-	INPUT
IR	-	INFRA RED
KP	-	KEYPAD
LAN	-	LOCAL AREA NETWORK
LCD	-	LIQUID CRYSTAL DISPLAY
LED	-	LIGHT EMITTING DIODE
LVL	-	LEVEL
MAG	-	ELECTROMAGNETIC LOCK
MATV	-	MASTER ANTENNA TELEVISION
MCR	-	MAIN COMMUNICATIONS ROOM
MDF	-	MAIN DISTRIBUTION FRAME
MH	-	MAINTENANCE HOLE
MIC	-	MICROPHONE
MMFO	-	MULTIMODE FIBER OPTIC
MUFIDS	-	MULTIUSER FLIGHT INFORMATION DISPLAY SYSTEM
NIC	-	NOT IN CONTRACT
NTS	-	NOT TO SCALE
NVR	-	NETWORK VIDEO RECORDER
O/P	-	OUTPUT
PA	-	PUBLIC ADDRESS
PAZ	-	PUBLIC ADDRESS ZONE TIEBOX
PB	-	PUSH BUTTON
PBX	-	PRIVATE BRANCH EXCHANGE
PC	-	PERSONAL COMPUTER
PIR	-	PASSIVE INFRARED
PP	-	PATCH PANEL
PR	-	PAIR
PRC	-	PARKING REVENUE CONTROL
PTZ	-	PAN/TILT/ZOOM
PVC	-	POLYVINYL CHLORIDE CONDUIT
RCVR	-	RECEIVER
REX	-	REQUEST FOR EXIT
RF	-	RADIO FREQUENCY
RGS	-	RIGID GALVANIZED STEEL
RIDS	-	RAMP INFORMATION DISPLAY SYSTEM
RM	-	ROOM
RU	-	RACK MOUNTED UNIT
SHLD	-	SHIELDED (AS IN CABLE)
SIDA	-	SECURE IDENTIFICATION DISPLAY AREA
TDD	-	TELEPHONE DEVICE FOR THE HEARING IMPAIRED
SMFO	-	SINGLEMODE FIBER OPTIC
TEL	-	TELEPHONE
TYP.	-	TYPICAL
UPS	-	UNINTERRUPTIBLE POWER SUPPLY
VE	-	VOICE EVACUATION
UON	-	UNLESS OTHERWISE NOTED
WP	-	WEATHERPROOF
XMTR	-	TRANSMITTER

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THIS RECORD CONTAINS SENSITIVE SECURITY INFORMATION THAT IS CONTROLLED UNDER 49 CFR PARTS 15 AND 1520. NO PART OF THIS RECORD MAY BE DISCLOSED TO PERSONS WITHOUT A "NEED TO KNOW," AS DEFINED IN 49 CFR PARTS 15 AND 1520, EXCEPT WITH THE WRITTEN PERMISSION OF THE ADMINISTRATOR OF THE TRANSPORTATION SECURITY ADMINISTRATION OR THE SECRETARY OF TRANSPORTATION. UNAUTHORIZED RELEASE MAY RESULT IN CIVIL PENALTIES OR OTHER ACTION. FOR U.S. GOVERNMENT AGENCIES, PUBLIC DISCLOSURE GOVERNED BY 5 U.S.C. 552 AND 49 CFR PARTS 15 AND 1520

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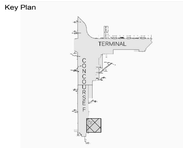

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

SECURITY LEGEND AND ABBREVIATIONS

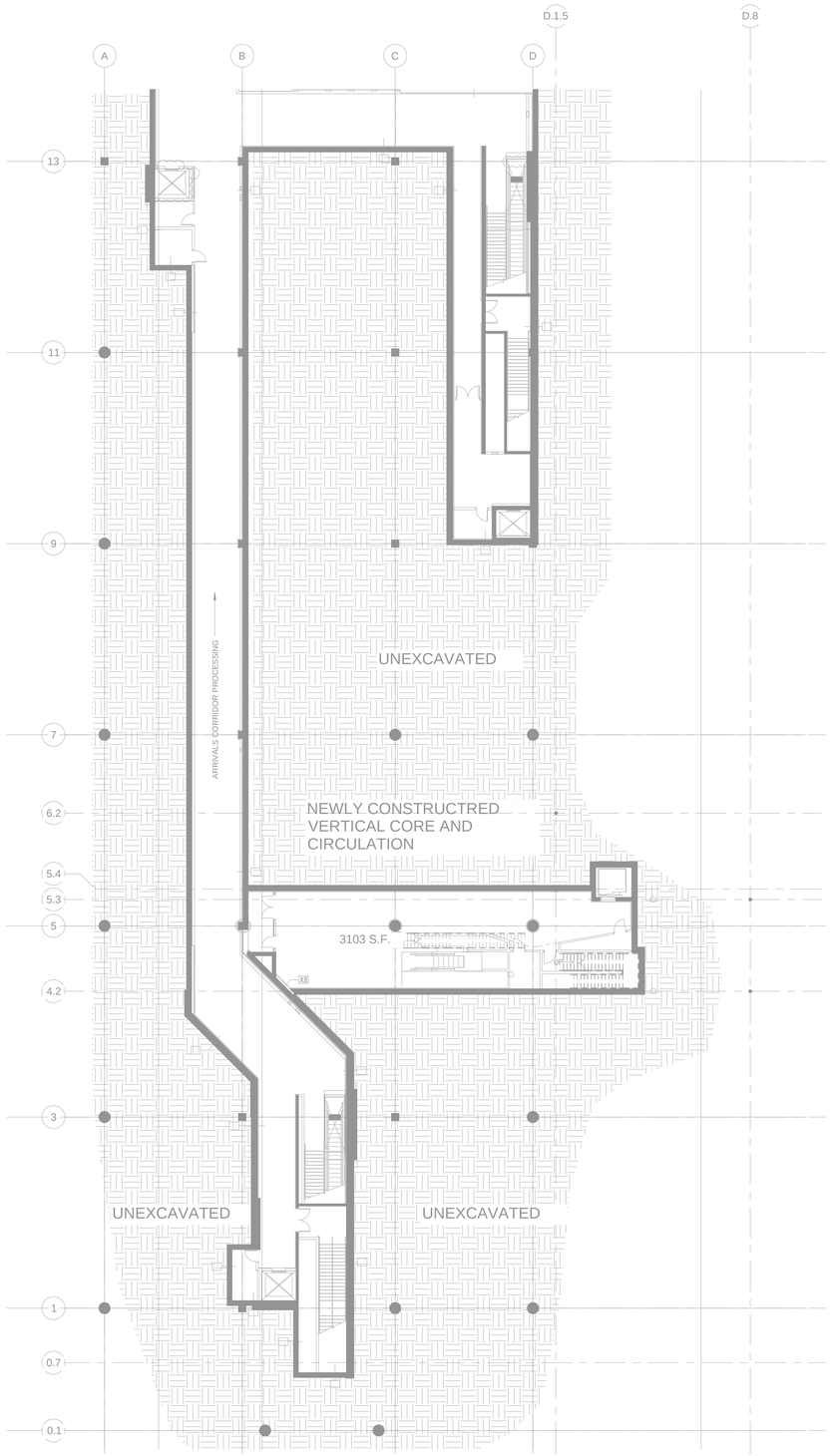
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

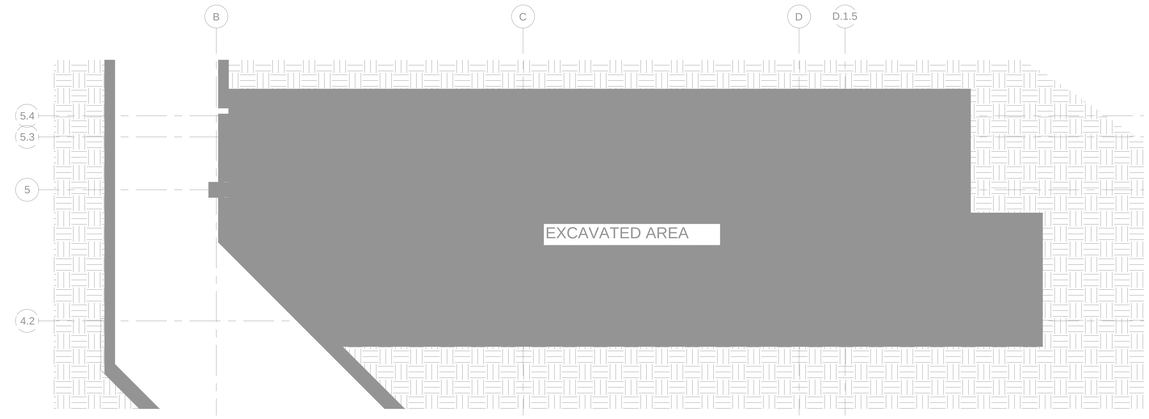
TY001

KEYED NOTES:

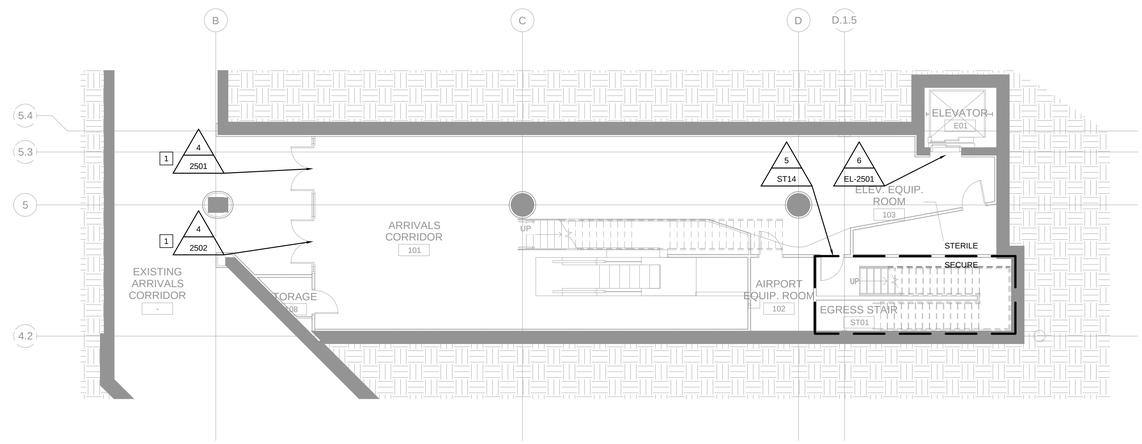
1. INTERLOCK DOOR WITH DEPARTURES LEVEL DOOR 4532.



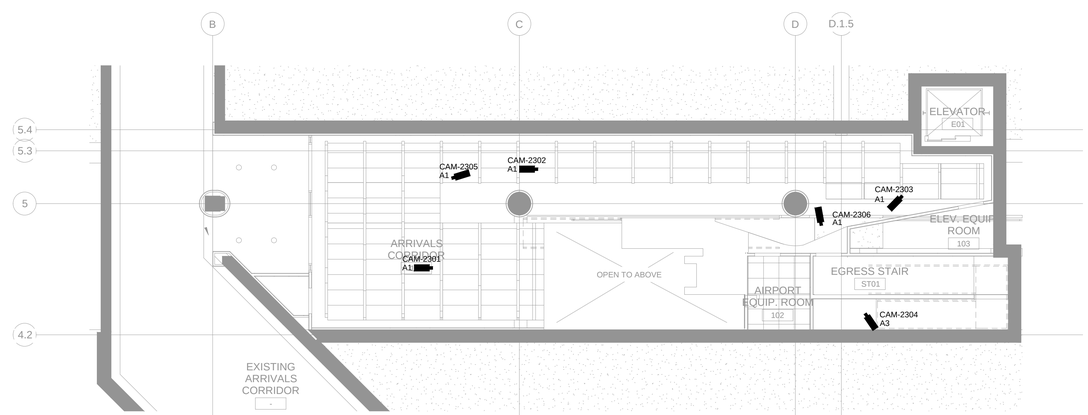
1 SECURITY OVERALL PLAN ARRIVALS LEVEL
1/16" = 1'-0"



2 SECURITY FLOOR PLAN DEMO - ARRIVALS LEVEL
1/8" = 1'-0"



3 SECURITY FLOOR PLAN - ARRIVALS LEVEL
1/8" = 1'-0"



4 SECURITY REFLECTED CEILING PLAN - ARRIVALS LEVEL
1/8" = 1'-0"

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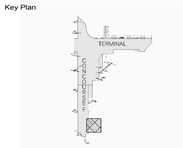

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

SECURITY
FLOOR PLANS
DEMO-PROPOSED-RCP
ARRIVALS LEVEL

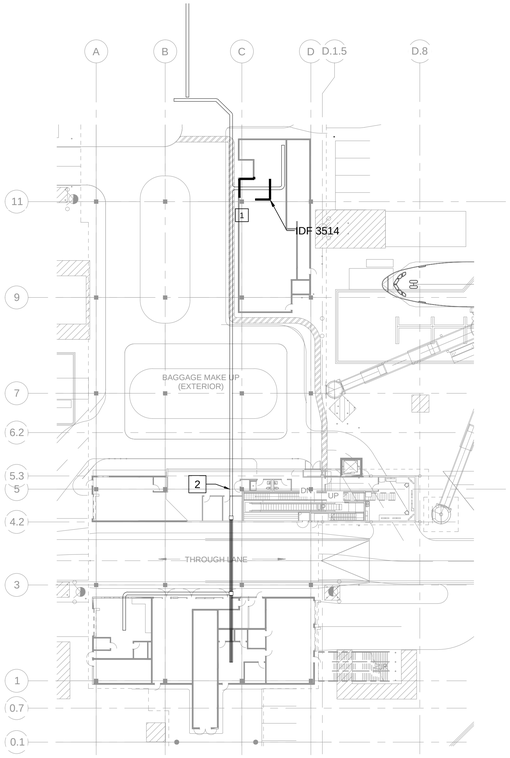
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

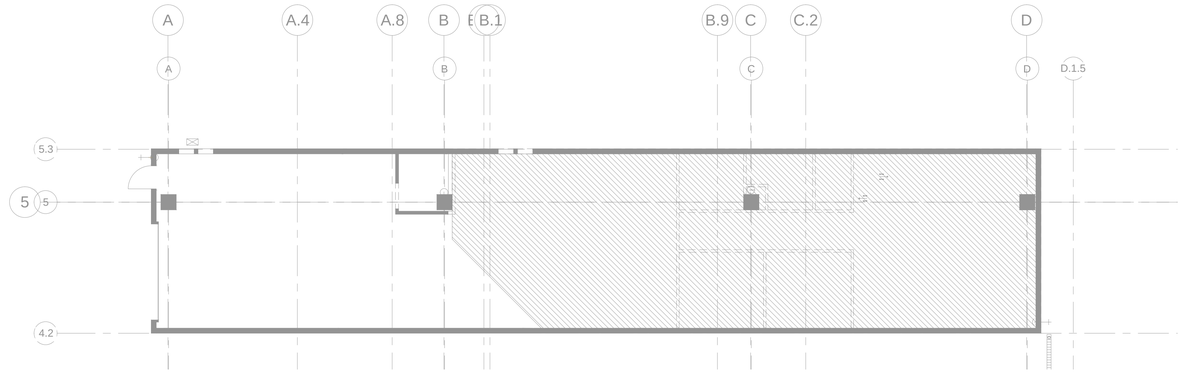
TY100

KEYED NOTES:

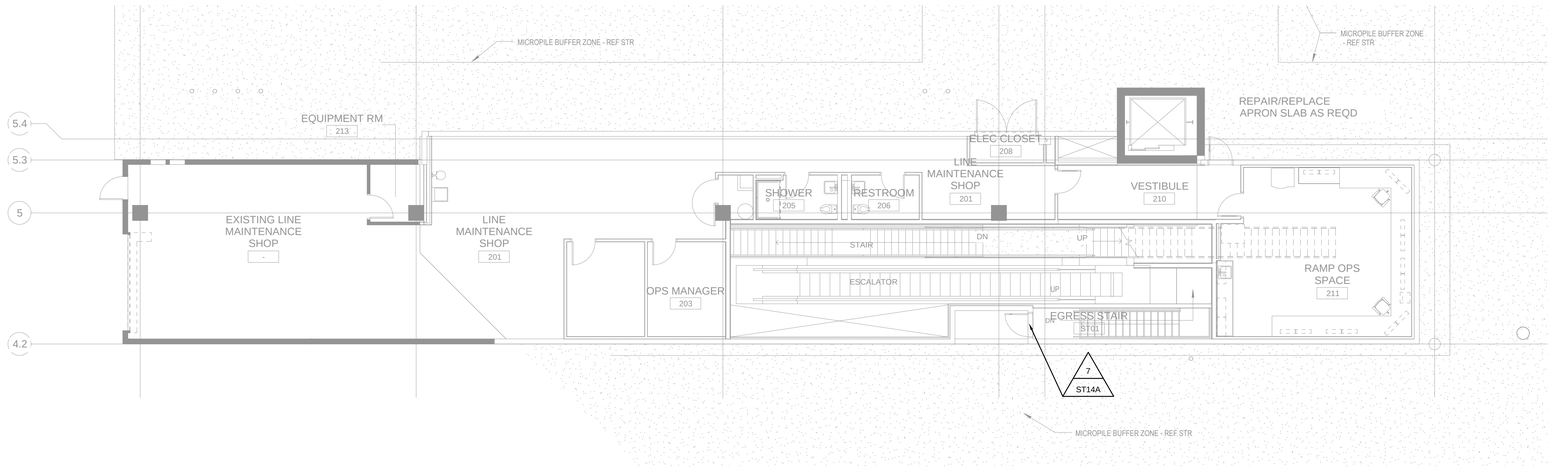
1. ACS PANEL LOCATION
2. EXISTING 18" WIDE GALVANIZED STEEL CABLE TRAY. PROTECT DURING CONSTRUCTION.



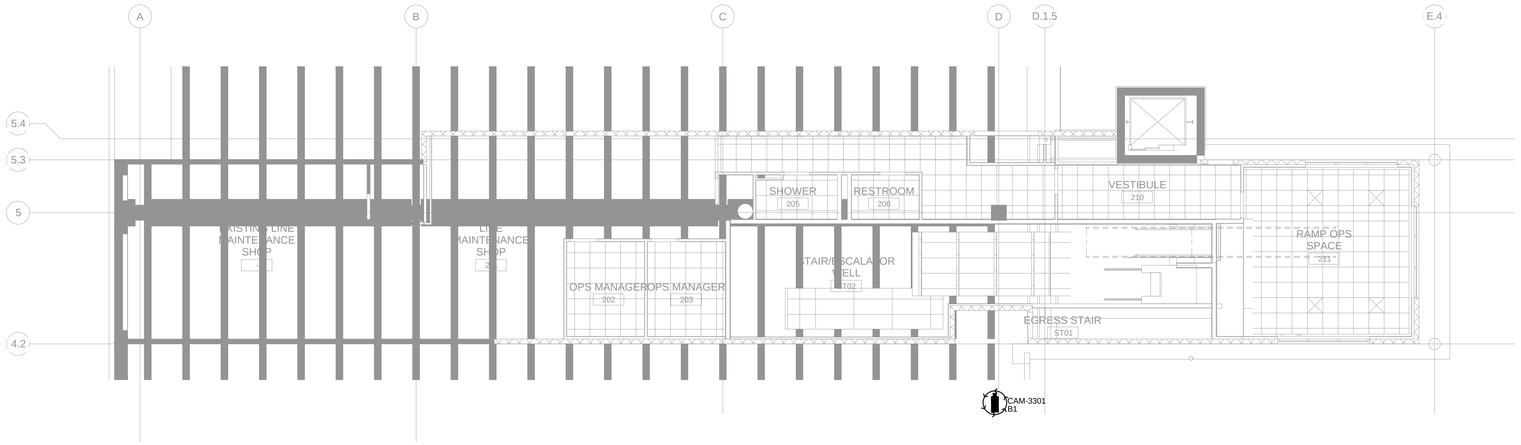
1 SECURITY OVERALL PLAN APRON LEVEL
1/32" = 1'-0"



2 SECURITY FLOOR PLAN DEMO - APRON LEVEL
1/8" = 1'-0"



3 SECURITY FLOOR PLAN - APRON LEVEL
1/8" = 1'-0"



4 SECURITY REFLECTED CEILING PLAN - APRON LEVEL
1/8" = 1'-0"

DISCLOSURE OF SECURITY SENSITIVE INFORMATION

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5/30/2014 10:29:30 AM

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Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p

Hartsfield Jackson + Partnership
191 Peachtree Street, NE
Suite 2250
Atlanta, GA 30303
Phone: 404-439-9000

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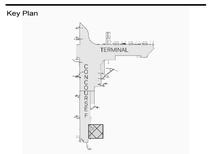
Key Plan



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1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	08-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

SECURITY FLOOR PLANS DEMO-PROPOSED-RCP APRON LEVEL

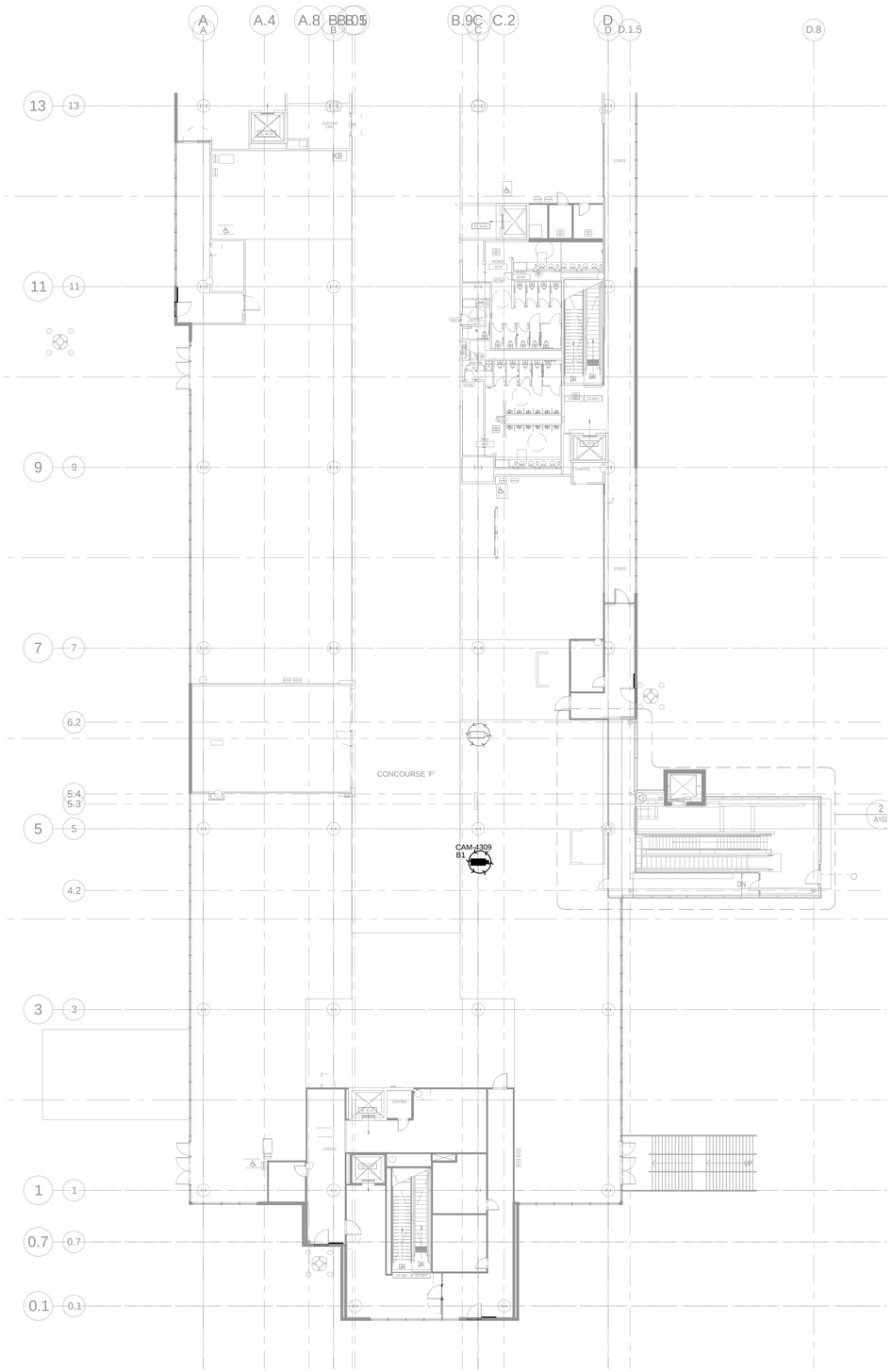
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

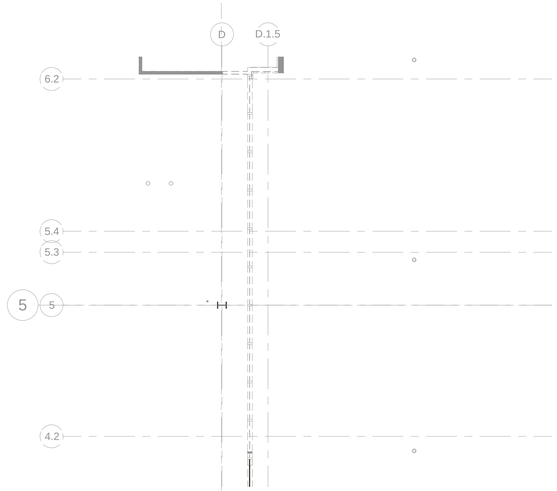
TY101

KEYED NOTES:

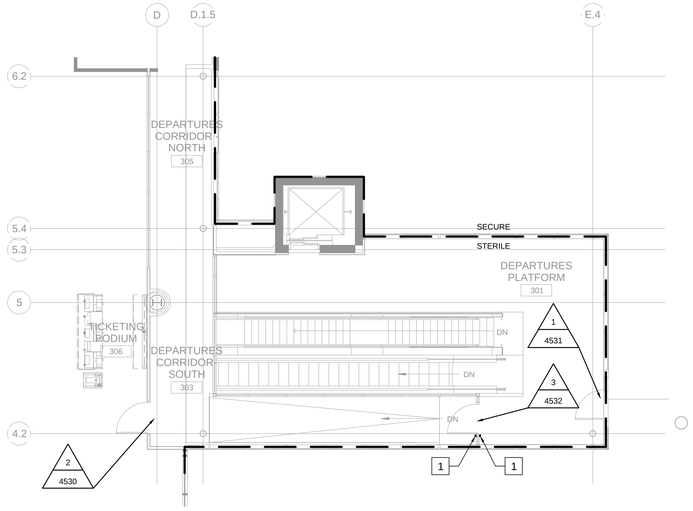
1. PROVIDE REMOTE INTERCOM SUBSTATION WITH HANDSET.
2. CONDUIT ROUGH-IN FOR FUTURE DELTA CAMERA. PROVIDE (1) 1"C. ABOVE CEILING TO INSITE HOLD ROOM. CAP AT BOTH ENDS.



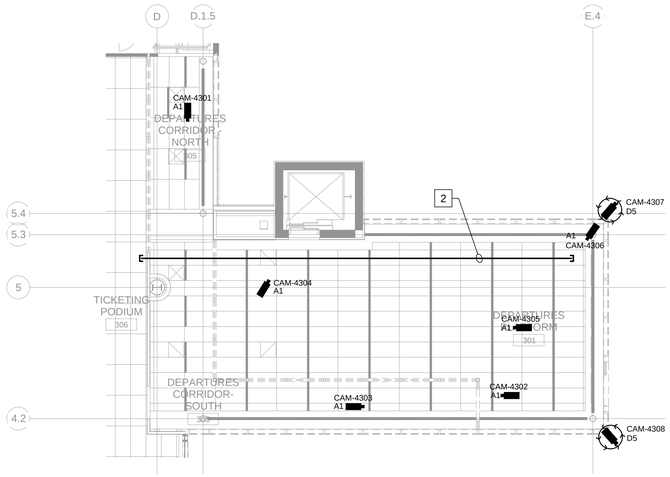
1 SECURITY OVERALL PLAN DEPARTURES LEVEL
1/16" = 1'-0"



2 SECURITY FLOOR PLAN DEMO - DEPARTURES LEVEL
1/8" = 1'-0"



3 SECURITY FLOOR PLAN - DEPARTURES LEVEL
1/8" = 1'-0"



4 SEURITY REFLECTED CEILING PLAN - DEPARTURES LEVEL
1/8" = 1'-0"

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Hartsfield-Jackson Atlanta International Airport

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WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

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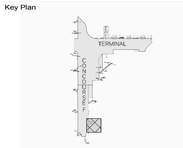
Key Plan



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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

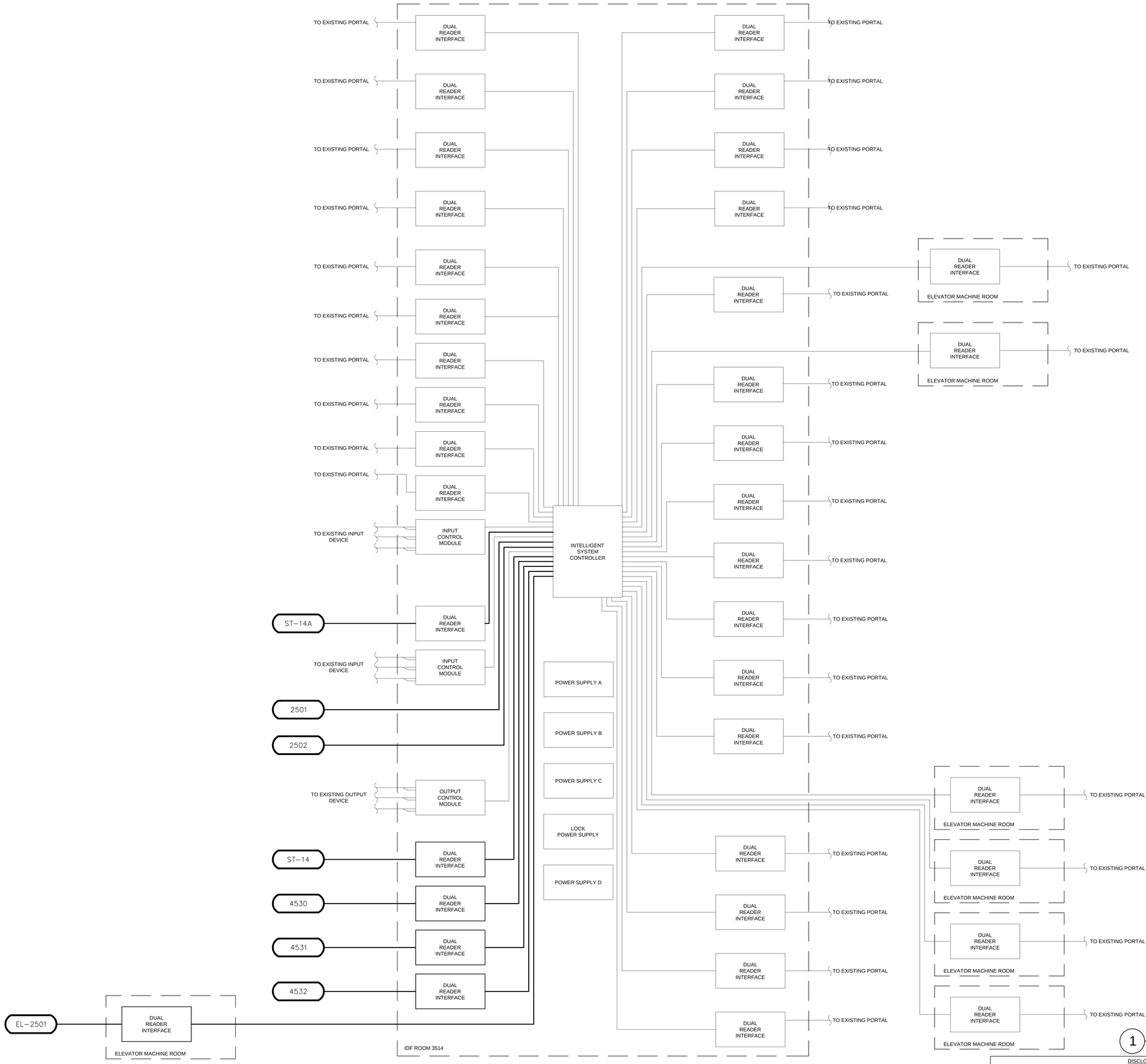
Sheet Title

SECURITY
FLOOR PLANS
DEMO-PROPOSED-RCP
DEPARTURES LEVEL

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

TY102



GENERAL NOTES:

1. PROVIDE ITEMS SHOWN IN DARK LINE WEIGHT. ITEMS IN LIGHT LINE WEIGHT ARE EXISTING.

1 ACCESS CONTROL SYSTEM BLOCK DIAGRAM
NTS

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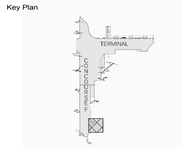

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Drawn by: TRM Reviewed by: MRH

Project No:

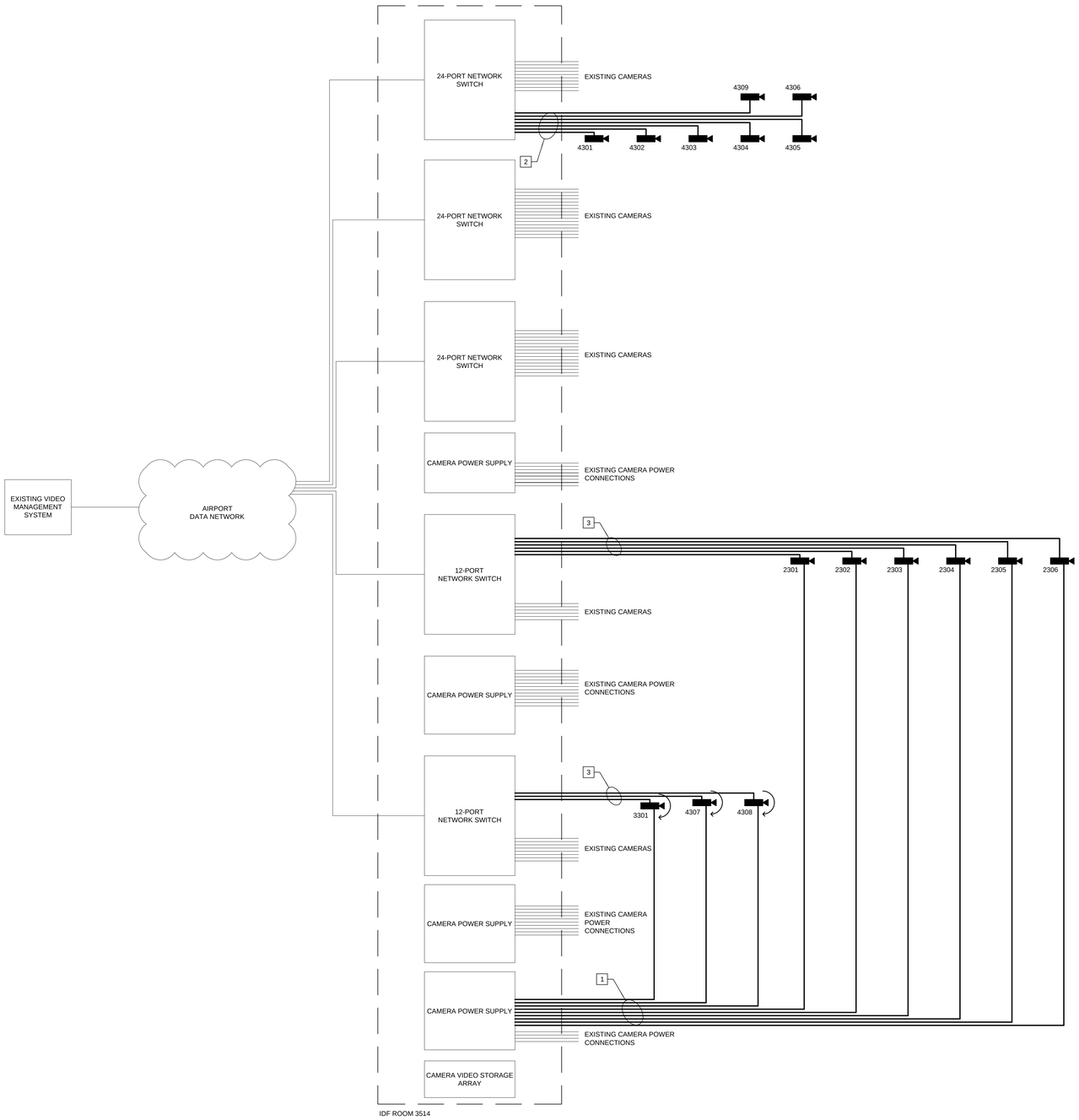
Sheet Title

ACCESS CONTROL SYSTEM BLOCK DIAGRAM

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

TY601



1 VIDEO SURVEILLANCE SYSTEM BLOCK DIAGRAM
NTS

GENERAL NOTES:

1. PROVIDE ITEMS SHOWN IN DARK LINE WEIGHT. ITEMS IN LIGHT LINE WEIGHT ARE EXISTING.

KEYED NOTES:

1. PROVIDE (1) 18AWG 2-CONDUCTOR CABLE FOR CAMERA POWER.
2. PROVIDE CAT 6 CABLE FOR EACH CAMERA.
3. PROVIDE 2-ST MMFO CABLE FOR EACH CAMERA

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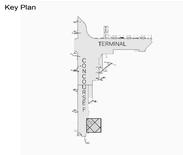

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

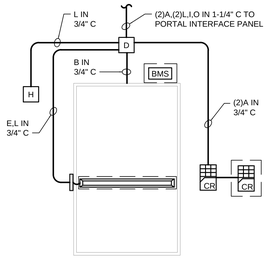
VIDEO SURVEILLANCE SYSTEM BLOCK DIAGRAM

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

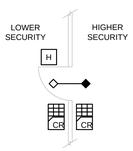
TY602

5/30/2014 10:29:30 AM



LOWER SECURITY

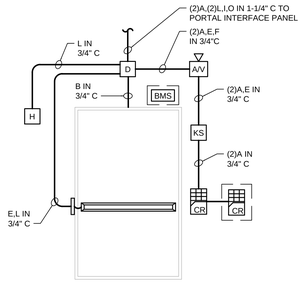
DASHED BOX INDICATES
EQUIPMENT ON OPPOSITE SIDE



PLAN VIEW

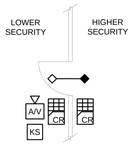
ACS EQUIPMENT:
1. PORTAL INTERFACE BOX
2. POWER SUPPLIES
3. (2) CARD READERS WITH PIN PADS
4. MAGNETIC DOOR HOLD OPEN (BY DIV.08)
5. PANIC HARDWARE (BY DIV.08)
6. POWER TRANSFER HINGE (BY DIV.08)
7. BALANCED MAGNETIC SWITCH
8. DEVICE MOUNTING BRACKETS (NOT SHOWN)
AS REQUIRED TO SECURELY MOUNT DEVICES

1 TYPE 1 ACCESS CONTROL DOOR DETAIL
NTS



LOWER SECURITY

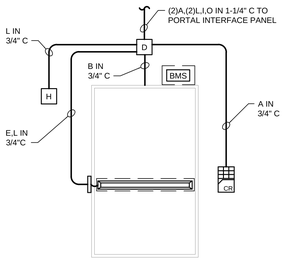
DASHED BOX INDICATES
EQUIPMENT ON OPPOSITE SIDE



PLAN VIEW

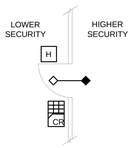
ACS EQUIPMENT:
1. PORTAL INTERFACE BOX
2. POWER SUPPLY
3. (2) CARD READERS WITH PIN PADS
4. DOOR HOLD OPEN DEVICE (BY DIV.08)
5. PANIC HARDWARE (BY DIV.08)
6. POWER TRANSFER HINGE (BY DIV.08)
7. AUDIBLE/VISUAL DEVICE
8. BALANCED MAGNETIC SWITCH
9. KEY SWITCH
10. DEVICE MOUNTING BRACKETS (NOT SHOWN)
AS REQUIRED TO SECURELY MOUNT DEVICES

2 TYPE 2 ACCESS CONTROL DOOR DETAIL
NTS



LOWER SECURITY

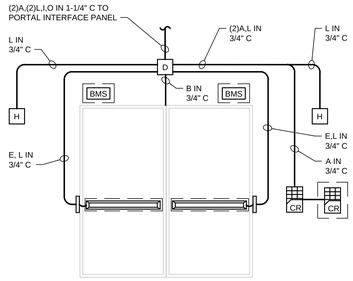
DASHED BOX INDICATES
EQUIPMENT ON OPPOSITE SIDE



PLAN VIEW

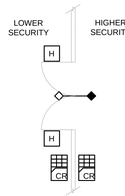
ACS EQUIPMENT:
1. PORTAL INTERFACE BOX
2. POWER SUPPLIES
3. CARD READER WITH PIN PAD
4. MAGNETIC DOOR HOLD OPEN
5. PANIC HARDWARE (BY DIV.08)
6. POWER TRANSFER HINGE (BY DIV.08)
7. BALANCED MAGNETIC SWITCH
8. DEVICE MOUNTING BRACKETS (NOT SHOWN)
AS REQUIRED TO SECURELY MOUNT DEVICES

3 TYPE 3 ACCESS CONTROL DOOR DETAIL
NTS



LOWER SECURITY

DASHED BOX INDICATES
EQUIPMENT ON OPPOSITE SIDE



PLAN VIEW

ACS EQUIPMENT:
1. PORTAL INTERFACE BOX
2. POWER SUPPLIES
3. (2) CARD READERS WITH PIN PADS
4. (2) MAGNETIC DOOR HOLD OPENS (BY DIV.08)
5. (2) PANIC HARDWARE (BY DIV.08)
6. (2) POWER TRANSFER HINGE (BY DIV.08)
7. (2) BALANCED MAGNETIC SWITCHES
8. DEVICE MOUNTING BRACKETS (NOT SHOWN)
AS REQUIRED TO SECURELY MOUNT DEVICES

4 TYPE 4 ACCESS CONTROL DOOR DETAIL
NTS

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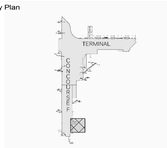

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4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

ACS DETAILS

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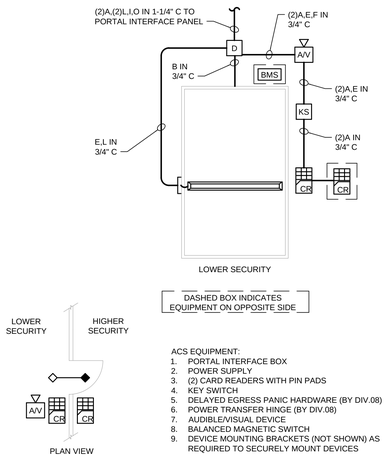
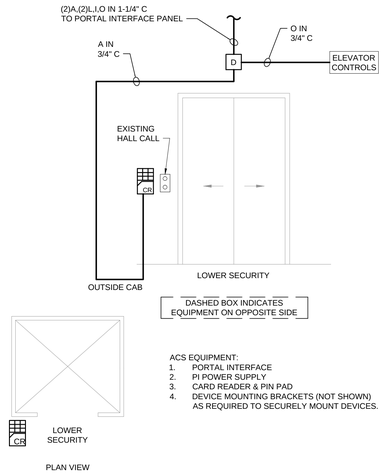
Sheet Number

TY801



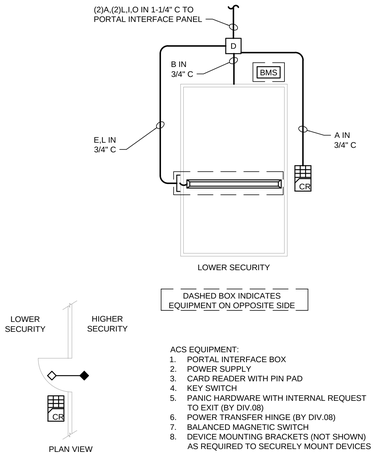
ACS EQUIPMENT:
1. PORTAL INTERFACE BOX
2. POWER SUPPLY
3. (2) CARD READERS WITH PIN PADS
4. KEY SWITCH
5. DELAYED EGRESS PANIC HARDWARE (BY DIV.08)
6. POWER TRANSFER HINGE (BY DIV.08)
7. AUDIBLE/VISUAL DEVICE
8. BALANCED MAGNETIC SWITCH
9. DEVICE MOUNTING BRACKETS (NOT SHOWN) AS REQUIRED TO SECURELY MOUNT DEVICES

5 TYPE 5 ACCESS CONTROL DOOR DETAIL
NTS



ACS EQUIPMENT:
1. PORTAL INTERFACE
2. PI POWER SUPPLY
3. CARD READER & PIN PAD
4. DEVICE MOUNTING BRACKETS (NOT SHOWN) AS REQUIRED TO SECURELY MOUNT DEVICES.

6 TYPE 6 ACCESS CONTROL DOOR DETAIL
NTS



ACS EQUIPMENT:
1. PORTAL INTERFACE BOX
2. POWER SUPPLY
3. CARD READER WITH PIN PAD
4. KEY SWITCH
5. PANIC HARDWARE WITH INTERNAL REQUEST TO EXIT (BY DIV.08)
6. POWER TRANSFER HINGE (BY DIV.08)
7. BALANCED MAGNETIC SWITCH
8. DEVICE MOUNTING BRACKETS (NOT SHOWN) AS REQUIRED TO SECURELY MOUNT DEVICES

7 TYPE 7 ACCESS CONTROL DOOR DETAIL
NTS

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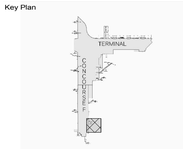

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

ACS DETAILS

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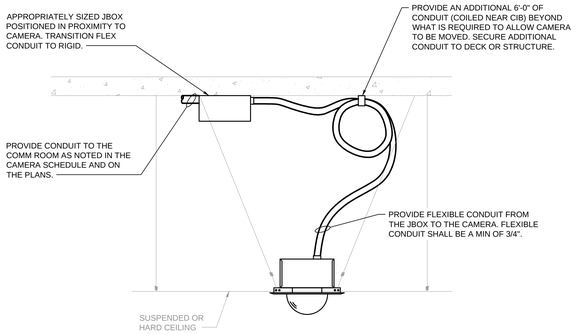
Sheet Number

TY802

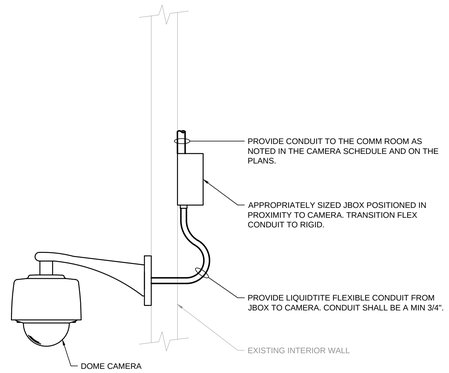


NOTE:

1. ALL CONDUIT SHALL BE RUN CONCEALED UNLESS NOTED OTHERWISE.
2. PROVIDE CCTV CAMERA, LENS, DOME ENCLOSURE AND MOUNT AS INDICATED ON PLANS. PROVIDE ALL MOUNTING AND SUPPORT HARDWARE AS REQUIRED BY THE MANUFACTURER. PROVIDE ALL CONNECTIONS OF FLEXIBLE CONDUIT AND CABLING TO CAMERA ENCLOSURE. SUPPORT ALL CONDUIT FROM STRUCTURE. CAMERA SHALL BE SUPPORTED FROM STRUCTURE.

1 TYPE A1 VIDEO SURVEILLANCE CAMERA DETAIL INTERIOR FIXED CEILING FLUSH MOUNTED CAMERA

NTS

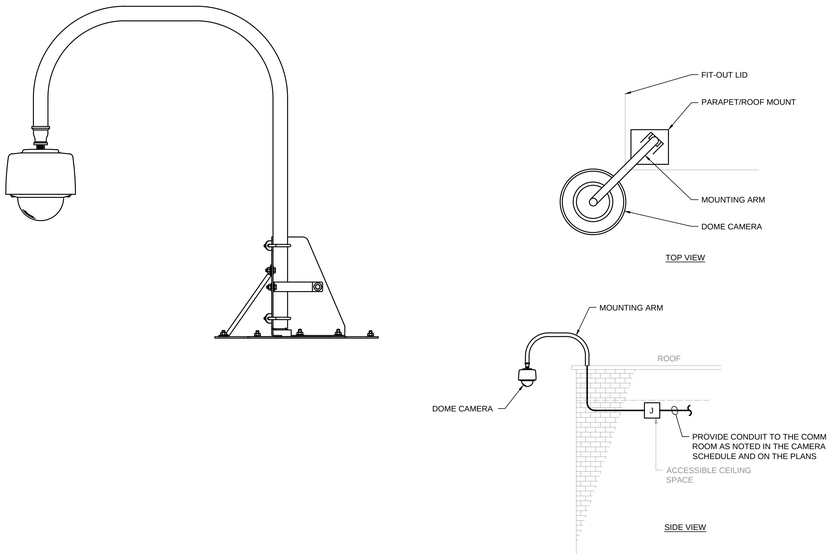


NOTE:

1. ALL CONDUIT SHALL BE RUN CONCEALED UNLESS NOTED OTHERWISE.
2. PROVIDE CCTV CAMERA, LENS, DOME ENCLOSURE AND MOUNT AS INDICATED ON PLANS. PROVIDE ALL MOUNTING AND SUPPORT HARDWARE AS REQUIRED BY THE MANUFACTURER. PROVIDE ALL CONNECTIONS OF FLEXIBLE CONDUIT AND CABLING TO CAMERA ENCLOSURE. SUPPORT ALL CONDUIT FROM STRUCTURE. CAMERA SHALL BE SUPPORTED FROM STRUCTURE.

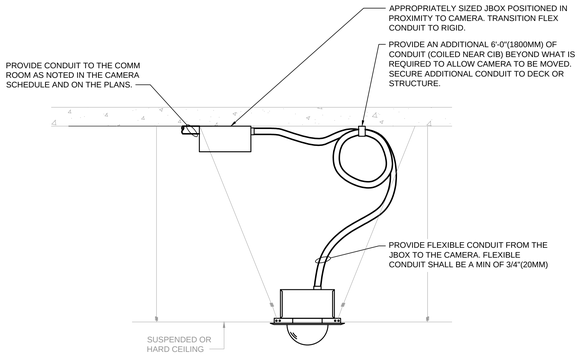
2 TYPE A3 VIDEO SURVEILLANCE CAMERA DETAIL INTERIOR FIXED WALL MOUNTED CAMERA

NTS



3 TYPE D5 VIDEO SURVEILLANCE CAMERA DETAIL EXTERIOR FIXED PARAPET MOUNTED CAMERA

NTS



NOTE:

1. PROVIDE CIB ABOVE CEILING IN AN ACCESSIBLE LOCATION. ALL CONDUIT SHALL BE RUN CONCEALED UNLESS NOTED OTHERWISE.
2. PROVIDE CCTV CAMERA, LENS, DOME ENCLOSURE AND MOUNT AS INDICATED ON PLANS. PROVIDE ALL MOUNTING AND SUPPORT HARDWARE AS REQUIRED BY THE MANUFACTURER. PROVIDE ALL CONNECTIONS OF FLEXIBLE CONDUIT AND CABLING TO CAMERA ENCLOSURE. SUPPORT ALL CONDUIT FROM STRUCTURE. CAMERA SHALL BE SUPPORTED FROM STRUCTURE.

4 TYPE B1 INTERIOR PTZ CEILING FLUSH MOUNTED CAMERA

NTS

DISCLOSURE OF SECURITY SENSITIVE INFORMATION

THIS RECORD CONTAINS SENSITIVE SECURITY INFORMATION THAT IS CONTROLLED UNDER 49 CFR PARTS 15 AND 1520. NO PART OF THIS RECORD MAY BE DISCLOSED TO PERSONS WITHOUT A "NEED TO KNOW," AS DEFINED IN 49 CFR PARTS 15 AND 1520, EXCEPT WITH THE WRITTEN PERMISSION OF THE ADMINISTRATOR OF THE TRANSPORTATION SECURITY ADMINISTRATION OR THE SECRETARY OF TRANSPORTATION. UNAUTHORIZED RELEASE MAY RESULT IN CIVIL PENALTIES OR OTHER ACTION. FOR U.S. GOVERNMENT AGENCIES, PUBLIC DISCLOSURE GOVERNED BY 5 U.S.C. 552 AND 49 CFR PARTS 15 AND 1520

5/30/2014 10:29:30 AM

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

h-j+p

Hartsfield Jackson + Partnership
191 Peachtree Street, NE
Suite 2250
Atlanta, GA 30303
Phone: 404-439-9000

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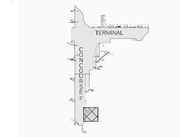
Ross&Baruzzini

6 South Old Orchard
St. Louis, MO 63119
Phone: 314-918-8383

Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 35% CONSTRUCTION DOCUMENTS	06-23-14
2.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: TRM Reviewed by: MRH

Project No:

Sheet Title

VSS DETAILS

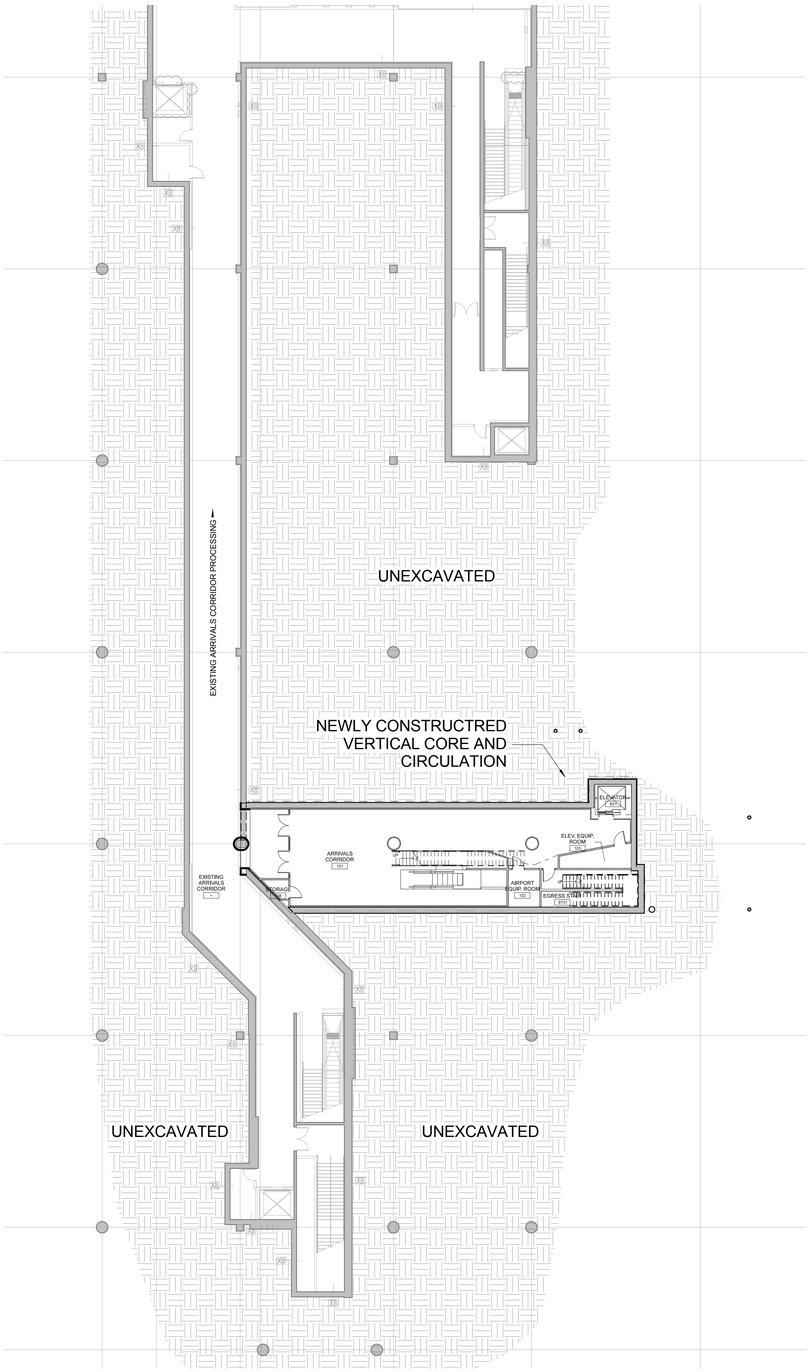
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

TY803

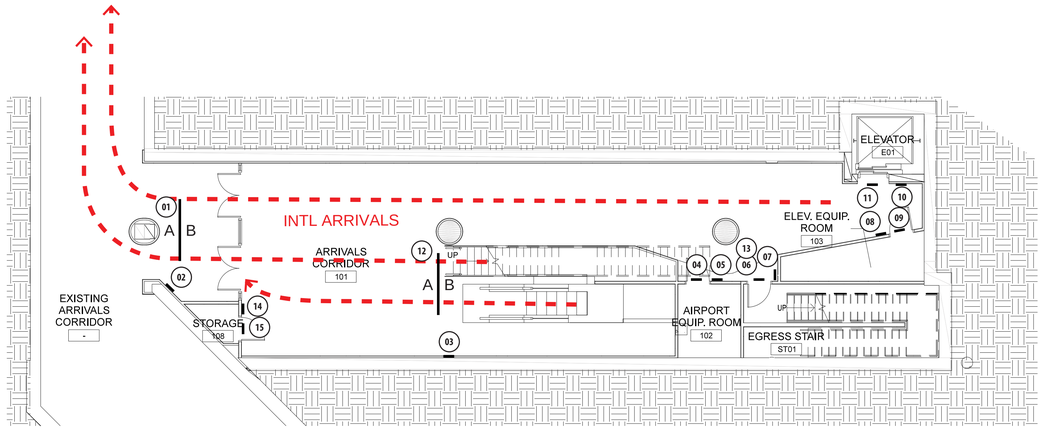
SIGN TYPE AND MESSAGE SCHEDULE

Sign Location #:	Sign Type:	Sign Message:	Design Sheet #
01	TIM10.1A	A: DO NOT ENTER B: Passport Control >	AG201
02	TREG.3	No Smoking / No Photography	AG202
03	TREG.2	GATE F3/F3A	AG202
04	TRN	(room ID # tbd)	AG202
05	TRM2.2	EQUIPMENT ROOM	AG202
06	TRN	(room ID # tbd)	AG202
07	TRM2.2	STAIRS	AG202
08	TRM2.2	ELEVATOR EQUIPMENT	AG202
09	TRN	(room ID # tbd)	AG202
10	TEV.2	(disabled use sign)	AG201
11	TRN	(room ID # tbd)	AG202
12	TIM10.1A	A: DO NOT ENTER B: Passport Control >	AG201
13	TREG.6	EMERGENCY EXIT...	AG202
14	TRM2.2	STORAGE	AG202
15	TRN	(room ID # tbd)	AG202



1 OVERALL PLAN - ARRIVALS LEVEL
1/16" = 1'-0"

0 4 8 16 32 FT.



2 ENLARGED ARRIVALS LEVEL SIGN LOCATION PLAN
1/8" = 1'-0"

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

Hartsfield Jackson + Partnership
191 Peachtree Street, NE
Suite 2250
Atlanta, GA 30303
Phone: 404-439-9000

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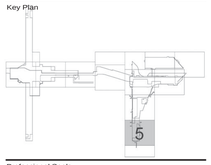
Jones Worley
Wayfinding & Signage
723 Piedmont Avenue NE
Atlanta, Georgia 30308
t: 404-876-9272

Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
2.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	12-19-14
3.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
4.	ISSUE FOR BID DOCUMENTS	04-17-15

Drawn by: JWD Reviewed by: JWD

Project No:

Sheet Title

ARRIVALS LEVEL
SIGN LOCATION PLAN

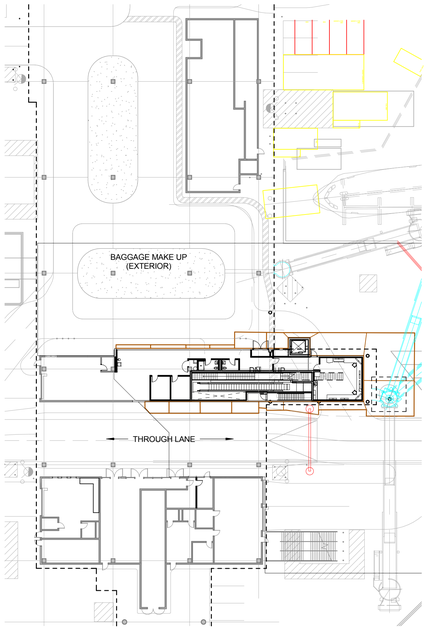
Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

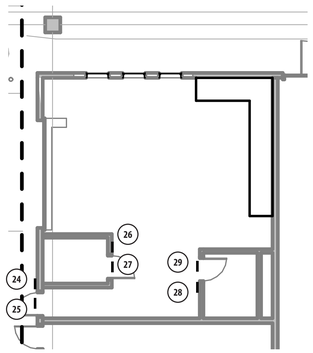
AG100

SIGN TYPE AND MESSAGE SCHEDULE

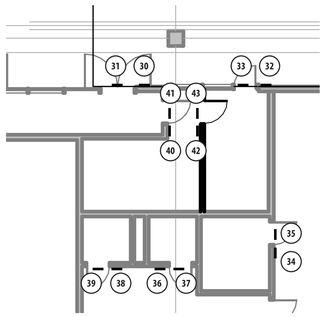
Sign Location #:	Sign Type:	Sign Message:	Design Sheet #
10	TRM2.2	TBD	AG202
11	TRN	(room ID # tbd)	AG202
12	TRN	(room ID # tbd)	AG202
13	TRM1.2	RESTROOM	AG202
14	TRM1.2	RESTROOM	AG202
15	TRN	(room ID # tbd)	AG202
16	-	(not used)	-
17	-	(not used)	-
18	TRN	(room ID # tbd)	AG202
19	TRM2.2	STAIRS	AG202
20	TRN	(room ID # tbd)	AG202
21	TRM1.2	TBD	AG202
22	TRM1.2	TBD	AG202
23	TRN	(room ID # tbd)	AG202
24	TRM2.2	TBD	AG202
25	TRN	(room ID # tbd)	AG202
26	TRM2.2	TBD	AG202
27	TRN	(room ID # tbd)	AG202
28	TRM2.2	TBD	AG202
29	TRN	(room ID # tbd)	AG202
30	TRM2.2	TBD	AG202
31	TRN	(room ID # tbd)	AG202
32	TRM2.2	TBD	AG202
33	TRN	(room ID # tbd)	AG202
34	TRM2.2	TBD	AG202
35	TRN	(room ID # tbd)	AG202
36	TRM2.2	TBD	AG202
37	TRN	(room ID # tbd)	AG202
38	TRM2.2	TBD	AG202
39	TRN	(room ID # tbd)	AG202
40	TRM2.2	TBD	AG202
41	TRN	(room ID # tbd)	AG202
42	TRM2.2	TBD	AG202
43	TRN	(room ID # tbd)	AG202



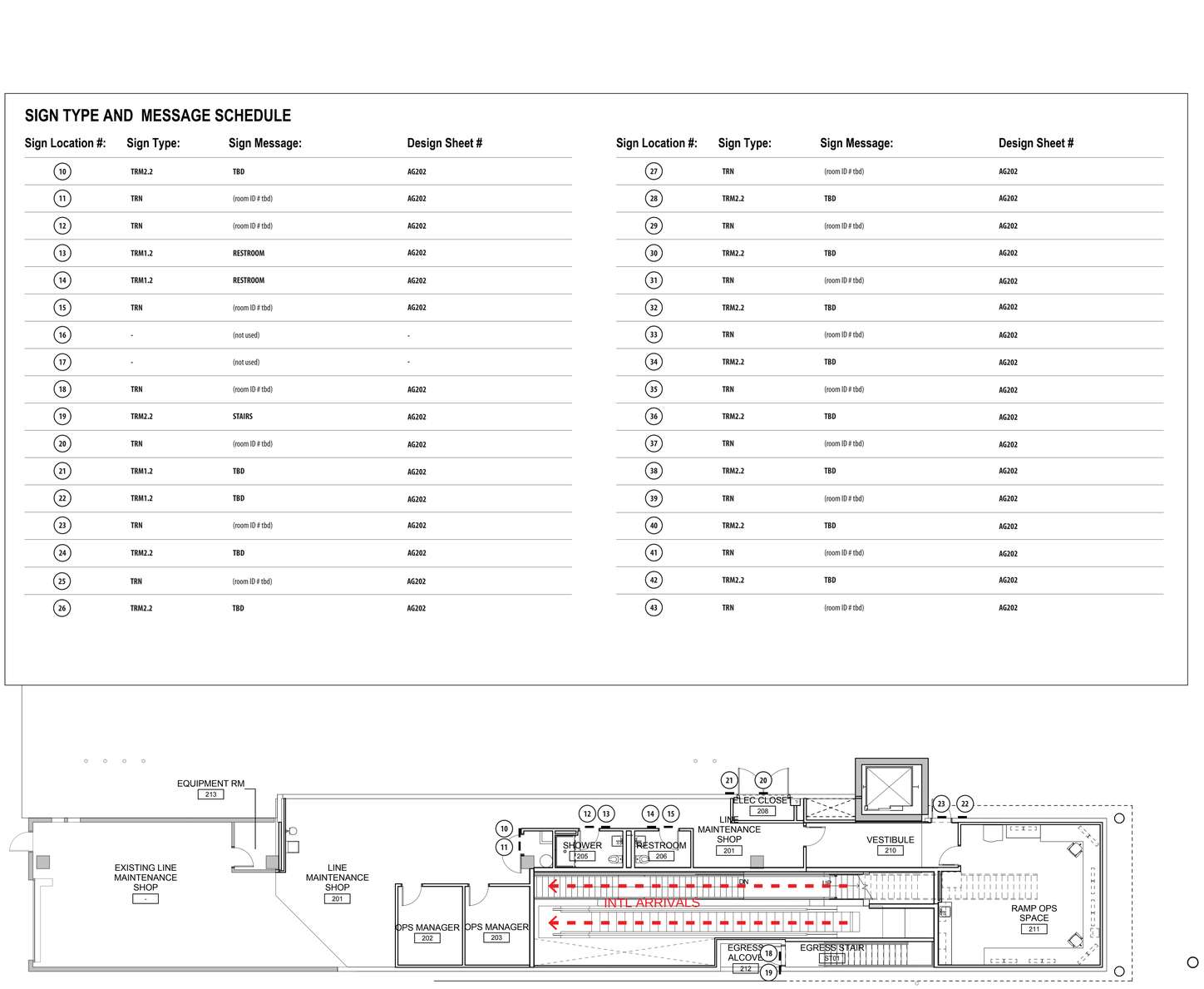
1 OVERALL PLAN - APRON LEVEL
1/32" = 1'-0"



5 SWING SPACE - WEST PLAN
1/8" = 1'-0"



6 SWING SPACE - EAST PLAN
1/8" = 1'-0"



2 ENLARGED APRON LEVEL SIGN LOCATION PLAN
1/8" = 1'-0"

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson
Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No. : 001

Hartsfield Jackson + Partnership
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Suite 2250
Atlanta, GA 30303
Phone: 404-439-9000

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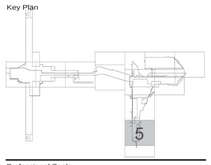
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
2.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	12-19-14
3.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15

Drawn by: JWD Reviewed by: JWD

Project No:

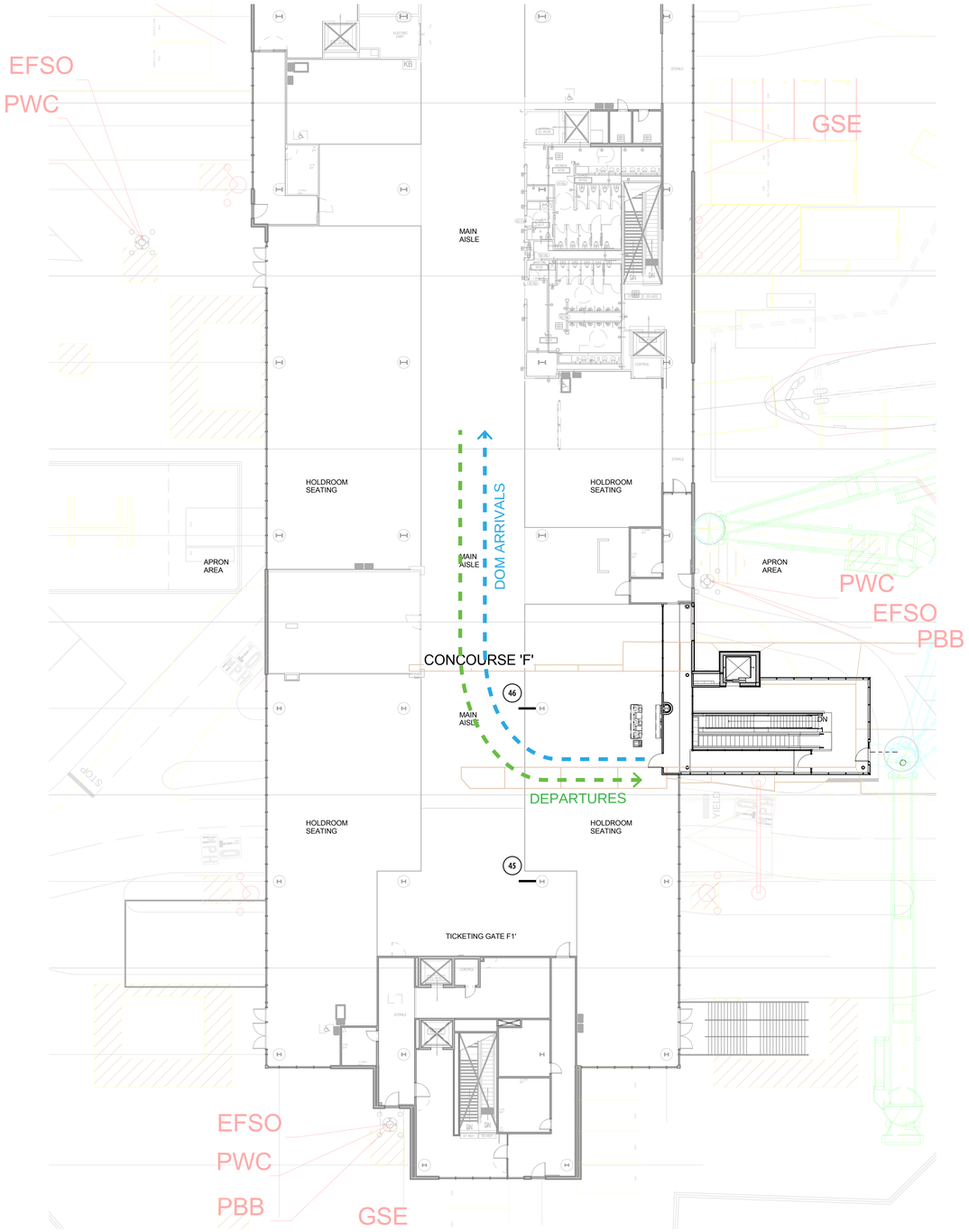
Sheet Title

APRON LEVEL
SIGN LOCATION PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

AG101



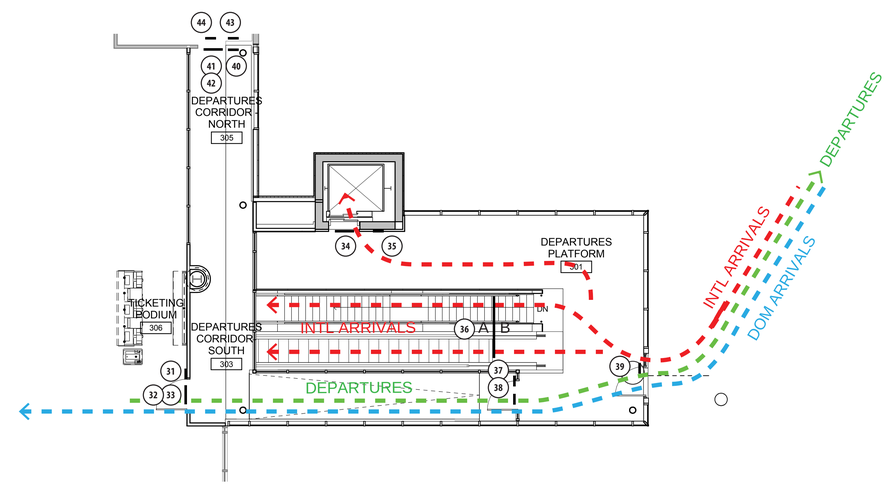
1 OVERALL PLAN - DEPARTURES LEVEL
1/16" = 1'-0"

EL. 1007'-6"

0 4 8 16 32 FT.

SIGN TYPE AND MESSAGE SCHEDULE

Sign Location #:	Sign Type:	Sign Message:	Design Sheet #
31	TRM2.2	F3A	AG202
32	TRN	(room ID # tbd)	AG202
33	TGE	F3A	AG201
34	TGE5	ELEVATOR	AG201
35	TEV.2	(disabled use sign)	AG201
36	TIM10.1A	A: DO NOT ENTER B: Passport Control v	AG201
37	TRM2.2	F3A	AG202
38	TRN	(room ID # tbd)	AG202
39	TRN	(room ID # tbd)	AG202
40	TRM2.2	F3	AG202
41	TGE	F3	AG201
42	TRN	(room ID # tbd)	AG202
43	TRM2.2	F3A	AG202
44	TRN	(room ID # tbd)	AG202
45	TGI (EXISTING)	F3A (remove and replace graphics on existing sign)	AG201
46	TGI	F1	AG201



2 ENLARGED DEPARTURES LEVEL SIGN LOCATION PLAN
1/8" = 1'-0"

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
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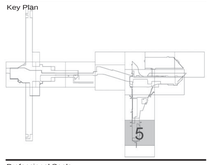
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
2.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	12-19-14
3.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15

Drawn by: JWD Reviewed by: JWD

Project No:

Sheet Title

DEPARTURES LEVEL SIGN LOCATION PLAN

Original drawing is 42 x 30. Do not scale contents of this drawing.

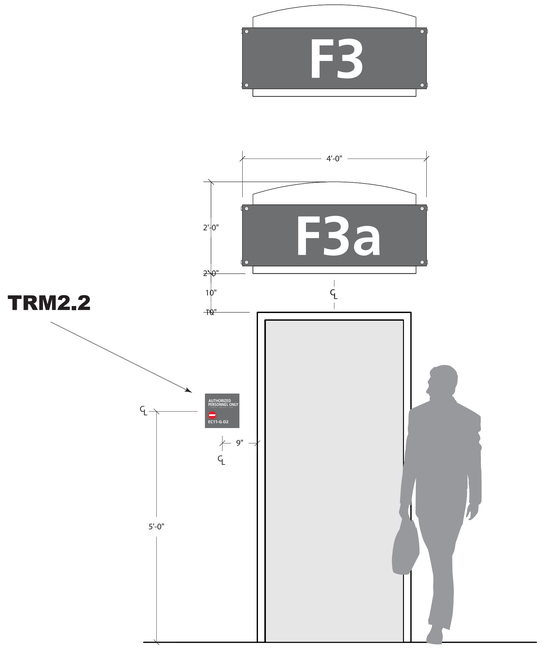
Sheet Number

AG102

Sign Type **TGI - Gate Identification**

1 KEY ELEVATION
3/4" = 1'-0"

Sign Type **TGE - Gate Identification**

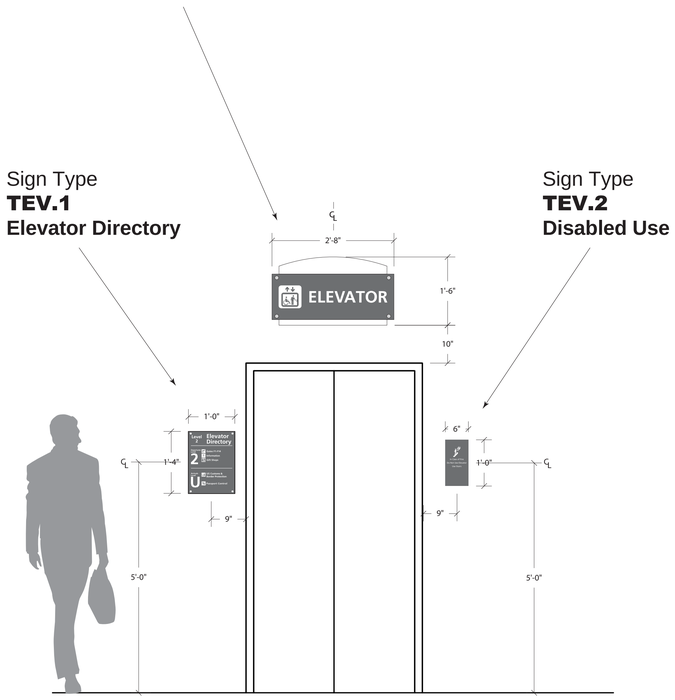


2 KEY ELEVATION
3/4" = 1'-0"

Sign Type **TIM10.1A - Overhead Directional**

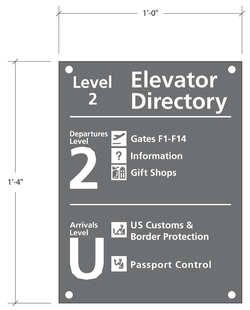
3 KEY ELEVATION
3/4" = 1'-0"

Sign Type **TGE5 - Elevator Identification**



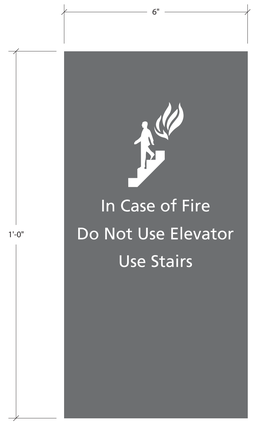
4 KEY ELEVATION
3/4" = 1'-0"

Sign Type **TEV.1 - Elevator Directory**



5 DETAIL ELEVATION
3" = 1'-0"

Sign Type **TEV.2 - Disabled Use**



**NOTE:
FOR DETAILED INFORMATION ON ALL SIGN CONSTRUCTION, REFER TO APPROVED SHOP DRAWINGS AVAILABLE THROUGH THE DEPARTMENT OF AVIATION**

6 DETAIL ELEVATION
One-Half Scale

QA / QC REVIEW 12-19-14

CITY OF ATLANTA, GEORGIA

Hartsfield-Jackson Atlanta International Airport

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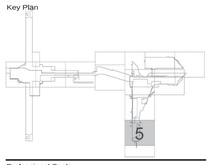
Key Plan



Professional Seals

No.	Description	Date
1.	ISSUED FOR 65% CONSTRUCTION DOCUMENTS	10-30-14
2.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	12-19-14
3.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15

Drawn by: JWD Reviewed by: JWD

Project No:

Sheet Title

SIGNAGE DETAILS

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

AG201

VT01	GENERAL ELEVATOR INFORMATION
VT02	PLANS AND HOISTWAY SECTION ELEVATOR 1
VT03	WELLWAY PLANS AND SECTION ESCALATORS 1F AND 1R

1 VT01 INDEX OF DRAWINGS
SCALE: NTS

ELEVATOR 1	4000# @ 350 FPM
ESCALATORS 1F AND 1R	48" (40" STEP) @ 100 FPM

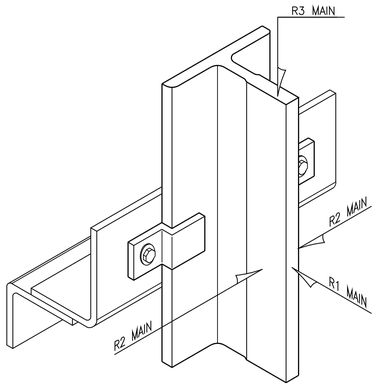
2 VT01 SUMMARY OF ELEVATORS
SCALE: NTS

AFF	ABOVE FINISH FLOOR
A.P.	ACCESS PANEL
A/C	AIR CONDITIONING
ALT.	ALTERNATE
AC	ALTERNATING CURRENT
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
AMP	AMPERE
APPROX.	APPROXIMATE
ARCH.	ARCHITECTURAL
AUX.	AUXILIARY
BSMT	BASEMENT
BOT.	BOTTOM
BTUH	BRITISH THERMAL UNITS PER HOUR
BM	BEAM
BOCA	BUILDING OFFICIALS AND CODE ADMINISTRATION
CLG	CEILING
°C	CELSIUS
℄	CENTERLINE
CM	CENTIMETERS
COL.	COLUMN
CLR	CLEAR
CONC.	CONCRETE
CMU	CONCRETE MASONRY UNITS
CONT.	CONTINUOUS
CONTR.	CONTRACTOR
COORD	COORDINATE
CNTRL	CONTROLLER
CWT	COUNTERWEIGHT
CYL.	CYLINDER
DEH	DEAD END HITCH
D.	DEEP
°	DEGREES
DTL	DETAIL
ø	DIAMETER
DIM.	DIMENSION
DC	DIRECT CURRENT
DISC.	DISCONNECT
DBG	DISTANCE BETWEEN GUIDE RAILS
DN	DOWN
DWG	DRAWING
EA.	EACH
ELEC.	ELECTRICAL
EL.	ELEVATION
ELEV.	ELEVATOR
ETS	EMERGENCY TERMINAL SLOWDOWN
EQ.	EQUAL
EQUIP.	EQUIPMENT
ESCL.	ESCALATOR
(E)	EXISTING
°F	FAHRENHEIT
FPM	FEET PER MINUTE
F.V.	FIELD VERIFY
F.F.	FINISH FLOOR
FLR	FLOOR
FT	FOOT (FEET)
FLUOR.	FLUORESCENT
F/O	FRONT OPENING
FUT.	FUTURE
G	GRAVITY
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GOV.	GOVERNOR
GA.	GUAGE
GYP. BD.	GYPSUM BOARD
HT	HEIGHT
HZ	HERTZ
H.	HIGH
HSTWY	HOISTWAY
HORIZ.	HORIZONTAL
HR	HOUR
HP	HORSEPOWER
HYDR.	HYDRAULIC
IBC	INTERNATIONAL BUILDING CODE
IN.	INCH (INCHES)
IGBT	INSULATED GATE BIPOLAR TRANSDUCER
J/S	JOULES PER SECOND
KCAL	KILOCALORIE
KG	KILOGRAMS
KN	KILONEWTONS
KVA	KILOVOLT-AMPERE
KW	KILOWATTS
K	KIPS
LT	LIGHT
MPS	METERS PER SECOND
MACH.	MACHINE
MRL	MACHINE-ROOM-LESS
MAX.	MAXIMUM
MEZZ.	MEZZANINE
M	METER
MM	MILLIMETERS
MIN.	MINIMUM
MISC.	MISCELLANEOUS
MG	MOTOR-GENERATOR
MTD	MOUNTED
NEC	NATIONAL ELECTRICAL CODE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
(N)	NEW
NOM.	NOMINAL
N/A	NOT APPLICABLE
NTS	NOT TO SCALE
NO.	NUMBER
O.C.	ON CENTER
OPNG	OPENING
O.A.	OVERALL
OPP.	OPPOSITE
OVHD	OVERHEAD
PL	PLATE
PLTFM	PLATFORM
#	POUNDS
PSI	POUNDS PER SQUARE INCH
PRELIM.	PRELIMINARY
RAD.	RADIUS
R/O	REAR OPENING
REQ.	REQUIRED
REV.	REVISION
RM	ROOM
R.O.	ROUGH OPENING
SEC.	SECONDARY
SECT.	SECTION
SHT	SHEET
SCR	SILICON CONTROLLED RECTIFIER
SIM.	SIMILAR
SPEC.	SPECIFICATION
SF	SQUARE FEET
SM	SQUARE METERS
STD	STANDARD
STL	STEEL
STRUCT.	STRUCTURAL
SW.	SWITCH
TBD	TO BE DETERMINED
T.O.	TOP OF
(TYP)	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VERT.	VERTICAL
V.	VOLT
W.	WIDE
W/	WITH
WP	WORKPOINT

3 VT01 ABBREVIATIONS
SCALE: NTS

1. THESE DRAWINGS FOR GENERAL INFORMATION ONLY. REQUIREMENTS OF INDIVIDUAL VENDORS MAY VARY.
2. THESE DRAWINGS TO BE DISTRIBUTED TO APPROPRIATE CONSULTING AND ENGINEERING FIRMS, INCLUDING ARCHITECT, STRUCTURAL, ELECTRICAL AND MECHANICAL ENGINEERS.
3. FIELD VERIFY ALL EXISTING DIMENSIONS.
4. ROUGH OPENING DIMENSIONS FOR ELEVATOR ENTRANCES APPLY ONLY IN THE CASE OF MASONRY OR CONCRETE CONSTRUCTION.
5. VERTICAL STRUCTURAL SUPPORT FOR RAIL BRACKETING IS PROVIDED BY HOISTWAY WALLS IN THE CASE OF REINFORCED CONCRETE HOISTWAY CONSTRUCTION.

4 VT01 GENERAL NOTES
SCALE: NTS



POWER FEEDER REQUIREMENTS (MAIN POWER SUPPLY: 480-3-60 ASSUMED)

ELEVATOR NUMBER	CAPACITY (POUNDS)	SPEED (FPM)	TRACTION DRIVE HP RATING	HYDRO MOTOR HP	HYDRO STARTING AMPS			FULL LOAD AMPS		HEAT RELEASE	
					LOCKED ROTOR	SOLID STATE	WYE DELTA	RUNNING	ACCELERATING	MACHINE SPACE BTUH PER CAR	CONTROLLER SPACE BTUH PER CAR
1	4000	350	30	N/A	N/A			36	90	4000	13,600

NOTES:

1. ELECTRIC POWER AND CURRENT ARE BASED ON THREE (3) PHASE A.C. POWER SUPPLY.
2. MAIN POWER TO BE PROVIDED AT EACH CONTROLLER THROUGH DISCONNECTING MEANS MEETING NEC REQUIREMENTS.
3. MAIN POWER SUPPLY FEEDERS TO LIMIT VOLTAGE DROP TO LESS THAN 5%.
4. USE COPPER CONDUCTORS ONLY.
5. FEEDER DEMAND FACTORS (NEC SECTION 430-26 AND 620-14)=
   (2) CARS= 95% (3) CARS= 90% (4) CARS= 85% (5) CARS= 82% (6) CARS= 79% (7) CARS= 77%
   (8) CARS= 75% (9) CARS= 73% (10) CARS= 72%.
6. MACHINE SPACE TEMPERATURE TO BE MIN. 13° C (55° F.), MAX. 32° C (90° F).
   TO BE MEASURED 1838 MM (6'-0") ABOVE FINISH FLOOR AT APPROX. CENTER OF ROOM.
7. RELATIVE HUMIDITY MAX. 80% NON-CONDENSING.
8. THE SELECTION OF MAIN POWER SUPPLY DISCONNECTING MEANS OVERCURRENT PROTECTION TO BE SIZED IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE, SECTIONS 620-51 AND 430-52.
9. PROVIDE LOCAL TELEPHONE SERVICE LINE TO EACH CAR CONTROLLER (IF APPLICABLE).
10. PROVIDE GFCI CONVENIENCE OUTLETS PIT, MACHINE ROOM AND MACHINERY SPACES. IN PIT, PROVIDE ONE NON-GFCI OUTLET FOR SUMP PUMP AND/OR OIL RETURN PUMP.
11. PROVIDE HOIST MACHINE WITH VOLTAGE TO MATCH SUPPLY VOLTAGE INDICATED, U.N.O.

ADDITIONAL POWER AND DISCONNECT REQUIREMENTS IN MACHINE ROOM

AUXILIARY SYSTEM	SUPPLY TERMINAL	SUPPLY VOLTAGE	CIRCUIT CAPACITY
CAR LIGHT AND FAN WITH LOCKABLE DISCONNECT	EACH CONTROLLER	120-1-60	(15 AMP PER CAR)
INTERCOM SYSTEM (IF APPLICABLE)	AT AMPLIFIER	120-1-60	1800 WATTS (15 AMP MIN)
AIR CONDITIONING AND HEATING SOURCE (IF APPLICABLE)	EACH CONTROLLER	120-1-60	(20 AMP PER CAR)
CONDENSATE EVAPORATOR UNIT FOR AIR CONDITIONING (IF APPLICABLE)	EACH CONTROLLER	120-1-60	(30 AMP PER CAR)

5 VT01 ELEVATOR ELECTRICAL AND MECHANICAL REQUIREMENTS
SCALE: NTS

RAIL FORCES MAXIMUM ON EACH GUIDE RAIL (FORCES ARE IN KIPS)

	ELEVATOR NUMBER	1	OCCURING ON
NORMAL FORCES	CAR R1	1.4	CAR NORMAL FACE OF MAIN RAIL
	CAR R2	0.8	CAR NORMAL SIDE OF MAIN RAIL – LOADING OR RUNNING
	CAR R3	31.2	FORCE TRANSMITTED TO PIT STRUCTURE AT CAR SAFETY APPLICATION*
	CWT R3	N/A	FORCE TRANSMITTED TO PIT STRUCTURE AT CWT SAFETY APPLICATION*

FOR SOME MACHINE ROOM-LESS (MRL) MODELS, PROVIDE ADDITIONAL LATERAL SUPPORTS ABOVE THE TOP TERMINAL FOR LARGE GUIDE RAIL FORCES DUE TO HOIST MACHINE, DEFLECTOR SHEAVE, AND DEAD END HITCH LOADS (NORMAL FORCES R1 AND R2 CAN BE OVER 13.3 KN [3.0 K] FOR SOME APPLICATIONS). COORDINATE LOADING AND SUPPORT LOCATIONS WITH ELEVATOR CONTRACTOR.

ASME A17.1

BUILDING SUPPORTS TO RESIST HORIZONTAL FORCES WITH A TOTAL DEFLECTION AT POINT OF SUPPORT NOT IN EXCESS OF 3MM (1/8") DURING NORMAL CONDITIONS.

* THESE REACTIONS DO NOT OCCUR SIMULTANEOUSLY WITH PIT BUFFER REACTIONS

A17.1/UBC VARIABLES USED FOR SEISMIC CALCULATIONS:
SEISMIC ZONE = 0 OR 1 (NON-SEISMIC FOR ELEVATORS)

IBC

IBC VARIABLES USED FOR SEISMIC CALCULATIONS:
SEISMIC DESIGN CATEGORY = _ (NON-SEISMIC FOR ELEVATORS)

ARCHITECT TO PROVIDE

6 VT01 RAIL FORCES
SCALE: NTS

POWER FEEDER REQUIREMENTS (MAIN POWER SUPPLY: 480-3-60 ASSUMED)

ESCALATOR	NOMINAL TREAD WIDTH	SPEED FPM	MOTOR HP	STARTING AMPS	RUNNING AMPS	BTUH/HR PER ESCL.
1	40"	100	30	54.4	27.2	18,000

NOTES:

1. ELECTRIC POWER AND CURRENT ARE BASED ON THREE (3) PHASE A.C. POWER SUPPLY.
2. MAIN POWER TO BE PROVIDED AT EACH CONTROLLER THROUGH DISCONNECTING MEANS MEETING NEC REQUIREMENTS.
3. DISCONNECTING MEANS TO BE SIZED TO LIMIT VOLTAGE DROP TO LESS THAN 5%.
4. USE COPPER CONDUCTORS ONLY.
5. THE SELECTION OF DISCONNECTING MEANS OVERCURRENT PROTECTION TO BE SIZED IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE, SECTION 620-51, ARTICLE 430-52 (EXCEPTIONS A, B, C).

7 VT01 ESCALATOR ELECTRICAL AND MECHANICAL REQUIREMENTS
SCALE: NTS

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Hartsfield-Jackson Atlanta International Airport

"F" CONCOURSE
A380 GATE F3 RECONFIGURATION
WBS No. D.05.26.001
CONTRACT No. FC-5801-A
TASK ORDER No.: 001

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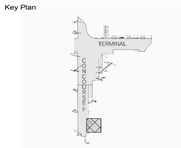
Key Plan



Professional Seals

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3.	ISSUED FOR 95% CONSTRUCTION DOCUMENTS	01-23-15
4.	ISSUED FOR 100% CONSTRUCTION DOCUMENTS	03-23-15
5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: L/B Reviewed by: TM

Project No:

Sheet Title

GENERAL ELEVATOR INFORMATION

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

VT01

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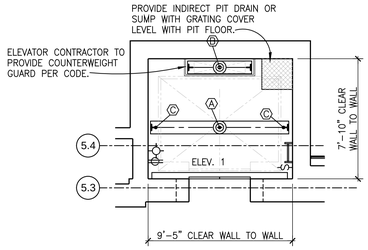


PIT REACTIONS VARY PER VENDOR BASED ON CWT LOCATION AND METHOD OF HOIST MACHINE SUPPORT. COORDINATE FINAL PIT REACTIONS WITH ELEVATOR SHOP DRAWINGS.

PIT REACTION TABLE		
DUTY: 4000# @ 350 FPM		
KEY	REACTION (FORCES IN KIPS)	DESCRIPTION
A	52.3	CAR BUFFER
B	47.8	CWT BUFFER
C	31.2 EACH	CAR SAFETY (SEE CAR R3 RAIL FORCES)

* THESE REACTIONS CAN OCCUR SIMULTANEOUSLY. OTHERWISE, REACTIONS DO NOT OCCUR SIMULTANEOUSLY.

PIT NOTES:

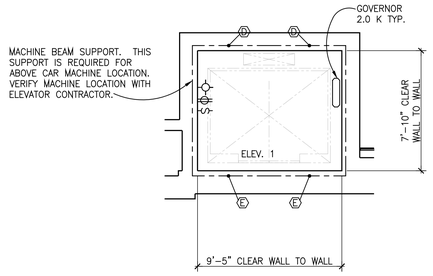
PROVIDE ADEQUATE LIGHTING TO MAINTAIN MIN. 100 LUX (10 FC) ILLUMINATION AT PIT FLOOR.

PROVIDE PIT ACCESS LADDERS, LIGHT SWITCHES, LIGHTS, AND GFCI–PROTECTED UTILITY OUTLETS.

PROVIDE ONE PIT LADDER, LIGHT SWITCH, LIGHT FIXTURE, AND OUTLET PER ELEVATOR.

PROVIDE ADEQUATE STRUCTURAL SUPPORT REQUIRED FOR BUFFER AND RAIL FORCE REACTIONS.

1 / VT02 **PIT PLAN ELEVATOR 1**
SCALE: 1/4" = 1'–0"
DUTY: 4000# @ 350 FPM



OVERHEAD REACTIONS VARY PER VENDOR BASED ON CWT LOCATION AND METHOD OF SUPPORT FOR HOIST MACHINE AND DEAD END HITCHES. COORDINATE FINAL REACTIONS WITH ELEVATOR SHOP DRAWINGS.

OVERHEAD REACTION TABLE	
DUTY: 4000# @ 350 FPM	
KEY	REACTION (FORCES IN KIPS)
D	17.4 EACH
E	11.8 EACH

REACTIONS HAVE BEEN DOUBLED FOR IMPACT.

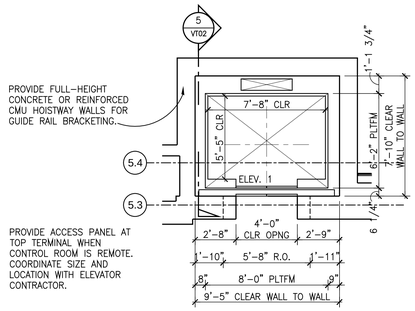
OVERHEAD NOTES:

PROVIDE ADEQUATE LIGHTING TO MAINTAIN MIN. 200 LUX (19 FC) ILLUMINATION AT TOP OF HOISTWAY.

PROVIDE LIGHTS, LIGHT SWITCHES AND GFCI–PROTECTED UTILITY OUTLETS. COORDINATE LOCATIONS WITH ELEVATOR CONTRACTOR.

PROVIDE STRUCTURAL SUPPORT TO SUSTAIN REACTIONS INDICATED.

4 / VT0 **OVERHEAD PLAN ELEVATOR**
SCALE: 1/4" = 1'–0"
DUTY: 4000# @ 350 FPM

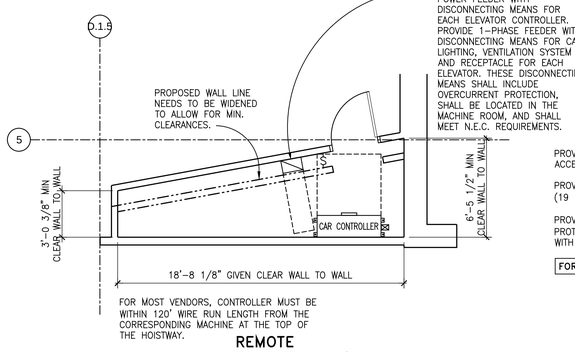


NOTES:

– APPLICATION DESIGNED FOR:
OTIS
KONE
SCHINDLER
THYSSENKRUPP

PIT AND OVERHEAD PLANS INDICATE REACTIONS FOR MACHINE ROOM–LESS EQUIPMENT OF VARIOUS ELEVATOR VENDORS. WHERE REACTIONS OF DIFFERENT VENDORS OVERLAP, THE HIGHER REACTION IS INDICATED. REACTIONS FOR ONE VENDOR DO NOT OCCUR WITH THE REACTIONS OF OTHER VENDORS. OVERHEAD PLANS ARE NOT SHOWN FOR VENDORS WITH NO REACTIONS IN THE OVERHEAD.

2 / VT02 **HOISTWAY PLAN ELEVATOR 1**
SCALE: 1/4" = 1'–0"
DUTY: 4000# @ 350 FPM



FOR MOST VENDORS, CONTROLLER MUST BE WITHIN 120' WIRE RUN LENGTH FROM THE CORRESPONDING MACHINE AT THE TOP OF THE HOISTWAY.

CONTROL ROOM NOTES:

PROVIDE SELF–CLOSING, SELF–LOCKING CONTROL ROOM ACCESS DOOR.

PROVIDE ADEQUATE LIGHTING TO MAINTAIN MIN. 200 LUX (19 FC) ILLUMINATION AT CONTROL ROOM FLOOR.

PROVIDE LIGHT(S), LIGHT SWITCH(ES) AND GFCI–PROTECTED UTILITY OUTLET(S). COORDINATE LOCATIONS WITH ELEVATOR CONTRACTOR.

FOR CONTROL ROOM HEAT EMISSIONS SEE 5/VT01

3 / VT02 **REMOTE CONTROL ROOM PLAN ELEVATOR 1**
SCALE: 1/4" = 1'–0"
DUTY: 4000# @ 350 FPM

PROVIDE 2 LIFELINE ATTACHMENTS AT THE TOP FRONT OF EACH HOISTWAY. EACH ATTACHMENT SHALL BE CAPABLE OF WITHSTANDING 5000# (2268 KG) LOAD PER OSHA. COORDINATE LOCATION OF ATTACHMENTS WITH ELEVATOR CONTRACTOR.

PROVIDE HOIST BEAM SUPPORT. MAKE HOIST BEAM(S) REMOVABLE IF NECESSARY TO MEET MIN CLEAR OVERHEAD DIMENSION. COORDINATE HOIST BEAM LOCATION(S) AND LOAD REQUIREMENTS WITH ELEVATOR CONTRACTOR.

ABOVE CAR MACHINE LOCATION. VERIFY FINAL LOCATION WITH ELEVATOR CONTRACTOR.

1070 MM (42") HIGH RAILING PER CODE BY ELEVATOR CONTRACTOR.

REAR CWT MACHINE LOCATION. VERIFY FINAL LOCATION WITH ELEVATOR CONTRACTOR.

VERTICAL OR ADDITIONAL HORIZONTAL STRUCTURAL SUPPORT FOR RAIL BRACKETING AS REQUIRED FOR CAR AND COUNTERWEIGHT BOTH SIDES OF HOISTWAY TO MEET BRACKET SPACING CRITERIA INDICATED IN SECTION.

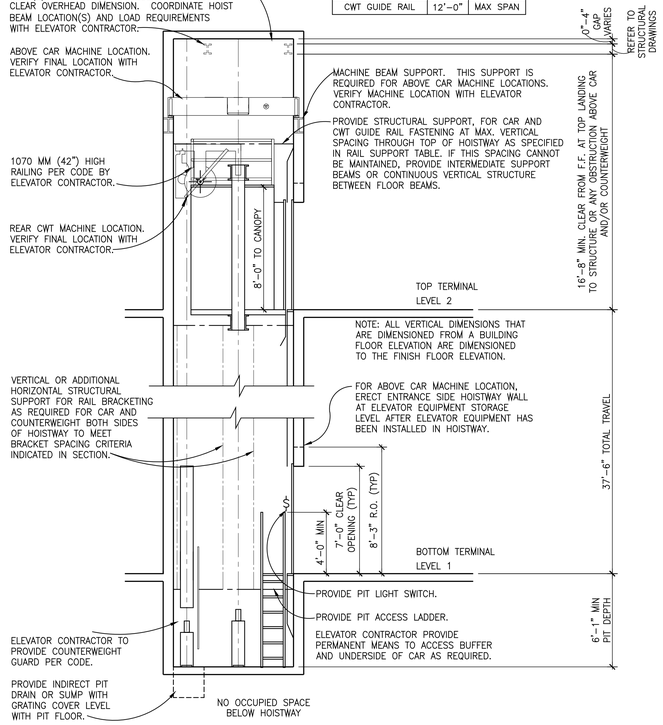
ELEVATOR CONTRACTOR TO PROVIDE COUNTERWEIGHT GUARD PER CODE.

PROVIDE INDIRECT PIT DRAIN OR SUMP WITH GRATING COVER LEVEL WITH PIT FLOOR.

MINIMUM TOTAL SMOKE VENTING REQUIRED TO OUTSIDE AIR: 3.0 SF OR 3.5% OF HOISTWAY AREA (WHICHEVER IS GREATER) PER ELEVATOR.

FOR CERTAIN MRL VENDORS, PROVIDE ADDITIONAL LATERAL SUPPORTS ABOVE THE TOP TERMINAL FOR THE LARGE GUIDE RAIL FORCES DUE TO THE MACHINE DEFLECTOR SHEAVE, AND DEAD END HITCH LOADS. COORDINATE LOADING REQUIREMENTS AND LOCATIONS WITH ELEVATOR MONITOR.

RAIL SUPPORT TABLE		
CWT GUIDE RAIL	12'–0"	MAX SPAN



5 / VT02 **HOISTWAY SECTION ELEVATOR 1**
SCALE: 1/4" = 1'–0"
DUTY: 4000# @ 350 FPM

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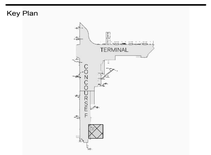

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5.	ISSUED FOR BID DOCUMENTS	04-17-15

Drawn by: L/B Reviewed by: TM

Project No:

Sheet Title

PLANS AND HOISTWAY SECTION ELEVATOR 1

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

VT02

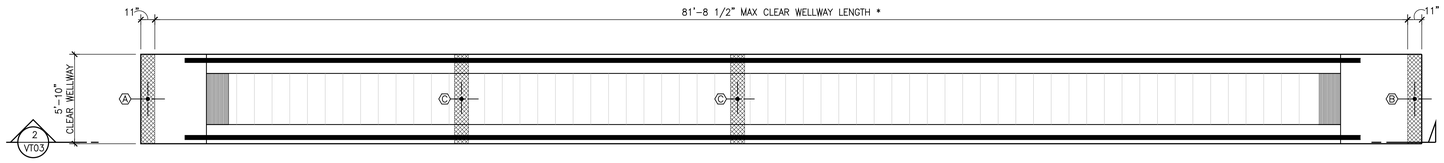
ESCALATOR DUTY: 48" (40" STEP) @ 100 FPM		
KEY	REACTION (FORCES IN KIPS)	
A	16.0	
B	26.3	
C	47.9	

REACTIONS INCLUDE DEAD LOAD AND LIVE LOAD.

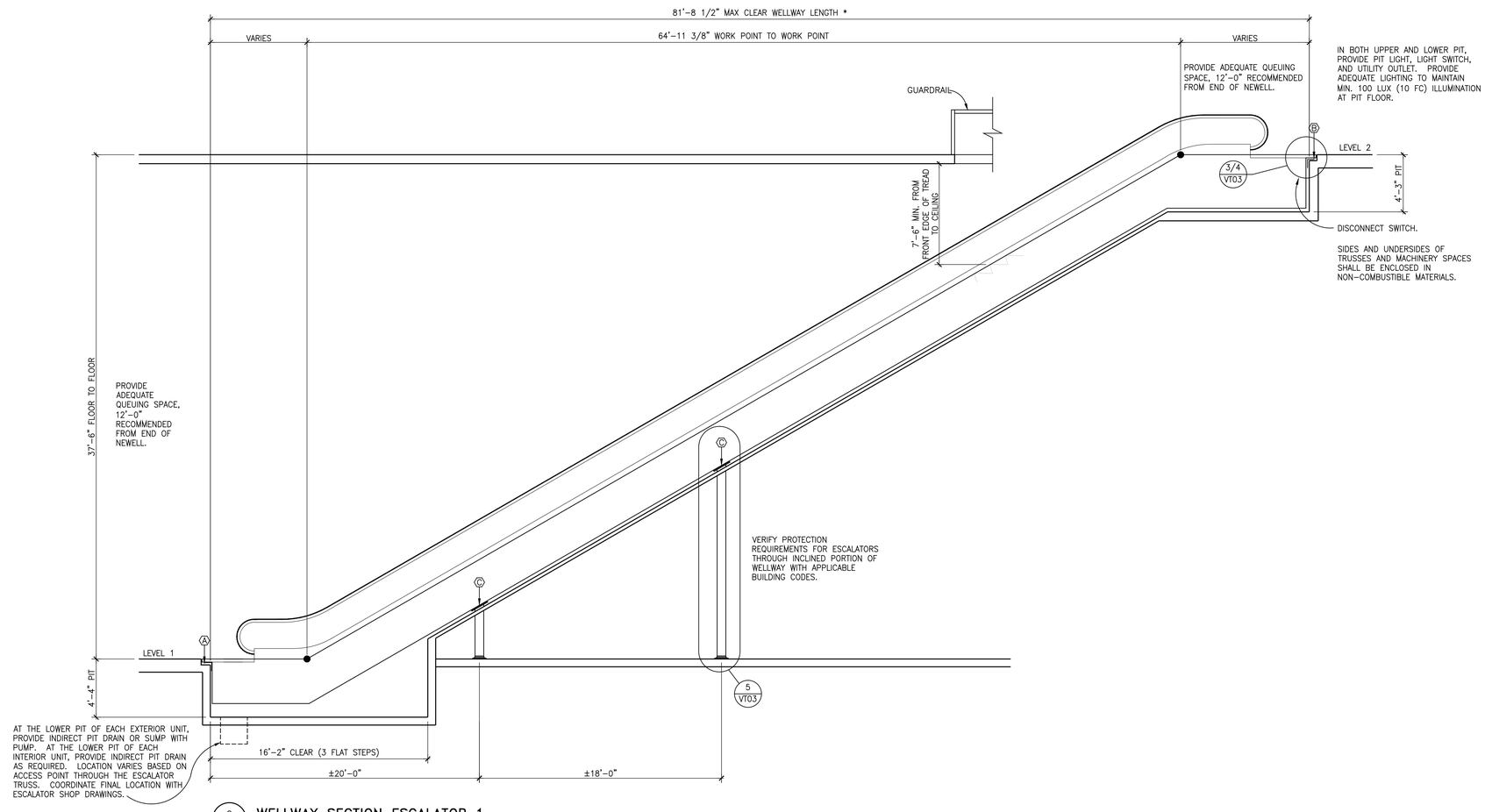
WELLWAY LENGTH SHOWN WILL ACCOMMODATE ALL APPROVED MANUFACTURERS. DISTANCE BETWEEN WORKING POINTS AND EDGE OF SUPPORT MAY VARY WITH EACH MANUFACTURER.

IF A SPECIFIC EDGE SUPPORT, WORK POINT, NEWELL, OR LANDING PLATE LOCATION IS REQUIRED CONTACT LERCH BATES.

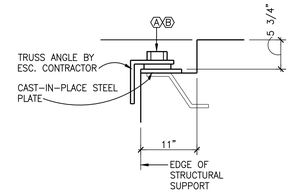
* BASED ON 3 FLAT STEPS AT UPPER AND LOWER LANDINGS



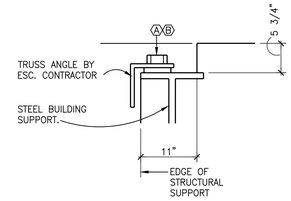
1 VT03 **WELLWAY PLAN ESCALATOR 1**
SCALE: NTS



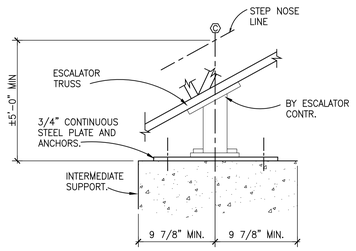
2 VT03 **WELLWAY SECTION ESCALATOR 1**
SCALE: NTS



3 VT03 **CONCRETE SUPPORT DETAIL**
SCALE: NTS



4 VT03 **STEEL SUPPORT DETAIL**
SCALE: NTS



5 VT03 **INTERMEDIATE SUPPORT DETAIL**
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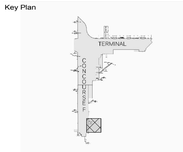

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4. ISSUED FOR 100% CONSTRUCTION DOCUMENTS		03-23-15
5. ISSUED FOR BID DOCUMENTS		04-17-15

Drawn by: L/B Reviewed by: TM

Project No:

Sheet Title

WELLWAY PLAN AND SECTION ESCALATOR 1

Original drawing is 42 x 30. Do not scale contents of this drawing.

Sheet Number

VT03

EXHIBIT G; AIRPORT SECURITY REQUIREMENTS

HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

FC-8075; F3 A380 RECONFIGURATION

EXHIBIT "G", AIRPORT SECURITY PLAN REQUIREMENTS (SIDA)

The CONTRACTOR is required to provide a Site Specific Security Plan. This Plan is part of the Contract Documents. The CONTRACTOR must, at all times, comply with all aspects of the approved Plan as well as ensure that all employees and subcontractors comply with the provisions of the Plan. This Plan is a "living document" and will be updated as needed. This Site specific security plan must be developed in accordance with the guidelines in Appendix 1 of this document.

The Site Specific Security Plan must be submitted in writing to the Engineer and approved prior to commencing Work at the Jobsite.

Costs for performing all Work necessary to provide a secure site must be incidental to the prices for other items of Work, and not priced separately.

1. **Airport Security Requirements**. The CONTRACTOR shall at all times conduct all operations under this Contract in a manner to avoid the risk of loss, theft, or damage by vandalism, sabotage or any other means to any equipment, materials, work or other property at the Jobsite. The CONTRACTOR shall continuously inspect all equipment, materials and work to discover and determine any conditions which might involve such risks and shall be solely responsible for discovery, determination and correction of any such conditions.

   The CONTRACTOR shall comply with the Transportation Security Administration (TSA) and the City's security requirements for the Airport. Contractor shall cooperate with the TSA and the City on all security matters and shall promptly comply with any Project security arrangements established by City. Such compliance with these security requirements shall not relieve the CONTRACTOR of its responsibility for maintaining proper security for the above-noted items, nor shall it be construed as limiting in any manner the CONTRACTOR's obligation with respect to all applicable state, federal and local laws and regulations and its duty to undertake reasonable action to establish and maintain secure conditions at the Jobsite.

2. **Preventing Unauthorized Access**. The Airport has been secured to prevent unauthorized access to the Air Operations Area (AOA), the secured area, the sterile area and other controlled areas of the Airport. The CONTRACTOR shall cooperate to the fullest extent with the TSA and DOA to maintain the integrity of the security system. The CONTRACTOR shall control its operations and the operations of its subcontractors and all suppliers so as to provide for the free and unobstructed movement of aircraft, aircraft operations personnel

and equipment in the AOA, the secured area, the sterile area and other controlled areas of the Airport as defined herein.

3. **Transportation Security Administration/Responsibility of the CONTRACTOR.** In order to comply with the TSA and DOA security requirements, the CONTRACTOR shall be responsible for informing itself as to current, ongoing, and changing requirements, and for remaining in compliance with those requirements throughout this Contract. The security requirements are as follows and from time to time may change as required by the TSA and/or DOA.

4. **Security Identification Display Area (SIDA)**. The Security Identification Display Area (SIDA) is defined in the Airport Security Program as any area that requires individuals to continuously display Airport issued or Airport approved identification badges. Personnel associated with construction contracts in the AOA secured area or sterile area of the Airport shall display SIDA badges at all times. The TSA and the DOA require all personnel to display SIDA badges in areas controlled for security purposes at all times.

   4.1 **FBI/CHRC Checks.** To obtain a SIDA badge, each individual must successfully undergo a Federal Bureau of Investigation (FBI) fingerprint based Criminal History Records Check (CHRC) which must reveal no convictions of disqualifying crimes within the last ten years as defined in Transportation Security Regulation, TSR Part 1542.209. Each individual must also attend a security awareness course conducted by the DOA Security Division. Each employee must present two forms of Identification prior to the badging process. At least one form of identification must have been issued by a government authority and at least one must contain a photograph. The CONTRACTOR shall be responsible for all fees associated with obtaining a SIDA badge, (i.e. badge and fingerprint fees as determined by DOA). The current cost for the CHRC is $60.00 per individual. The current cost for badge is $60.00 per individual. Costs for lost badges is $200.00. The CONTRACTOR shall contact the DOA Security office at (404) 530-6667 prior to sending individuals to the DOA Security office for badging. The CONTRACTOR/Escorting Requirements are specified in subsection below.

5 **Displaying Badges.** Employees and those of all subcontractors must display a DOA issued badge showing the CONTRACTOR's name and an employee number. All personnel shall be required to wear this badge at all times while within the secured areas of the Airport.

6 **Badging Records and Process.** The CONTRACTOR shall maintain an up-to-date record of all badge holders showing name, address, sex, height, weight, color of eyes and badge number. The CONTRACTOR will be required to furnish this information to the DOA upon request.

   6.1 The Badging process may begin upon the CONTRACTOR's receipt of a formal Notice to Proceed (NTP) from the City and may take up to fourteen (14) calendar days to complete. Access to secured areas shall be denied until such time as the CONTRACTOR has completed the badging process.

6.2 If applicable, an Administrative NTP may be presented to the DOA Security Division by the CONTRACTOR in order to initiate the badging process for the CONTRACTOR's employees.

6.3 The CONTRACTOR shall appoint one of its employees as an Authorizing Agent and submit his or her name, on the CONTRACTOR's letterhead, to the DOA Security Division. The submittal letter shall indicate the Project Name, Contract Number, Point of Contact, Telephone and Fax number, list of subcontractors including subcontractors' Authorizing Agent nature of the work to be performed by the CONTRACTOR, and each subcontractor, location and duration, time frame(s), and justification for vehicle access, if required. A copy of the CONTRACTOR's Insurance Certificate shall accompany the letter. Once badged, the CONTRACTOR's Authorizing Agent shall be responsible for the badging process of his/her company employees.

6.4 Each Subcontractor identified in the CONTRACTOR's letter shall appoint one of its employees as an Authorizing Agent and submit his or her name through the CONTRACTOR, to the DOA Security Division. A copy of the Subcontractor's Insurance certificate shall accompany the letter. Once badged, the Subcontractor's Authorizing Agent shall be responsible for the badging process of his/her company employees.

6.5 Processing time for badging, at the badging office after completion of the CHRC, will last approximately one (1) hour. Processing time for Authorizing Agents will last an additional hour for briefing by the DOA Security Division. Authorizing agent briefing sessions will be conducted only on Mondays, Wednesdays and Fridays at 11 a.m. in the DOA Security office.

6.6 Each person applying for badging shall complete and submit all forms required by the DOA Security Division. All required forms will be provided to the authorizing agent at the time of the briefing at the DOA Security office.

6.7 Each person applying for a badge shall also submit to fingerprinting upon the submittal of said forms. Fingerprints will be utilized for a ten (10) year Federal Bureau of Investigation (FBI) based criminal history records check for each individual employee.

6.8 Pursuant to TSR § 1542.209 certain Felony convictions within the most recent ten (10) year period, may cause disqualification. A list of disqualifying Felony convictions is available in the offices of the DOA Security Division and in the TSR Regulations.

6.9 The Authorizing Agent will be notified when the results of the fingerprint checks are completed. Upon notification and approval, the CONTRACTOR's and subcontractor's approved employees may return to the DOA Security Office, during posted hours, for photographing and badging. This process may take up to sixty (60) minutes.

6.10 Badges issued to the CONTRACTOR and subcontractor employees and agents shall expire upon the happening of one (1) of the following events, whichever occurs first:

6.10.1 Completion of Contract or subcontract, unless extended by the City;
6.10.2 Expiration of Insurance coverage, as indicated on the CONTRACTOR's Insurance certificate; or
6.10.3 Employee's driver's license expiration date;
6.10.4 Two (2) years from the issuance of the badge.

6.11 The CONTRACTOR and its subcontractor shall be responsible for making arrangements, ahead of time, to extend badges, when necessary. A letter, directed to the DOA Assistant General Manager, Facilities, and the DOA Security Manager, explaining the reason(s) for the badge extension on the CONTRACTOR's letterhead will be required. Extension requests must be approved in writing by the DOA prior to extension of the badges.

6.12 The CONTRACTOR's questions concerning Airport Security shall be directed to (404) 530-6667.

7 **Drivers.** All drivers operating vehicles within the AOA must obtain, in addition to the DOA Security badge, a DOA Ramp Certification. Ramp Certification will be evidenced by a "D" sticker placed on the face of the badge by the DOA Security department.

7.1 **Ramp Certification.** City will require Airport Driver Safety Training and Ramp Certification for all personnel required to operate a motor vehicle in the AOA. This can be obtained by completing an Airport Driver Safety Training Course administered by the Airport Operations Division. These drivers shall only operate vehicle on the approved NLVR's & Aprons, excluding the Aircraft Movement Area. Contractor shall contact Airport Operations, at (404)530-6620 during normal business hours to schedule the training session.

7.2 Except where noted, all vehicles operating within the AOA shall carry a minimum liability insurance coverage amount of TEN MILLION DOLLARS ($10,000,000.00).

7.3 The CONTRACTOR shall mark all vehicles and construction equipment, including those of subcontractors, in a manner as required by the Department of Aviation and consistent with Transportation Security Regulations (TSR).

7.4 All vehicles operating within the AOA must display permanent signage, legible and visible from a sight distance of five hundred (500) feet on both sides of the vehicle. MAGNETIC SIGNS ARE PROHIBITED FROM USE IN THE AOA.

8 **Protocols for the CONTRACTOR Escorting.** The CONTRACTOR must incorporate escorting protocol with Security Plan submitted for approval by the Security Manager. The Security Manager must approve any exceptions. The CONTRACTOR must attach a map of work area(s) and routes to access the work area(s) to project security plan submitted to the Aviation Security Division for approval. The CONTRACTOR may contact DOA Security Manager at (404) 530–6667 during normal operating hours. These requirements cover

security escorting of unbadged personnel through airport security gates. The requirements for escorting onto the Aircraft Movement Area (AMA) and for crossing-guards on the airfield are included in the Technical Specifications.

8.1 All escorted vehicles and personnel must remain under the direction of authorized escorting personnel at all times.

8.2 The CONTRACTOR and escorted personnel shall have no Terminal or Concourse access.

8.3 Escorting is limited to an Airport SIDA badged prime CONTRACTOR or an Airport SIDA badged escorting subcontractor approved by the Security and Operations Managers to perform escorting duties. The individuals involved in escorting shall perform no other services other than escorting while in service. No other subcontractors will be allowed to escort any vehicle(s).

8.4 Escorting person(s) must have a SIDA badge.

8.5 Designated badged prime CONTRACTOR employees approved or badged escorting subcontractor must escort prime CONTRACTOR employees and subcontractors' employees to all work sites. Once at the work site, badged employees, prime or subcontractors', may supervise unbadged employees, not to exceed five (5) employees per one (1) SIDA badged employee.

8.6 All personnel (badged or escorted) must have an employee photo ID displayed on the outermost garment, waist high or above. The employee badge must contain the employee's name, The CONTRACTOR's name and project number or name. All escorted personnel must remain under the control of person(s) with an Atlanta SIDA badge at all times while in the SIDA.

8.7 Maximum vehicular escort—one (1) prime CONTRACTOR vehicle or approved badged escorting subcontractor is permitted to escort two (2) subcontractor vehicles.

8.8 All vehicles requiring escort must access and egress the AOA through Pre-approved gates. Vehicles requiring escort shall not be permitted access or egress through any other entry or exit point within the AOA for any reason whatsoever.

8.9 All escorted vehicles must obtain a permit, valid for up to ten (10) hours**,** at Gate 59. The obtaining of a permit, however, shall not relieve a vehicle from the requirement of being escorted as set forth herein.

8.10 In the event an escorted vehicle requires a time limit extension, the vehicle, and its original operator, must return to Gate 59 to obtain a time limit extension to complete

work in the AOA secure or sterile area. Time limit extension shall not exceed an additional ten (10) hour period under any circumstances.

9 **Construction Contracts Within Sterile Area (Inside Terminal, Concourses)**

9.1 Highest level of Security required.

9.2 All employees of prime CONTRACTOR and subcontractor, must be badged to work in the sterile area.

9.3 If escorting of unbadged the CONTRACTORs and or subcontractors is required, an approved sponsor agency (DOA, AATC, IAC, HACM, HCM, etc.) must perform escort full time.

9.4 For any work requiring access to the sterile area (beyond the Passenger Screening Checkpoint area and on Concourses), a tool inventory must be conducted daily by the prime CONTRACTOR or designated representative. A copy of this inventory should be provided to the construction manager or project manager for verification. In general, tools will not be allowed to pass through the checkpoint area.

10 **Restricted AOA Access.** The CONTRACTOR shall allow passage into the AOA or secured area through its access point to persons, vehicles, and equipment displaying identification of the DOA or provide an escort for each person or vehicle not displaying proper identification. Escort vehicles must be insured as specified per Exhibit D, Insurance and Bonding Capacity. Escorted vehicles need not carry the aforementioned coverage but must carry the minimum amounts of insurance required by Georgia Law. However, Insurance coverage of escort vehicles must provide coverage as specified by Exhibit D for vehicles being escorted.

11 **Visual Aids**. In the event of the possibility of contact with the AOA or secured area, the CONTRACTOR shall establish a system of visual aids for marking and delineating the limits of required clearances adjacent to active runways, taxiways, and NAVAIDS during both day and night time work, subject to City's approval prior to the start of any work under this Contract. The approved system of marking and delineating shall be installed, maintained and protected at all times.

12 **Tools and Materials.** The CONTRACTOR shall create and maintain an inventory of all tools and materials utilized within the SIDA, terminal building, Federal Inspection Service (FIS), and AOA.

12.1 All tools and materials shall be stored and maintained in a secured manner to prevent unauthorized use, within pre-designated areas within the secured areas of the airport. Storage designations shall be obtained by the CONTRACTOR and/or subcontractor, prior to mobilization, by contacting the DOA Properties Division at (404) 209-2945. Change requests for storage designation may be approved only through the DOA Properties Division with notification and concurrence from the DOA Security Division.

Failure to comply with this requirement may result in the termination of the CONTRACTOR's or subcontractor's contract and disqualification from working on construction contracts within secured areas of the Airport.

12.2 All tools and materials must be secured to prevent unauthorized use at all times within the secured areas of the Airport and/or the AOA. Failure to comply with this requirement may result in the termination of the CONTRACTOR's or subcontractor's contract and disqualification from working on construction contracts within secured areas of the Airport.

12.3 Any and all job-specific or unusual tools and/or materials shall be presented to the security authority at point of entry gate when accessing and/or egressing the SIDA and/or AOA. Failure to comply with this requirement may result in the termination of the CONTRACTOR's or subcontractor's contract and disqualification from working on construction contracts within secured areas of the Airport.

12.4 All vehicles shall remain subject to search while within the secured areas of the Airport and/or the AOA at all times. Vehicles may also be searched prior to entry to the secured areas of the Airport. The possession of weapons and other prohibited items may result in criminal or civil charges in accordance with applicable laws.

13 **Terminal/Curbside.** A maximum of two (2) CONTRACTOR vehicles <u>or</u> two (2) subcontractor vehicles may be permitted in a work area at any given time, subject to the approval of the Atlanta Police Department, and the DOA Security. In the event one (1) CONTRACTOR vehicle is present, then no more than one (1) subcontractor vehicle may be present at the same time, and vice versa.

13.1 Debris removal may be allowed from curbside with special permission by the DOA Security Department.

13.2 When parked at curbside, at least one (1) badged employee must remain with the vehicle at all times. Vehicles must be removed as expeditiously as possible in all cases.

13.3 Areas surrounding vehicles accessing curbsides must be kept clean at all times.

13.4 For purposes of obtaining Terminal or Curbside access, the APD Airport Section shall be contacted by dialing (404) 530-6630 24 hours in advance of the desired access time.

14 **Staging Areas.** The CONTRACTOR's Construction staging area shall be identified on the plans.

15 **Federal Inspection Service Areas.** For any or all work conducted within Federal Inspection Service (FIS) areas, Contractor shall submit FIS Authorization requests to the **U.S. Customs Service (404) 765-2300.** The request shall detail the names of employees, description and

area of work, work schedule, and any other relevant information to the DOA Security Department.

15.1 The CONTRACTOR shall be responsible for obtaining the appropriate approvals and special SIDA badge FIS access decals from the appropriate Federal authorities. Special SIDA badge FIS access decals will not be required in if one (1) or more U.S. Customs Agent(s) are present at the work site at all times.

16 **Security Checkpoints.** The CONTRACTOR and subcontractors shall maintain awareness among all employees, and at all times, that all Security Checkpoints are now under Federal jurisdiction rather than privately contracted Security agents. In general, contractors will not be allowed to carry tools and construction materials through the passenger security screening points.

16.1 Questions regarding Federal Security Checkpoints shall be directed to (404) 763-7437 or (404) 530-2150.

Appendix 1 to Exhibit G

Components of a CONTRACTOR SIDA Site Specific Security Plan

General Notes

1. In general, the security plan needs to explain who, what, when, and how:

    a. Who is performing the work or requiring access.

    b. What work is being performed and what security requirements are being observed.

    c. When the work is scheduled to commence and when it is scheduled to end.

    d. How the CONTRACTOR plans to maintain compliance with the airport security program (to include site access, controlling tool inventory, identifying workers/employees, how escorting will be performed, etc.

2. The document is not considered Sensitive Security Information (SSI), however once a security plan is completed and populated with the necessary information, that plan is to be considered SSI and handled observing all SSI non-disclosure rules.

    a. The submitted security plan is to be handled as SSI until that designation has been removed by Airport Security or Transportation Security Administration (TSA) or airport security.

3. The Security Plan requires 45-60 calendar days for review by the ENGINEER, Airport Security, and TSA as required.

    Note: The review time could be a minimum of 20 days; however, for the purpose of the schedule the CONTRACTOR should anticipate the 60 day possibility.

4. The Security Plan must be approved prior to any construction work taking place. This is an Airport Security and federal regulation requirement with no exceptions.

5. If original dates submitted on the approved security plan change (time extension), an updated security plan will have to be submitted to the ENGINEER, Airport Security, and TSA (as appropriate for the project) for review and approval.

Plan Outline

1. Introduction

    a. Project Name
    b. Project WBS Number
    c. Contractor
    d. Contract Number
    e. Location of Work Site
    f. Project Duration (Start/End Dates)
    g. Purpose of Security Plan
    h. Scope of Project

2. Project Access Points
    How the CONTRACTOR will access the project worksite and how this access point will be protected (if required).

3. Haul Routes
    How the CONTRACTOR will bring the material and equipment to the site. The route will be as identified on the Plans

4. CONTRACTOR Staging Areas
    Speak to where the CONTRACTOR will stage the equipment for this project. The staging area will be as identified on the Plans or as directed by the ENGINEER and/or Construction Manager.

5. Gate Security

    a. If the CONTRACTOR is to use a construction gate (69 or 54) other than the normal gate 59, this needs to be mentioned in this section.
    b. Also mention if the regular guard staffing firm will be used to staff the respective gate.

6. Fencing/Barricades
    Identify if additional fencing will be needed, altered, removed, etc. for this project. Provide drawing, sketch, marked up document(s) showing the as-is condition and proposed alteration.

7. Vehicles
    Identification methods to be used to identify the CONTRACTOR vehicles.

8. Identification

    a. Explain how personnel on this project will be identified

b. Explain if the CONTRACTOR will need to secure ATL SIDA badges and how they will be obtained.
c. Explain if customs seals will be needed and how they will be obtained.

9. Escorting

a. Who is allowed to conduct escorts under this project
b. Primary escorting gate.
c. Specifically state that "no escorting will be allowed beyond 3 days. All those requiring escorting beyond 3 days will be required to apply for and obtain an ATL SIDA badge".
d. Pre-approval of escorting activity for each occurrence
e. Pre-approval of escorting personnel and/or companies by DOA Security.
f. Appropriate escorting ratio for vehicles (1:2)
g. Appropriate escorting ratio for personnel (1:5).
h. Specifically state that "contractors who have begun the badging process are no longer eligible for escorting".

10. Department of Aviation Procedures
Speak to any other specific DOA Security Rules that will be observed (can be pertinent/specific contract language or other).

11. Security Communication
Project Points of Contact – PM, CM, Safety Representative, Emergency, etc.

12. References
Any reference documents that should be referred to (typically a contract number or something to that affect).

EXHIBIT H; SCHEDULE REQUIREMENTS

HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

FC-8075; F3 A380 Reconfiguration

EXHIBIT H - SCHEDULE REQUIREMENTS

1. General Requirements

1.1. The Work under this Contract shall be planned, scheduled, executed, reported and accomplished using the Precedence Diagramming Critical Path Method (hereinafter referred to as CPM), in workdays, unless otherwise specifically provided in the Contract Documents.

1.2. Contractor shall have within its employ or under contract, throughout the execution of the Work under its contract, such expertise in CPM scheduling and experience with the specified scheduling program so as to insure its effective and efficient performance under this section. Contractor shall submit the qualifications of the Project Scheduler for acceptance by the ENGINEER and comply with the requirements of this Exhibit.

1.3. The Project Schedule shall be computerized by the Contractor utilizing the latest version of Oracle Primavera P6, hereinafter referred to as Primavera. It is expected that the Contractor shall have sufficient capabilities to perform this Work. Any and all costs incurred by the Contractor in researching and/or educating its personnel in CPM or Primavera are to be borne by the Contractor and will not be reimbursed by the CITY.

1.4. The primary objectives of the requirements of this section are: (a) to insure adequate planning and execution of the Work by Contractor; (b) to assist ENGINEER in evaluating progress of the Work; (c) to provide for optimum coordination by Contractor of its trades, Subcontractors, and Suppliers, and of its Work with the work or services provided by any separate CONTRACTORS; (d) to permit the timely prediction or detection of events or occurrences which may affect the timely prosecution of the Work; (e) to provide a mechanism or tool for use by the ENGINEER, and Contractor in determining and monitoring any actions of the Contractor which may be required in order to comply with the requirements of the Contract Documents relating to the completion of the various portions of the Work by the Contract Time specified in the Contract Documents.

1.5. Contractor is responsible for determining the sequence of activities, the time estimates for the detailed construction activities and the means, methods, techniques and procedures to be employed. The Project Schedule shall represent the Contractor's best judgment of how it will prosecute the Work in compliance with the Contract requirements. Contractor shall ensure that the Project Schedule is current and accurate and is properly and timely monitored, updated and revised as Project conditions may require and as required by the Contract Documents.

1.6. Contractor shall provide the basic data relating to activities, durations, Specified Contract milestones, and sequences to ENGINEER as part of Contractor's Draft Baseline Schedule and Final Baseline Schedule submittal, discussed later in this Exhibit. This data shall reflect the Contractor's actual plan for the Project, and shall fully comply with all requirements of the Contract Documents and this Exhibit.

1.7. Subject to ENGINEER’s review and approval, Contractor shall determine when, where, and how it will interface with others performing work, for the CITY, in the same area and to coordinate its activities with all parties including the Owner, Consultants, Suppliers and other CONTRACTORS.

1.8. Contractor shall include in the Project Schedule all interface points with others. These points shall be in the form of Start Milestones for deliverables due to the Contractor from others and as Finish Milestones for deliverables that Contractor must supply to others.

1.9. Should Contractor intend or plan to complete the Work, or any portion thereof, earlier than any applicable Specified Milestone Date or the Contract Time, Contractor shall give timely and reasonable Notice of this fact to ENGINEER. The CITY shall have the sole discretion to agree to or reject such early completion plan by Contractor. Schedule improvement is always encouraged whenever possible. However, since interface with other parties performing work at Hartsfield-Jackson Atlanta International Airport (HJAIA) is necessary, the CITY and its representatives shall have no duty or obligation to agree to, or to cooperate with Contractor regarding any early completion plan or proposal by Contractor and shall not be liable for any damages of Contractor because of the rejection by the CITY of said plan.

1.10.

2. Schedule Development, Submittal and Approval

2.1. Development of the Project Schedule is a multi-step process with each step requiring defined information and input of project team members. The development process includes the Preliminary Schedule, Schedule Orientation Session, Draft Schedule, and Final Schedule.

2.2. **Preliminary Schedule**: Contractor shall submit at the pre-construction meeting, a Project Schedule indicating detailed activities for the first ninety-days (90) of the Project and including general activities for the remaining operations. This Preliminary Schedule shall be a CPM Network displayed in the time scaled bar chart format showing, as a minimum, the following information: (a) Activity identification number of the task or event; (b) description of the task or event (c) duration of the task or event (d) earliest start and finish dates for the task or event (e) latest start and finish dates for the task or event; (f) Contract Milestones; (g) milestones for interface points with others.

2.3. Upon receipt by Contractor of the Notice to Proceed and until the Final Baseline Schedule is reviewed and accepted by the ENGINEER, Contractor shall proceed with its Work in accordance with the accepted Proposal Schedule which was submitted at the pre-construction meeting.

2.4. Contractor shall, within seven (7) calendar days of the Notice to Proceed submit a Primavera generated electronic back-up of the Preliminary Schedule on electronic media acceptable to the ENGINEER. This schedule shall be resourced and cost loaded.

2.5. **Schedule Orientation Session**: Contractor shall, upon notification from the ENGINEER, attend a Schedule Orientation Session relating to the Schedules and Reports requirements for this Project. The Schedule Orientation Session is designed to review in detail, the objectives of the Schedules and Reports requirements. Contractor shall arrange for its Project Manager, Superintendent, and Project Scheduler to attend the schedule orientation session. The following items will be discussed during the orientation session: (a) The procedures and requirements for the preparation of the Resource and Cost Loaded Project Schedule; (b) how the requirements of the Contract Documents will be monitored and enforced by the ENGINEER (c) long-lead items and time requirements for the Work by Subcontractors will be identified and included in the schedule.

2.6. The ENGINEER will provide the format for the Project Schedule electronically at the Schedule Orientation Session, if required. Calendars, Activity Codes, and Work Breakdown Structure (WBS) dictionaries, tabular reports, graphic reports contained in the template may not be modified without the consent of the ENGINEER. The ENGINEER will also provide samples of schedule reports. The ENGINEER also reserves the right to request additional reports, change calendars and/or coding throughout the duration of the project at no additional cost to the CITY.

2.7. **Draft Baseline Schedule**: Within forty-five (45) calendar days of the Schedule Orientation Session the Contractor shall complete and submit a draft of its Project Schedule (Draft Baseline Schedule).

2.8. The Draft Baseline Schedule shall represent the Contractor's best judgment and intended plan for completion of the Work in compliance with Contract Milestone Dates in the Contract Documents. The Contract Milestone Dates shall be included in the Draft Baseline Schedule as zero duration finish milestones. The Draft Baseline Schedule shall take into account all foreseeable activities to be accomplished by any separate Contractor, interface dates with utility owners, CITY's operations and others. The Draft Baseline Schedule shall anticipate all necessary manpower, by craft, and resources to accomplish the activities within the durations set forth in the schedule.

2.9. The ENGINEER shall have the right to require the Contractor to modify any Contractor data or any portion of the Contractor's Draft Baseline Schedule as herein required, with Contractor bearing the expense thereof, which the ENGINEER reasonably determines to be: (a) impracticable, (b) based upon erroneous calculations or estimates, (c) unreasonable, (d) required in order to ensure proper coordination by Contractor of the Work of its Subcontractors and with the work or services being provided by any separate CONTRACTORS, (e) necessary to avoid undue interference with the CITY's operations or those of any utility owners or adjoining property owners, (f) necessary to ensure completion of the Work by the Contract Milestone Dates set forth in the Contract Documents, (g) required in order for Contractor to comply with the requirements hereof or any other requirements of the Contract Documents or this Exhibit, (h) not in accordance with the Contractor's actual operations, unless the revision or modification will change the original scope of Work.

2.10. Along with the Draft Baseline Schedule submittal, Contractor shall submit to the ENGINEER a Schedule of Values for review and acceptance.

2.11. **Final Baseline Schedule:** No later than fourteen (14) calendar days after the Draft Baseline Schedule is returned with comments to the Contractor, by the ENGINEER, the Contractor shall complete and submit the Final Baseline Schedule to the ENGINEER, for acceptance.

2.12. Upon review of the Final Baseline Schedule by the ENGINEER, the Contractor will be notified in writing as to acceptance, reasons for rejection, or any revisions required.

2.13. The accepted Final Baseline Schedule will be “frozen” and shall become the **“Project Schedule”** for the Work and shall be used to monitor and record progress and evaluate revisions. This Final Baseline Schedule shall be established as the target schedule for the Contract and shall not be changed, altered or revised. A copy of the accepted Final Baseline Schedule shall be used to establish progress reporting in accordance with Section 5.5 of this Exhibit. The CITY will not recognize or accept any other schedule***.***

2.14. Contractor shall include, as part of the Final Baseline Schedule submittal to the ENGINEER, a narrative report indicating anticipated allocation by Contractor of the following resources and work shifts for each activity which it proposes to be utilized on the Project, (a) Labor resources, (b) Equipment resources, and (c) Whether it proposes the Work to be performed on single, double or triple shifts, and whether it is to be done on a 5, 6, or 7-day work week basis. The ENGINEER may provide a template for the narrative if necessary.

2.15. For any sequence of work requiring the closure of designated areas in the Aircraft Movement Area, the CONTRACTOR shall be required to submit a detailed hourly baseline schedule in addition to the Final Baseline Schedule which further details specific activities in the affected areas. This hourly schedule shall conform to all other requirements specified in this exhibit and must be reviewed and accepted by the ENGINEER prior to commencement of the work. The hourly

schedule shall be submitted ten (10) working days prior to the pre-activity meeting held for the specific closure.

3. Cost and Resource Loading

3.1. With each Schedule submittal, each weekly/monthly update, and each revision, the Contractor shall also submit a Project Resource Profile and Schedule of Cost Loading and Cash Flow, generated in Primavera, to the ENGINEER. There shall be a strict correlation between the sum of individual activity costs and the total values indicated for bid items. That is, each individual activity within the Project Schedule shall employ a code which, in summary, attaches its cost, if any, to the appropriate bid items. The sum of activity costs within a specific code, then, shall equal the cost of its corresponding bid items and approved Revisions and Change Orders.

3.2. The dollar value for the activity shall be the cost of the work, including labor and materials. General Conditions and site overheads shall be loaded on activities specifically included for this purpose. Stored materials, for which the Contractor will bill, shall be loaded on zero duration finish milestones called out as material delivery activities. The sum of all activity costs shall equal the total contract sum. The Contractor shall revise the Resource Profile and/or Schedule of Cost Loading and Cash Flow as necessary to gain the acceptance of the ENGINEER.

3.3. The Resource Profile and Cost Loading shall represent a fair, reasonable and equitable dollar (cost) allocation for activities on all Schedule submittals. The Resource Profile and Cost Loading in coordination with the monthly updated Schedule shall be used as a basis for the Contractor's application for payment. No construction installation activity or design activity on the Schedule shall exceed a value of $20,000 unless approved by the ENGINEER. As this contract is lump sum, the Contractor's schedule of values should match the activity detail in the project schedule exactly (one to one). As work progresses, any activities added to the schedule of values must be added to the project schedule in the month that the activities were created (and vice versa).

4. Schedule Content and Format

4.1. As discussed in paragraph 2.6 of this Exhibit the ENGINEER will provide the format, for the Project Schedule, if required, electronically at the Schedule Orientation Session. Calendars, Activity Codes, and Work Breakdown Structure (WBS) dictionaries contained in the template may not be modified without the consent of the ENGINEER.

4.2. Except for non-construction activities such as, procurement, delivery, or submittal development, Contractor shall differentiate activities of the schedule so that no single activity shown has a duration longer than fifteen (15) working days, unless the ENGINEER, in its sole discretion, shall approve a longer duration for certain activities. All work activities shall be limited to the hours of 11:00 pm and 6:00 am daily. This time period must include clean-up activites to prepare the work area for commercial use. Failure to comply to these work hours may result in penalties as defined in the Contract Special Conditions.

4.3. The Draft Baseline Schedule and Final Baseline Schedule submittals shall consist of two (2) Primavera generated bar charts, representing all activities which are part of the Contractor's plan on 11" x 17" paper, in color, and a Primavera generated backup, XER file, of the schedule on electronic media acceptable to the ENGINEER.

4.4. The Draft Baseline Schedule and Final Baseline Schedule submittals must contain or be able to demonstrate that the following items have been addressed: (a) Project name; (b) Contractor name; (c) Revision or edition number; (d) activities of completed Work ready for use by next trade, CITY, etc.; (e) activities relating to different areas of responsibility, such as subcontracted Work which is distinctly separated from that being done by the Contractor directly; (f) different categories of Work as distinguished by craft or crew requirements; (g) different categories of Work as

distinguished by equipment requirements; (h) different categories of Work as distinguished by materials; (i) distinct and identifiable subdivisions of Work such as structural slabs, beams, columns; (j) locations of Work within the Project that necessitates different times or crews to perform; (k) outage schedules for existing utility services that will be interrupted during the performance of the Work; (l) acquisition and installation of equipment and materials supplied and/or installed by CITY or separate CONTRACTORS; (m) material to be stored on site; and (n) Contract Milestone Dates, and (o) detailed breakdown of activities by discipline.

4.5. For all major equipment and materials to be fabricated or supplied for the Project, the Final Baseline Schedule shall show a sequence of activities including, (a) preparation of shop drawings and sample submissions, (b) a minimum of ten (10) working days for review of shop drawings and samples or such time as specified in the Contract Documents, (c) shop fabrication, delivery and storage per the contract documents, (d) erection; and, (e) testing of equipment and materials.

4.6. The Final Baseline Schedule shall include late completion dates for the Work that is no later than the required Contract Milestone Dates. The bar chart submittal shall be drawn based upon the early start dates of activities shown on the graphic.

4.7. Contractor shall develop and assign a Responsibility Code for each activity corresponding to Contractor or Subcontractor responsible for the work.

4.8. Contractor shall identify the activities, which constitute the controlling operations or critical path. No more than 10 % of the activities shall be critical. Critical is defined as total float less than one (1) working day.

4.9. All activity durations shall be given in working days.

5. Updating of Project Schedule/Progress Reports

5.1. At least once a month, the Contractor shall arrange for its Project Manager, and Superintendent to meet at the Project site with the ENGINEER to review Contractor's updated Project Schedule, prepared by Contractor. Said update shall show up-to-date and accurate progress data and shall be based upon Contractor's best judgment; and said update shall be prepared by Contractor in consultation with all principal Subcontractors and Suppliers. The Contractor shall also submit with the each update an electronic copy, XER file, of the updated Project Schedule.

5.2. Contractor shall adjust the data date (“as of date”) to reflect the current update period as required by the ENGINEER. The required monthly data date shall be the last Friday of every month. This shall also be consistent with the cutoff for the application for payment.

5.3. The updated Project Schedule shall show activity actual commencement and completion dates, remaining duration in workdays, and physical percent complete for those activities commenced and not complete. The Project Schedule shall also show a graphic comparison of the current status & baseline plan for each activity in the network.

5.4. **Monthly Progress Report:** Contractor shall submit, with the Monthly Application for Payment, a narrative report which shall include, but not be limited to, a description of problem areas, current and anticipated delaying factors and their impact, explanations of corrective actions taken or planned, any newly planned activities or changes in sequence, and proposed logic for a Recovery Schedule, if required, as further described herein. The report shall also include: (a) The updated Project Schedule updated as of the last Friday of the month; (b) A narrative describing actual Work accomplished during the reporting period; (c) A list of major construction equipment used on the Project during the reporting period and any construction equipment idle during the reporting period; (d) The total number of men by craft actually engaged in the Work during the reporting period, with such total stated separately as to office, supervisory, and field personnel; (e) A manpower and

equipment forecast for the succeeding thirty (30) days, stating the total number of men by craft, and separately stating such total as to office, supervisory and field personnel; (f) A list of Contractor-supplied materials and equipment, indicating current availability and anticipated jobsite delivery dates; (g) Changes or additions to Contractor's supervisory personnel since the preceding progress report; (h) Value of Work in place to date (i) Value of Work in place since last report; and (j) Value of uncompleted Work.

5.4.1. The Contractor will provide initial computer reports and Monthly Progress Reports thereafter, in accordance with the Contract Document, and including as a minimum, the following:

5.5. **Schedule Reports:** The monthly Schedule Update Reports will contain the following minimum information for each activity: (a) Activity identification number, description and estimated original duration in workdays; (b) Calculated early and late finish dates; (c) Actual start and actual finish dates, and remaining duration, in workdays, for those activities started and not completed; (d) Days ahead and/or behind schedule of the milestones representing the Specified Milestone Dates. (e) Physical percent complete for each activity. (f) A float analysis of the longest path through the schedule detailing potential delays and areas for acceleration. Actual start and finish dates shall be indicated for each activity as appropriate. Completed activities will be omitted from remaining Float and Late Start Sorts.

5.6. **Application for Payment:** Contractor understands and agrees that the submission and acceptance of progress updates and the receipt of progress reports are an integral part and basic element of the Applications for Payment. The “accepted updated” Project Schedule, including the Schedule of Values, shall be required for each Application for Payment. However, 1 (one) initial provisional progress payment may be payable at the sole discretion of the ENGINEER if it determines the Contractor is complying with the requirements of this Exhibit during the development of the Project Schedule. However, no more than one (1) Application for Payment will be approved until all of the requirements of this Scheduling and Reports Section have been met.

6. Recovery Schedule

6.1. Should the updated Project Schedule, at any time during Contractor's performance, show, in the sole opinion of the ENGINEER that the Contractor is 5% (Based on Phase or Project Total Float) or fourteen (14) or more calendar days behind schedule for any Contract Milestone Date, or should Contractor be required to undertake actions under Section 7.0 hereof, the Contractor shall prepare a Recovery Schedule at no additional cost to the CITY (unless the Owner is solely responsible for the event or occurrence which has caused the schedule slippage) explaining and displaying how Contractor intends to reschedule its Work in order to regain compliance with the Baseline Resource and Cost Loaded Construction Schedule during the immediate subsequent pay period.

6.2. If the Contractor believes that all of the time can be recovered during the subsequent pay period the Contractor will be permitted to prepare a Recovery Schedule as set forth below. However, if the Contractor believes it will take more than thirty (30) calendar days to recover all of the lost time, it shall prepare and submit a request for revision to the “Baseline” Project Schedule and comply with all of the requirements of a Schedule Revision as set forth in this Exhibit.

6.2.1. The Contractor shall prepare and submit to the Owner’s Representative a one-month maximum duration Recovery Schedule, incorporating the best available information from Subcontractors and others which will permit a return to the original accepted “Baseline Project Schedule” at the earliest possible time. The Contractor shall prepare a Recovery Schedule to same level of detail as the originally accepted “Baseline Project Schedule for a maximum duration of one month. This Recovery Schedule shall be prepared in coordination with other separate Contractors on the Project and shall not alter Contractor Milestone Dates.

6.2.2. Within two (2) working days after submission of Recovery Schedule to the ENGINEER, the Contractor shall participate in a conference with the ENGINEER to review and evaluate the Recovery Schedule. Within two (2) working days of conference, the Contractor shall submit the revisions necessitated by the review for the ENGINEER's review and acceptance. The Contractor shall use the approved Recovery Schedule as its plan for returning to the original accepted “Baseline Project Schedule”.

6.2.3. During the period of time that the Recovery Schedule is in force, the Contractor shall prepare and submit to the ENGINEER weekly updates and shall confer continuously with the ENGINEER to assess the effectiveness of the Recovery Schedule. As a result of this conference, the ENGINEER will direct the Contractor as follows:

6.3. If the ENGINEER determines the Contractor is still behind schedule, the ENGINEER will direct the Contractor to prepare a Schedule Revision and comply with all of the requirements of a Schedule Revision as stated herein and the other requirements of the Contract Documents; provided, however, that nothing herein shall limit in any way the rights and remedies of the CITY as provided elsewhere in the Contract Documents; or

6.4. If the ENGINEER determines the Contractor has successfully complied with provisions of the Recovery Schedule, the ENGINEER will direct the Contractor to return to the use of the approved Resource and Cost Loaded Construction Schedule.

7. Time Impacts Evaluation for Change Orders, and Other Delays

7.1. When the Contractor is directed to proceed with changed work, the Contractor shall prepare and submit, a Time Impact Evaluation (TIE), within ten (10) workdays, which includes both a written narrative and a schedule diagram depicting how the changed work affects other schedule activities. The schedule diagram shall show how the Contractor proposes to incorporate the changed work in the schedule, and how it impacts the current schedule update critical path. The Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable the ENGINEER to evaluate the impact of changed work to the scheduled critical path. Contractor shall be required to comply with the requirements of this Paragraph for all types of delays.

7.2. The Contractor shall be responsible for all costs associated with the preparation of Time Impact Evaluations, and the process of incorporating them into the current schedule update. The Contractor shall provide the ENGINEER with four (4) copies of each TIE.

7.3. Once agreement has been reached on a TIE, the Contract Times will be adjusted accordingly. If agreement is not reached on a TIE, the Contract Times may be extended in an amount the ENGINEER allows, and the Contractor may submit a claim for additional time.

8. Time Extensions

8.1. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current schedule update. Notice of time impacts shall be given, in writing, within ten (10) workdays, of the occurrence of the event and in accord with the requirements of this Exhibit.

8.2. Where an event, for which the CITY is responsible, impacts the Contractual Substantial Completion date, the Contractor shall submit a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment and material the Contractor would expend to mitigate the CITY caused time impact. The Contractor is responsible for the cost of preparing the mitigation plan.

8.3. Failure to request time, provide TIE, or provide the required mitigation plan within the required ten (10) workdays, will result in Contractor waiving its right to a time extension and cost to mitigate the delay.

8.4. No time will be granted under this Contract for cumulative effect of changes.

8.5. The CITY will not be obligated to consider any time extension request unless requirements of this Exhibit are complied with.

8.6. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.

9. Schedule Revisions

9.1. Schedule Revisions, as defined herein, shall refer to modifications made to activities in the Accepted Baseline Project Schedule in any of the following items: (a) Activity Original Duration; (b) changes in logical connections between activities; (c) changes in imposed constraints; (e) changes to activity descriptions.

9.2. Should Contractor desire to or be otherwise required under the Contract Documents to make modifications or changes in its method of operation, its sequence of Work, or the durations of the activities in its Resource and Cost Loaded Construction Schedule, it shall do so in accordance with the requirements of this Scheduling and Reports Section and the Contract Documents. Revisions to the initial accepted Baseline Resource and Cost Loaded Construction Schedule must be accepted in writing by the ENGINEER.

9.3. Contractor shall submit requests for revisions to the Project Schedule to the ENGINEER, together with written rationale for revisions and description of logic for rescheduling work and maintaining the Contract Milestone Dates listed in the Contract Documents. Proposed revisions acceptable to the ENGINEER will be incorporated into the next update of the Baseline Project Schedule.

9.4. Changes in activity description(s) may be done for clarification purpose only. If the proposed description change affects the Scope of Work covered by the activity, Contractor shall obtain approval of the ENGINEER before incorporating into schedule.

9.5. Contractor shall be solely responsible for expediting the delivery of all materials and equipment to be furnished by him so that the progress of construction shall be maintained according to the currently approved Project Schedule for the Work. Contractor shall notify the ENGINEER in writing, within ten (10) calendar days of the occurrence, whenever Contractor determines or anticipates that the delivery date of any material or equipment to be furnished by Contractor will be later than the delivery date indicated by the Project Schedule.

10. Float Time

10.1. Float or slack time, as calculated by Primavera using retained logic, associated with one chain of activities is defined as amount of time between earliest start date and latest start date or between earliest finish date and latest finish date for such activities, as calculated as part of the Project Schedule. Float or slack time shown on the Project Schedule is not for exclusive use or benefit of either the CITY or the Contractor and is available for use by either according to whichever first needs the use or benefit of the float to facilitate the effective use of available resources and to minimize the impact of Project problems, delays or Changes in the Work which may arise during performance. Contractor specifically agrees that float time may be used by the CITY in conjunction with their review activities or to resolve Project problems. Contractor agrees that there will be no basis for any modification of the Contract Milestone Dates or an extension of the Contract Time, or

a claim for additional compensation as a result of any Project problem, Change Order or delay which only results in the loss of available positive float on the Project Schedule.

10.2. Float time shown on the Project Schedule shall not be used arbitrarily by Contractor in a manner which, in the opinion of the ENGINEER, unnecessarily delays separate Contractors from proceeding with their work in a way which is detrimental to the interests of the CITY. If Contractor refuses to perform Work which is available and necessary to be performed in order not to delay any separate Contractors, the CITY may, regardless of the float shown on the Project Schedule to be available for the path of activities which encompasses said Work, terminate the Contractor for default.

11. **Adverse Weather Delays**

11.1. Contract time extensions for weather are based on the National Oceanic and Atmospheric Administration (NOAA) data for the project location. Delays will only be considered for such delays which impact activities on the critical path of the contract as defined by the schedule currently accepted by the ENGINEER at the time of the delay. Such time extensions, if approved by the ENGINEER, will be non-compensable. Weather delays may consist of days lost to adverse weather conditions, days lost to dry out of exposed soil, and or days lost to site clean-up due to adverse weather.

11.2. The following table below lists the typical number of work days lost to weather per month on critical path activities for this Contract. Working days lost due to weather in a given month in excess of those listed for that month, will be considered for a time extension. Days are not cumulative from month to month. Such time extension must be requested by the Contractor.

Month	**# of Days**
January	8
February	7
March	7
April	4
May	4
June	4
July	4
August	4
September	4
October	4
November	8
December	8

12. Default

12.1. Failure of the Contractor to substantially comply with the requirements of this Exhibit shall constitute a default by Contractor of its obligations under this Contract sufficient for termination of Contractor.

EXHIBIT I; QUALITY CONTROL PROGRAM

HARTSFIELD-JACKSON ATLANTA INTERNATIONAL AIRPORT

FC-8075; F3 A380 RECONFIGURATION

EXHIBIT "I", QUALITY CONTROL PLAN REQUIREMENTS

The CONTRACTOR is required to provide a Project Quality Control Plan specific to this project. This Plan is part of the Contract Documents. The CONTRACTOR must, at all times, comply with all aspects of the approved Plan as well as ensure that all employees and subcontractors comply with the provisions of the Plan. This Site specific security plan must be developed in accordance with the guidelines in Appendix 1 of this document.

The Project Specific Quality Control Plan must be submitted in writing to the ENGINEER and approved prior to commencing Work on the Project.

Costs for performing all Work necessary to provide a quality product must be incidental to the prices for other items of Work, and not priced separately.

QUALITY CONTROL PLAN APPROACH

The purpose of the Project Quality Control Plan is to ensure all project work and services are performed with the highest quality per the Contract documents, as well as to provide guidance and measures to ensure that all work is completed in the safest of manners. It is important that project authority and practices are clearly defined and that the practices and quality control methods are implemented consistently. It shall be the responsibility of the CONTRACTOR to provide well trained and competent personnel to perform the QC/QA functions as outlined in the Project Quality Control Plan.

The quality control plan is intended to identify project controls/authority, general procedures such as document/data control and activity-specific controls and verification procedures for all project quality functions. The quality control plan is to be implemented to ensure initial and remedial construction procedures are performed in compliance with the plans and specifications under the contract. The plan is to provide a means to maintain effective quality control at the project site as outlined in the Task Order. The quality control measures as presented in the CONTRACTOR's plan are to include quality control organization and staffing; methods of performing, documenting and enforcing quality control operations of both the CONTRACTOR and its subcontractors (including inspection and testing); inspections to be performed; and protocol describing corrective actions. The quality control plan is meant to be a "living document" and will be amended and updated in keeping with all current local laws and ordinances, individual task orders and other areas where quality is being tailored for consistency to the project requirements.

GENERAL PLAN REQUIREMENTS

1. The Quality Control Plan is to be developed to a level commensurate with the level of complexity of the project.

2. The Plan shall cover controls instituted to assure the quality of the Work and the documenting of quality activities, inspections and testing requirements, materials certification and testing submittals, procedural direction and specific technical instructions.

3. The Plan shall address such items as documentation, QC/QA staff, and proposed recovery methodology for non-compliance.

General Quality Control/Quality Assurance Requirements

4. All project Quality Control functions will be performed in accordance with the CONTRACTOR Project Quality Control Plan which shall conform to the provisions of the Contract Document.

5. The CONTRACTOR shall supervise the Work of its Subcontractors providing instructions to each when their Work does not conform to the requirements of the Contract Documents, and it shall ensure that corrections are made in a timely manner so as to not affect the efficient progress of the Work.

6. Any commissioning will be provided by the Owner. The Contractor shall coordinate, cooperate, and accommodate the Owner's Commissioning Agent's activities and provide all required documents requested by the Commissioning Agent.

7. The CONTRACTOR shall manage the Quality control for their scope of work per the drawings and specifications as identified in the contract documentation.

8. All required site third party inspections shall be scheduled with adequate notice to the ENGINEER and Construction Manager.

9. Should disagreement occur between the Contractor and the ENGINEER over acceptability of the Work and conformance with the requirements of the Contract Documents, the Owner shall be the final judge of such performance and acceptability.

10. The Project Quality Control Plan shall be updated as necessary during this Task Order to reflect any changes in the plan.

11. The Project Quality Control Plan shall provide for the issuance of a “stop work” order by the Contractor or Engineer at any time during the Work when significant adverse quality trends and/or deviations from the approved Quality Control Plan are found.

12. The CONTRACTOR shall accommodate and cooperate with any inspections and testing by the OWNER.

13. If applicable, the project schedule shall incorporate major quality functions and assign time as required.

Appendix 1 to Exhibit I

Components of a CONTRACTOR Project Specific Quality Control Plan

QUALITY CONTROL PLAN STRUCTURE

The quality control plan is to be organized with the following sections:

1. Introduction

2. Project Scope

3. Project Organization and Authority

   The roles and responsibilities of the key personnel of the project are to be identified and defined. The person(s) having overall management of the Project Quality Control Plan and their supporting staff are to be identified.

4. Project Quality Assurance and Quality Control

   This section includes quality assurance and quality controls implemented for the contract. As a minimum the following shall be identified and defined:

   a. Communications Plan to define the flow and distribution of correspondence
   b. Procurement Plan
   c. QC/QA Plan
   d. Submittals
      1. Specification number
      2. Item description
      3. Description of submittal
      4. Specification paragraph requiring submittal
      5. Scheduled date of submittal
   e. Material Verification
   f. Inspection Activities with schedule “hold points” clearly indicated (if required).
   g. Testing Plan
   h. Recovery Plan
   i. Non-Conformances Procedures

5. Documentation and Recordkeeping

   This section shall include the Specific quality control records that the CONTRACTOR will provide to the ENGINEER

   a. Daily Inspection Records
   b. Request for Information
   c. Test Reports
   d. Non-Compliance
   e. Corrective Action
   f. As Builts
   g. O&M Manuals
   h. Warranties
   i. Meeting Minutes

6. Review and Evaluation

APPENDIX A; OFFICE OF CONTRACT COMPLIANCE (OCC)

CITY OF ATLANTA
DEPT. OF PROCUREMENT

2015 APR 17 PM 3:13

CITY OF ATLANTA

Kasim Reed
Mayor

SUITE 1700
55 TRINITY AVENUE, SW
ATLANTA, GA 30303
(404) 330-6010 Fax: (404) 658-7359
Internet Home Page: www.atlantaga.gov

OFFICE OF
CONTRACT COMPLIANCE
Larry Scott
Director
L.Scott.@atlantaga.gov

MEMORANDUM

TO: Adam L. Smith, Chief Procurement Officer
Department of Procurement

FROM: Larry Scott, Director L.S.
Mayor's Office of Contract Compliance

RE: **EBO Bid Documents for Project No.: FC-8075, F3 A380 Reconfiguration at H-JAIA.**

DATE: **April 17, 2015**

The EBO bid documents with project specific goal for Project No.: **FC-8075, F3 A380 Reconfiguration at H-JAIA** are enclosed.

The entire OCC package, which includes the project specific goal for the above referenced contract, must be included in the bid documents. Please note that the enclosed package is solely for this project.

If there are questions, please contact Alberto Aponte at (404) 330-6012.

cc: File,
Kiondria Walker, DOP

CITY OF ATLANTA

Kasim Reed
Mayor

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OFFICE OF
CONTRACT COMPLIANCE
Larry Scott
Director
L.Scott@atlantaga.gov

April 17, 2015

RE: Project No.: FC-8075, F3 A380 Reconfiguration at H-JAIA.

Dear Prospective City of Atlanta Bidder:

The Office of Contract Compliance information is an integral part of every City of Atlanta bid. All Bidders are required to make efforts to ensure that businesses are not discriminated against on the basis of their race, ethnicity or gender, and to demonstrate compliance with these program requirements at or prior to the time of Bid opening, or upon request by OCC. Bidders are required to ensure that prospective subcontractors, vendors, suppliers and other potential participants are not denied opportunities to compete for work on a City contract on the basis of their race, ethnicity, or gender, and must afford all firms, including those owned by racial or ethnic minorities and women, opportunities to participate in the performance of the business of the City to the extent of their availability, capacity and willingness to compete. Please read all of the information very carefully. Pay close attention to the specific goal of minority and female business enterprises for this project and the EBO program reminders listed on page 6.

If you have any questions about the information included in this section of the solicitation, please contact the City of Atlanta Office of Contract Compliance at (404) 330-6010.

The City of Atlanta looks forward to the opportunity to do business with your company.

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CITY OF ATLANTA

EQUAL BUSINESS OPPORTUNITY
EQUAL EMPLOYMENT OPPORTUNITY

POLICY STATEMENT

It is the policy of the City of Atlanta to promote full and equal business opportunity for all persons doing business with the City. The City must ensure that firms seeking to participate in contracting and procurement activities with the City are not prevented from doing so on the basis of the race or gender of their owners. The City is committed to ensuring that it is not a passive participant in any private scheme of discrimination. To ensure that businesses are not discriminated against with regard to prime contracting, subcontracting or other partnering opportunities with the City, the City has developed an Equal Business Opportunity (EBO) Program. It is also the policy of the City of Atlanta to actively promote equal employment opportunities for minority and female workers and prohibit discrimination based upon race, religion, color, sex, national origin, marital status, physical handicap or sexual orientation through the City's Equal Employment Opportunity (EEO) Program. The purpose of the Equal Business Opportunity and Equal Employment Opportunity Programs is to mitigate the present and ongoing effects of the past and present discrimination against women and minority owned businesses and women and minority workers so that opportunity, regardless of race or gender, will become institutionalized in the Atlanta marketplace. It is important to note that all bidders, without exception, including minority and female owned business enterprises, must comply with the City of Atlanta's EBO and EEO Program requirements. Goals for minority and female business enterprises are set for this project on page 6.

Implementation of EBO Policy

The Office of Contract Compliance will review information submitted by Bidders pertaining to efforts to promote opportunities for diverse businesses, including M/FBEs, to compete for business as subcontractors and/or Suppliers. A Bidder is eligible for award of a City contract upon a finding by OCC that the Bidder has engaged in, and provided with its bid submission documentation of, efforts to ensure that its process of soliciting, evaluating and awarding subcontracts, placing orders, and partnering with other companies has been non-discriminatory. To assist prime contractors in this effort, the Office of Contract Compliance has set forth in this solicitation document the M/FBEs goals within the relevant NAICS Codes, for this Project.

For subcontracting, the Subcontractor Project Plan must include all subcontractors to be utilized on the project, detail the services to be performed, the dollar value of the work to be performed by each subcontractor, and the *City of Atlanta* M/FBE certification number and supplier id number.

For Suppliers, the Subcontractor Project Plan must include all suppliers to be utilized on the project, the supplies to be provided, including the dollar value of the supplies being provided and the *City of Atlanta* M/FBE certification number and supplier id number.

Determination of Non-discrimination During Bid Process

No Bidder shall be awarded a contract on an Eligible Project unless the Office of Contract Compliance determines that the Bidder has satisfied the non-discrimination requirements of section 2-1448 on such Eligible Project. Accordingly, each Bidder shall submit with each Bid the following

1. Covenant of Non Discrimination. Each Bidder shall submit with her/his Bid a Covenant of Non-Discrimination which is set forth herein as Exhibit EBO1.

2. Outreach efforts documentation. Each bidder shall submit with her/his bid written documentation demonstrating the bidder's outreach efforts to identify, contact, contract with, or utilize businesses, including certified MFBEs and SBEs, as subcontractors or suppliers on the contract. This information shall be set forth on Exhibit EBO2, which is included herein.

3. Subcontractor project plan. Each bidder shall submit with her/his bid a completed and signed subcontractor project plan, in a form approved and provided by the office of contract compliance, which lists the name, address, telephone number and contact person of each subcontractor or other business to be used in the contract, the NAICS Code and the type of work or service each business will perform, the dollar value of the work and the scope of work, the ownership of each business by race and gender, if applicable the AABE, APABE, FBE, or HABE certification number of each business, and any other information requested by the office of contract compliance. In order for the office of contract compliance to officially consider a firm to be an MFBE, the MFBE firm must be certified by or have a certification application pending with the office of contract compliance prior to the bidder's submission of the bid. The subcontractor project plan shall not be changed or altered after approval of the plan and award of the contract without the written approval of the director of the office of contract compliance. A written letter to the director of the office of contract compliance requesting approval to

change the subcontractor project plan must be submitted prior to any change in the plan or termination of an MFBE's contract.

OCC Review of Bidder Submissions

The Office of Contract Compliance shall determine whether a Bidder has satisfied the non-discrimination requirements of section 2-1448 based on its review of the Covenant of Non Discrimination, the Outreach Efforts Documentation, the Subcontractor Project Plan, and its review of other relevant facts and circumstances, including complaints received as part of the bid process. In reviewing the documents submitted by a Bidder to determine whether the Bidder has satisfied the non-discriminatory practices requirement of this section, the Office of Contract Compliance will consider, among other things, the total project dollars subcontracted to or expended for services performed by other businesses, including certified MFBEs, whether such businesses perform Commercially Useful Functions in the work of the contract based upon standard industry trade practices, whether any amounts paid to Supplier businesses are for goods customarily and ordinarily used based upon standard industry trade practices, and the availability of certified MFBEs within the relevant NAICS Codes for such Eligible Project.

(a) Receipt of Complaint of Discrimination in the Bid Process

The Office of Contract Compliance shall accept complaints of alleged discrimination during the bid process regarding any participant in the bid process. Where the complaint of discrimination is specific to the procurement which is under consideration by the city, the office of contract compliance may investigate said complaint, determine its validity, and determine whether the actions complained of impact the bidder's responsiveness on the specific procurement. Allegations of discrimination based on events, incidents or occurrences which are unrelated to the specific procurement will be placed in the bidder's file maintained in the vendor relations database and handled in accordance with the procedure established in the city's vendor relations subdivision, section 2-1465, et seq.

(b) Determination of Violation of EBO Process

Determination of violation of EBO process. Where the office of contract compliance investigates a complaint of discrimination that is related to the specific bid process, the details of that investigation, including findings, shall be recorded and maintained in the vendor relations database, pursuant to section 2-1471.

(c) Office of Contract Compliance Determination of Non-Compliance

Office of contract compliance determination of non-compliance. When, based upon the totality of the circumstances, the office of contract compliance determines that a bidder fails to satisfy the requirements of section 2-1448(a) of a city bid solicitation, the director of the office of contract compliance shall present a written determination of non-compliance to the Chief Procurement Officer which states the determination and lists the reasons for the determination. A bid that does not comply with the requirements set forth in section 2-1448(a) shall be deemed non-responsive and rejected.

Equal Business Opportunity Program Bid/RFP Submittals

The Office of Contract Compliance will make any determinations of non-responsiveness. The covenant of non-discrimination, the outreach efforts documentation, the subcontractor project plan, and any other information required by OCC in the solicitation document pursuant to section 2-1448(b) must be completed in their entirety by each bidder and submitted with the other required bid documents in order for the bid to be considered as a responsive bid. Failure to timely submit these forms, fully completed, will result in the bid being considered as a non-responsive bid, and therefore, excluded from consideration.

Monitoring Of EBO Policy

Upon execution of a contract with the City of Atlanta, the successful bidder's Subcontractor Project Plan will become a part of the contract between the bidder and the City of Atlanta. The Subcontractor Project Plan will be monitored by the City of Atlanta's Office of Contract Compliance for adherence with the plan. The successful bidder will be required to provide specific EBO information on a monthly basis that demonstrates the use of subcontractors and suppliers as indicated on the Subcontractor Project Plan. The failure of the successful bidder to provide the specific EBO information by the specified date each month shall be sufficient cause for the City to withhold approval of the successful bidder's invoices for progress payments, increase the amount of the successful bidder's retainage, or evoke any other penalties as set forth in the City of Atlanta Code of Ordinances, Section 2-1452.

Implementation of EEO Policy

The City effectuates its EEO policy by adopting racial and gender work force availability for every contractor performing work for the City of Atlanta. These percentages are derived from the work force demographics set forth in the 2000 Census EEO file prepared by the United States Department of Commerce for the applicable labor pool normally utilized for the contract.

Monitoring of EEO Policy

Upon award of a contract with the City of Atlanta, the successful bidder must submit a Contract Employment Report (CER), describing the racial and gender make-up of the firm's work force. If the CER indicates that the firm's demographic composition does not meet the adopted EEO goals, the firm will be required to submit an affirmative action plan setting forth the steps to be taken to reach the adopted goals. The CER and the affirmative action plan, if necessary, will become a part of the contract between the successful bidder and the City of Atlanta. Compliance with the EEO requirements will be monitored by the Office of Contract Compliance.

First Source Jobs Program Policy Statement

It is the policy of the City of Atlanta to provide job opportunities to the residents of the City of Atlanta, whenever possible. Every contract with the City of Atlanta creates a potential pool of new employment opportunities. The prime contractor is expected to work with the First Source Jobs Program to fill at least 50% of all new entry-level jobs, which arise from this project, with residents of the City of Atlanta. For more specific information about the First Source Jobs Program contact:

Michael Sterling
Executive Director
First Source Jobs Program
Atlanta Workforce Development Agency
818 Pollard Boulevard
Atlanta, GA 30315
(404) 546-3001

Joint Venture Participation on City of Atlanta EBO Projects

The City of Atlanta encourages, where economically feasible, the establishment of joint ventures to ensure prime contracting opportunities for all businesses, including non-discriminatory outreach efforts to utilize certified minority and female business enterprises on Eligible Projects. On selected projects valued at five million dollars and over, the Office of Contract Compliance shall determine on a project-by-project basis whether non-discriminatory outreach efforts to enter into a joint venture shall be required. On such Eligible Projects, joint venture member businesses must have different race ownership, different gender ownership or both. The minority and female business enterprise members of the joint venture on projects on which a Joint Venture is required must be certified as such by the Office of Contract Compliance, and the joint venture team shall include in its bid submittal the M/FBE certification number of each M/FBE joint venture member.

A joint venture may submit its agreement to the Office of Contract Compliance for pre-approval no later than fourteen (14) calendar days prior to the date set for receipt of bids on an Eligible Project. Otherwise, agreements must be submitted on or before the date set for receipt of bids on an Eligible Project.

Components of a Joint Venture Agreement

The Joint Venture agreement should include at a minimum:

- The initial capital investment of each venture partner.
- The proportional allocation of profits and losses to each venture partner.
- The sharing of the right to control the ownership and management of the joint venture.
- A detailed description of the discrete portion of work or tasks that will be performed by each of the venture partners.
- The method of, and responsibility for, accounting.
- The methods by which disputes are resolved.
- All other pertinent factors of the joint venture.

Equal Business Opportunity M/FBE Goals for this Project

Project No.: FC-8075, F3 A380 Reconfiguration at H-JAIA.

Part 1: All proponents must ensure that non-discriminatory practices are utilized to enter into a Joint Venture Agreement with a certified AABE or FBE in accordance with the City of Atlanta's EBO Ordinance. The Joint Venture Agreement, at the very least, should reflect details of the member company's/companies' involvement in the FC-8075, F3 A380 Reconfiguration at H-JAIA project throughout the life of the contract (See Page 6).

Part 2: All proponents must ensure that non-discriminatory practices are utilized during efforts to engage minority and female subcontractors and suppliers throughout the life of the contract. All outreach efforts must be documented and included with this bid submittal.

The availability of certified minority and female firms for the procurement categories listed in this project are:

17.5% AABE and 13% FBE

Please be reminded that no Bidder shall be awarded a contract on an Eligible Project unless the Office of Contract Compliance determines that the Bidder has satisfied the non-discrimination requirements of section 2-1448 on such Eligible Project. Details of the O.C.C. review process for determination of non-discrimination are outlined on page 2 of this document.

Equal Business Opportunity Program Reminders

1. Joint Venture Agreements. The Joint Venture member businesses must have different race ownership, different gender ownership, or both. MFBE members of the Joint Venture must be certified as such by the Office of Contract Compliance. The Joint Venture team shall include in its submittal the MFBE certification number of each MFBE Joint Venture member.

2. Subcontractor Certification. It is the prime contractor's responsibility to verify that MFBEs included on the Subcontractor Project Plan are certified by the City of Atlanta's Office of Contract Compliance, or have a certification application pending with the City of Atlanta's Office of Contract Compliance at the time that the bid is submitted.

3. Reporting. The successful bidder must submit monthly EBO participation reports to the Office of Contract Compliance.

4. Subcontractor Contact Form. It is required that bidders list and submit information on **all subcontractors** they solicit for quotes, all subcontractors who contact them with regard to the project, and all subcontractors they have discussions with regarding the project. Failure to provide complete information on this form will result in your bid being declared non-responsive.

5. EBO Ordinance. The EBO Program is governed by the provisions of the EBO Ordinance set forth in the City of Atlanta Code Division 12, section 2 - 1441 through 2 -1464. The ordinance can be obtained from the City of Atlanta Clerk's Office at (404) 330-6032.

6. Supplier Participation. In order to receive full M/FBE credit, suppliers must manufacture or warehouse the materials, supplies, or equipment being supplied for use on the Eligible Project.

COVENANT OF NON-DISCRIMINATION

The undersigned understands that it is the policy of the City of Atlanta to promote full and equal business opportunity for all persons doing business with the City of Atlanta. The undersigned covenants that we have not discriminated, on the basis of race, gender or ethnicity, with regard to prime contracting, subcontracting or partnering opportunities. The undersigned further covenants that we have completed truthfully and fully the required forms EBO-2 and EBO-3. Set forth below is the signature of an officer of the bidding entity with the authority to bind the entity.

_____

Signature of Attesting Party

_____

Title of Attesting Party

On this _____ day of _____, 20___, before me appeared _____, the person who signed the above covenant in my presence.

_____

Notary Public

Seal

CONTRACTOR CONTACT FORM

List all potential joint venture partners, protégés, subcontractors or suppliers (regardless of ethnicity/gender) that were contacted regarding this project.

Name of Contractor/ Supplier (indicate if contact was for JV or protégé participation)	City of Atlanta Supplier Numner	Company Name, Contact Name, Address and Phone Number	City Of Atlanta Business License? (Yes or No)	Type of Work Solicited for	Business Ownership (see code below)	Certification No. and Expiration Date	Results of Contact

Name of Contractor/ Supplier (indicate if contact was for JV or protégé participation)	City ofAtlanta Supplier Number	Company Name, Contact Name, Address and Phone Number	City Of Atlanta Business License? (Yes or No)	Type of Work Solicited for	Business Ownership (see code below)	Certification No. and Expiration Date	Results of Contact

Business Ownership Code: AABE - African American Business Enterprise, HABE – Hispanic American Business Enterprise, FBE – Female Business Enterprise. APABE – Asian (Pacific Islander) American Business Enterprise

Proponent Name: _____ **Project Name:** _____ **FC#:** _____

Signature: _____ **Date:** _____

EQUAL BUSINESS OPPORTUNITY SUBCONTRACTOR PROJECT PLAN
SUBCONTRACTOR/SUPPLIER UTILIZATION

List all Majority, Minority and Female Business Enterprise subcontractors/suppliers, including lower tiers, to be used on this project.

Name of Sub-contractor/ Supplier	City of Atlanta Supplier ID Number	Company Name, Address and Phone Number	City Of Atlanta Business License? (yes or no)	NAICS Code(s)	Type of Work to be Performed	Ownership of Business (see code below)	Certification No. and Expiration Date	Dollar ($) Value of Work & Scope of Work	Percentage of Total Bid Amount

Total MBE%_____
Total FBE% _____

Code: AABE - African American Business Enterprise, HABE – Hispanic American Business Enterprise, FBE – Female Business Enterprise. APABE – Asian (Pacific Islander) American Business Enterprise

Proponent's Co. Name: _____ **Date:** _____ **FC#:** _____

Proponent's Contact Number:_____ **Project Name:**_____

Signature: _____ _____

Form EBO-3

First Source Job Information

Company Name: _____

FC No.: _____

Project Name: _____

The following entry level positions will become available as a result of the above referenced contract with the City of Atlanta.

1.

2.

3.

4.

5.

Include a job description and all required qualifications for each position listed above.

Identify a company representative and contact phone number who will be responsible for coordinating with the First Source Jobs Program.

Company Representative: _____

Phone Number: _____

FORM 4

First Source Jobs Agreement

THIS AGREEMENT REGARDING THE USE OF THE FIRST SOURCE JOBS PROGRAM BY CONTRACTORS WITH THE CITY OF ATLANTA TO FILL ENTRY LEVEL JOBS is made and entered into by _____

This_____ day of_____, 201__.

The City of Atlanta requires the immediate beneficiary or primary contractor for every eligible project to enter into a First Source Jobs employment agreement. The contractor agrees to the following terms and conditions:

- The first source for finding employees to fill all entry level jobs Created by the eligible project will be the First Source Program.
- The contractor will make every effort to fill 50% of the entry level jobs created by this eligible project with applicants from the First Source Program.
- The contractor shall make good faith effort to reach the goal of this employment agreement.
- Details as to the number and description of each entry level job must me provided with the bid.
- The contractor shall comply with the spirit of the First Source Jobs Policy beyond the duration of this agreement and continue to make good faith attempts to hire employees of similar backgrounds to those participating in the First Source Program.
- The contractor as a condition of transfer, assignment or otherwise shall require the transferee to agree in writing to the terms of the employment Agreement.

Upon a determination that a beneficiary or contractor has failed to comply with the terms of this Agreement, the City may impose the following penalties based on the severity of the non-compliance:

- The City of Atlanta may withhold payment from the contractor.
- The City of Atlanta may withhold 10 percent of all future payments on the contract until the contractor is in compliance
- The City of Atlanta may refuse all future bids on city projects or applications for financials assistance in any form from the City until the contractor demonstrated that the First Source requirements have been met, or cancellation of the eligible project.
- The City of Atlanta may cancel the eligible project.

All terms stated herein can be found in the City of Atlanta Code of Ordinances Sections 5-8002 through 5-8005.

The undersigned hereby agrees to the terms and conditions set forth in this agreement.

_____

Contractor

FORM 5

[END OF DOCUMENT]