

PROJECT MANUAL
INCLUDING CONSTRUCTION SPECIFICATIONS

for

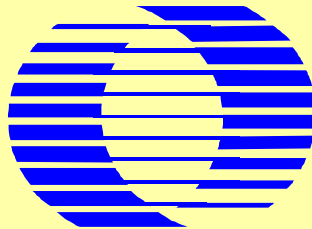
BP-S00195
TERMINAL C, PHASE 1X – AIRSIDE CONCOURSE

CONTRACT DOCUMENTS

Addenda Book 5 OF 5
(Addenda Nos. 7-9)

ORLANDO INTERNATIONAL AIRPORT

Orlando, Florida 32827



GREATER ORLANDO AVIATION AUTHORITY

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ADDENDUM NO. 07

(Issued July 15, 2022)

TO THE BID DOCUMENTS FOR
BP-S00195, TERMINAL C, PHASE 1X AIRSIDE CONCOURSE

ORLANDO INTERNATIONAL AIRPORT

ADDENDUM NO. 07

TO ALL HOLDERS OF CONTRACT DOCUMENTS

1. Your attention is directed to the following interpretations of, changes in, and/or additions to the contract documents for the above-named project
2. This addendum is part of the Contract Documents
3. Bidders are required to acknowledge receipt of this Addendum in the space provided on the Bid Form Section 00 41 13

Revised Specifications

The following Specifications have been revised by this Addendum and are included as attachments to this Addendum:

- 01 11 00 SUMMARY OF WORK
- 27 05 00 COMMON WORK ELEMENTS FOR COMMUNICATIONS
- 27 51 13 EMERGENCY COMMUNICATIONS SYSTEM

Added Specifications

The following Specifications have been added by this Addendum and are included as attachments to this Addendum:

- 01 45 29 STRUCTURAL TESTING AND INSPECTION

- 34 70 00 FDOT STANDARD SPECIFICATIONS

Revised Drawings

G0.01.05 – SHEETS ADDED TO VOL. 09 - GSE

Added Drawings

The following drawings have been added by this Addendum and are included as attachments to this Addendum:

- QCE0.01.01 SYMBOLS, LEGENDS AND NOTES
- QCE4.01.02 LEVEL 01 - RAMP LEVEL - PC AIR ROOM 514 - POWER
LEVEL 01 - RAMP LEVEL - PC AIR ROOM 514 -
- QCE4.02.02 LIGHTING
PARTIAL 1X ONE - LINE DIAGRAM AND PANEL
- QCE6.01.02 SCHEDULES
- QCM0.01.02 PCA PLANT MECHANICAL SYMBOL LEGEND
MECHANICAL OVERALL PLAN - LEVEL 01 - RAMP
- QCM1.01.02 LEVEL - PCA PLANT P1X
OVERALL PCA PIPING PLAN AND EQUIPMENT
- QCM1.11.01 SCHEDULES
- QCM2.11.03 PCA PIPING SCHEMATIC
- QCM3.01.02 MECHANICAL SECTIONS PCA PLANT 01 - 6286
- QCM3.11.10 TYPICAL PCA PIPING SECTION RISERS
- QCM3.11.11 TYPICAL PCA PIPING SECTION RISERS
- QCM3.11.12 TYPICAL PCA PIPING SECTION RISERS
- QCM4.01.03 PCA PLANT ENLARGED MECHANICAL PIPING PLAN
- QCM4.01.04 PCA PLANT ENLARGED MECHANICAL HVAC PLAN
- QCM4.11.02 PCA PIPING ENLARGED PLAN - AREA 14
- QCM4.11.26 PCA PIPING ENLARGED PLAN - AREA 34
- QCM4.11.27 PCA PIPING ENLARGED PLAN - AREA 35
- QCM4.11.28 PCA PIPING ENLARGED PLAN - AREA 36
- QCM4.11.29 PCA PIPING ENLARGED PLAN - AREA 37
- QCM4.11.30 PCA PIPING ENLARGED PLAN - AREA 38
- QCM4.11.31 PCA PIPING ENLARGED PLAN - AREA 39
- QCM5.01.04 MECHANICAL DETAILS
- QCM5.01.05 MECHANICAL DETAILS
- QCM5.01.06 MECHANICAL DETAILS
- QCM5.11.01 PBB EQUIPMENT DETAILS
- QCM5.11.02 PCA AND PBB DETAILS
- QCM5.11.03 PCA AND PBB DETAILS
- QCM6.01.02 MECHANICAL SCHEDULES
- QCM8.01.04 MECHANICAL DIAGRAM
- QCM8.01.05 MECHANICAL CONTROLS

- QCM8.01.06 MECHANICAL CONTROLS
PCA AND PBB AHU CONTROLS AND PIPING FLOW
- QCM8.11.01 DIAGRAM
- QCM9.01.02 3-D DIAGRAMS
- QPS5.01.01 PBB FOUNDATION DETAILS

Responses to Bidders Questions

<p><i>Question 1: We would like to be listed as an Approved Lightning Protection Manufacturer on this project and future projects.</i></p>	<p>Response 1: The Manufacturer's product will need to comply with all requirements listed in Section 01 25 00 Substitutions Procedures.</p>
<p><i>Question 2: In order to be able to meet the requirements of the Terminal C-Phase 1x Request for Proposal, we would like to request a bid date extension to August 9th, 2022 Please confirm this is acceptable.</i></p>	<p>Response 2: Per Addendum No. 5, sealed bids will be received up to 2:00 p.m. local time, August 2, 2022.</p>
<p><i>Question 3: I do not see the Minimum wages for the Davis Bacon Act. Can you please provide those?</i></p>	<p>Response 3: Davis Bacon Act minimum wages were incorporated by Addendum No. 1 into Volume 1 of the Project Manual. See Special Provisions Section SP-1.</p>
<p><i>Question 4: Are the passenger boarding bridges, PCA, GPU and other ancillary gate equipment procurement and installation a part of this bid? If not, how will they be procured and installed.</i></p>	<p>Response 4: PBBs and GPU's will be procured and installed by the Owner and are not part of this bid.</p> <p>PBB Air Handlers will be procured and installed by the Owner and are not part of this bid. Final connection of Glycol Lines from the building to the PBB Air Handlers will be part of the Contractor's bid.</p> <p>Potable water cabinets will be procured by the owner and are not part of this bid, final connection of potable water line from the building to the potable water cabinet will be part of the Contractor's bid.</p> <p>Other ancillary gate equipment that is beyond the face of the building such as baggage conveyance equipment, supplemental air conditioning, etc., and that is associated with the passenger boarding bridges will be procured and installed by the owner as part of passenger boarding bridge procurement.</p>

<p><i>Question 5: RFI #1, Item #1– 274133 - AV Touchscreen Controller</i></p> <p><i>Specification Section 274133 Section 2.3.K specifies a 10” color touch screen is to be provided as part of the IP Master Antenna Television System (IPTV). The IPTV System Block Diagram on drawing TA6.01.01 does not illustrate any touch screen controllers to be part of the IPTV system. Please confirm the touchscreen controller is not required. If it is required, please provide an updated block diagram illustrating all required connectivity and components.</i></p>	<p>Response 5: The Touch Screen Controller is required and will be field located in one of the IDF rooms per GOAA IT as the project progresses.</p>
<p><i>Question 6: RFI #1, Item #2– 274133 – Networked AV Media Player</i></p> <p><i>Specification Section 274133 Section 2.3.G specifies a Networked AV Media Player is to be provided as part of the IP Master Antenna Television System (IPTV) but does not provide a model number as the basis of design. The specified manufacturers do not appear to provide models that meet the specified performance requirements. Please confirm a Brightsign XT1144 is an approved Networked AV Media Player and is compatible with the existing GOAA IPTV infrastructure. If not, please provide the manufacturer and model number of the required Media Player.</i></p>	<p>Response 6: The XT114 is acceptable.</p>

<p><i>Question 7: RFI #1, Item #3– 274220 – Fiber Channeling Contractor</i> <i>Specification Section 274220 Section 1.3.B specifies Fiber Channeling as described in Specification Section 271000 to be part of the Scope of Work for the Electronic Dynamic Signage System. Specification Section 271000 Section 1.3.C states that Fiber Channeling is to be provided by hiring the services of a GOAA Continuing Contractor. Specification Section 271000 does not provide any method for contacting the required contractor(s). Please provide the contact details for the required Fiber Channeling Contractor(s).</i></p>	<p>Response 7: Advanced Cable Connection, Inc. (ACCI): Project Manager: Alan Jones Phone (Office): 813-978-0101 EXT 249 Phone (Cell): 401-263-4070</p> <p>Orion Management: Florida Operations Manager: Billy Nobles Phone (Office): 321-453-4668 EXT 238 Phone (Cell): 321-615-2804</p> <p>Orlando Business Telephone Systems (OBTS): Project Manager: Tom Roberts Phone (Office): 813-978-0101 EXT 249 Phone (Cell): 321-239-3831 Project Manager: Bart Baranack Phone (Office): 321-239-4679 Phone (Cell): 321-239-3831</p> <p>Quality Cable Contractors, Inc (QCCI): President: Jorge del Rio Phone (Office): 407-246-0606 Phone (Cell): 407-468-6238</p> <p>Precision Contracting Services (PCS): Dir Ent Networks: Rick Arnold Phone (Office): 561-360-1104 Phone (Cell): 407-578-9607.</p>
<p><i>Question 8: RFI #1, Item #4– 274220 – Spare Materials</i> <i>Specification Section 274220 Section 1.12 specifies spare materials that are to be provided as part of the Electronic Dynamic Signage System. The language appears to mirror the original project specifications and requires spare materials in excess of the spare materials previously provided. Please clarify if additional spare materials are required as part of P1X, or if the specified spare materials can be disregarded. If additional spare materials are required, please clarify the quantities and models that are required.</i></p>	<p>Response 8: Refer to 1.12.D for the minimum requirements. Omit the Outdoor LED.</p>

<p><i>Question 9: RFI #1, Item #5– 275113 – Local Volume Controls</i> <i>Specification Section 275113 specifies the AtlasIED AT##-PA Local Volume Control to be provided where indicated on the drawings. The TA-Series drawings do not appear to illustrate any local volume controls to be part of the Emergency Communication System. Please confirm the specified local volume controls can be disregarded. If not, please provide updated block diagram and floor plan drawings illustrating all required connectivity and locations.</i></p>	<p>Response 9: None are currently shown in plan but may become necessary due to future revisions and/or tenant requests, provide only when shown on plans.</p>
<p><i>Question 10: RFI #1, Item #6– 275113 – Spare Materials</i> <i>Specification Section 275113 Section 1.12 specifies spare materials that are to be provided as part of the Emergency Communication System. The language appears to mirror the original project specifications and requires spare materials in excess of the spare materials previously provided. Please clarify if additional spare materials are required as part of P1X, or if the specified spare materials can be disregarded. If additional spare materials are required, please clarify the quantities and models that are required.</i></p>	<p>Response 10: See Revised Spare Material Schedule below</p> <ol style="list-style-type: none"> 1. (5) of each style AMP Card used 2. (2) AMP Mainframes 3. (2) Multifunction IO 4. (5) Ambient Sensor Collectors 5. (5) of each style Mic stations 6. Ceiling Speakers <ol style="list-style-type: none"> a. (20) Type 00 b. (5) Type 01 7. Wall Speakers <ol style="list-style-type: none"> a. (10) Type 01 b. (2) Type 06
<p><i>Question 11: RFI #1, Item #7– Communication System Terminal Cabinet</i> <i>The TA-series drawings illustrate CSTC terminal cabinets in the MDF/IDF rooms. Specification Section 275113 does not specify a manufacturer or model number for the CSTC cabinets. Please provide the manufacturer and model number for the required cabinets.</i></p>	<p>Response 11: Shall be per DIV 26 and DIV 27 general specification for terminal cabinets and junction boxes for additional requirements, and detail on drawings.</p>
<p><i>Question 12: RFI #1, Item #8– 275113 – Additional Devices</i> <i>Specification Section 275113 Section 1.13 specifies additional devices to be provided as part of the Emergency Communication System. The language appears to mirror the original project specifications and requires additional devices in excess of the additional devices previously provided. Please clarify if additional devices are required as part of P1X, or if the specified additional devices can be disregarded. If additional devices are required, please clarify the quantities and models that are required.</i></p>	<p>Response 12: Devices shall be per specifications.</p>

<p><i>Question 13: RFI #1, Item #9– 275113 – Fire Alarm Interface</i> <i>The Head End Fire Alarm Interface block diagram on drawing TA5.02.24 notes that the contractor is to “PROVIDE THIS DETAIL (x2) IN HEAD END. TOTAL OF (2) OF EACH CONNECTION SHOWN BELOW.” Please confirm a quantity of four (4) AtlasIED IP116 ECS System Controllers are required to accommodate the illustrated and noted connectivity.</i></p>	<p>Response 13: Will remove note requiring detail x2, only (2) total ACS to support additional equipment are required.</p>
<p><i>Question 14: RFI #1, Item #10– 275113 – Logic Relay Module</i> <i>The Head End Fire Alarm Interface block diagram on drawing TA5.02.24, as well as the ECS Block Diagrams on drawing TA6.12.20 and TA6.12.21 illustrate connectivity for a Logic Relay Module. Specification Section 275113 specifies the AtlasIED IED1516LI to be the Logic Relay Module. The IED1516LI does not have Relay Outputs as illustrated on the block diagrams. Please confirm the IED1516LI is the required interface module.</i></p>	<p>Response 14: Specifications will be revised to indicate correct part number IED: 1522LR 2 Input x 2 Relay Output.</p>
<p><i>Question 15: RFI #1, Item #11– Type C41 Displays</i> <i>The Display Schedule on drawing TA7.01.01 notes the Type C41 displays and mounts to be TBD “Pending response to RFI 1135.” Please provide a manufacturer and model for the Type C41 displays and mounts that can be included as a baseline value for the purpose of accurately estimating the project.</i></p>	<p>Response 15: Refer to specification 27 42 20 part 2.3.B.b. Gable Z-Clip LED Cabinet Bracket. Note that the displays and supporting AV equipment for this sign type is also Owner Furnished.</p>
<p><i>Question 16: RFI #1, Item #12– Type C06 FIDS Wall</i> <i>The Display Schedule on drawing TA7.01.01 notes the Type C06 displays to require six (6) displays and to be “14 Phase 1.” The display detail on drawing X8.00.18 illustrates the Type C06 displays to have twenty (20) displays. Please confirm the quantity of displays required for each Type C06 location.</i></p>	<p>Response 16: 20 Displays.</p>
<p><i>Question 17: RFI #1, Item #13– Type C07 Information Tower</i> <i>The Display Schedule on drawing TA7.01.01 notes the Type C07 display to be two sided and require two (2) displays. The display detail on drawing X8.00.19 illustrates the Type C07 displays to have two (2) displays on both front and back. Please confirm the quantity of four (4) displays are required for each Type C07 location.</i></p>	<p>Response 17: 4 Displays.</p>

<p><i>Question 18: RFI #1, Item #14– 275113 – Mic Station Cabling</i> <i>Specification Section 275113 Section 1.3.C states that PAS Signal Cabling falls under the scope of work for the Emergency Communication System contractor. Specification Section 275113 Section 2.13.A refers to the Network Cabling requirements to Specification Section 271000 for the Horizontal Cabling that would be required for the Microphone Paging Stations. Please clarify who is to provide the network cabling for the Microphone Paging Stations.</i></p>	<p>Response 18: To be coordinated with CM / GC.</p>
<p><i>Question 19: RFI #1, Item #15– 275113 – Additional Mic Station Quantity</i> <i>Specification Section 275113 Section 2.8.A specifies the provision of an “additional twenty-five (25) stations and all associated cable, conduit, labor, programing and materials to be located where directed by GOAA.” The language appears to mirror the original project specifications and requires devices in excess of the additional devices previously provided. Please clarify if additional devices are required as part of P1X, or if the specified additional devices can be disregarded.</i></p>	<p>Response 19: Will revise specifications, provide additional (5) Type 1 Station only.</p>
<p><i>Question 20: RFI #1, Item #16– 275113 – Type 4 Wall Speakers</i> <i>Specification Section 275113 Section 2.10.6 specifies the Renkus-Heinz ICL-F-DUAL-RN to be the Type 4 Wall Speaker. The TA-Series drawings do not appear to illustrate any Type 4 Wall Speakers to be part of the Emergency Communication System. Please confirm the specified Type 4 Wall Speakers can be disregarded. If not, please provide updated block diagram and floor plan drawings illustrating all required connectivity and locations.</i></p>	<p>Response 20: Will revise specifications and remove type 4 wall speakers as they are not used in this phase.</p>
<p><i>Question 21: RFI #1, Item #17– 275113 – Type 5 Wall Speakers</i> <i>Specification Section 275113 Section 2.10.6 specifies the AtlasLED ALA5T to be the Type 5 Wall Speaker. The TA-Series drawings do not appear to illustrate any Type 5 Wall Speakers to be part of the Emergency Communication System. Please confirm the specified Type 5 Wall Speakers can be disregarded. If not, please provide updated block diagram and floor plan drawings illustrating all required connectivity and locations.</i></p>	<p>Response 21: Will revise specifications and remove type 5 wall speakers as they are not used in this phase.</p>

Question 22: I came across your project mentioning IPTV in the spec. VITEC is a leading manufacturer of IPTV, Signage and Videowall solutions and I wanted to see if it makes sense for us to bid on this project. There weren't any details and I'm reaching out to see if you can refer me to someone to speak with or an area that lists specific for the IPTV requirement and how we can be included in the bid process.

Response 22: The IPTV details are in the plans and specifications. Refer to the TA series plans for Dynamic Signage and IPTV locations, quantities, logic diagrams and details. Refer to specification 27 41 33 for IPTV requirements. Refer to 27 42 20 for dynamic signage requirements.

SECTION 01 11 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Conditions of Contract, including other Division 1 Specification Sections, apply to this Section.

1.2 PROJECT DESCRIPTION

- A. Project/Work Identification:

- 1. The General overall description of the Work of the Contract for the:

BP-S195, TERM C, PH-1X-AIRSIDE CONCOURSE
Orlando International Airport
Orlando, Florida

can be summarized for purposes of administration and payment in the manner of project segments as follows:

- 2. The Project scope of work includes, but is not limited to, concrete, masonry, waterproofing, fireproofing, doors, frames and hardware, tile, resilient tile and carpet, fire suppression, plumbing and heating, ventilation, air conditioning (HVAC), electrical and low voltage work, elevators and an escalator for four aircraft gates as part of the expansion of Terminal C at the Orlando International Airport and everything required by design intent to complete the project.
- 3. The Project shall be seeking LEED v4 BD+C certification.

1.3 CONTRACTOR USE OF PREMISES

- A. Limit use of the premises to construction activities within areas indicated; allow for any Owner and tenant occupancy, and use by the public.

- 1. Minimize any disruption to all operating areas, including parking areas.
 - a. Existing public services and utility systems shall remain in operation during the construction period, excluding times required for installation of new work unless specifically allowed by the Contract.
 - b. Schedule and coordinate outages and interruptions of public service with the OAR. See the specific forms for processes and time constraints. Utilize the following forms:
 - 1) Form #018 System Interruption/Utility Outage Notification.
 - 2) Form #018a System Interruption/Utility Outage Notification Procedured.
 - 3) Form #018b Roofing Impact Notification
 - 4) Form #018c Security System Interruption/Outage Request

2. Provide all temporary directional signage, safety, and barricading required for passenger services.
 - a. Submit a plan indicating signage, safety, and barricading for access routes, storage areas and work sites, at the pre-construction meeting.
 - b. Directional signing at the access gate and or along the delivery route to the storage area or work site shall be as directed by the OAR.
 3. Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
 4. Access to site shall be shown on the plans or as directed by the OAR. Do not permit any unauthorized construction personnel or traffic on the site. Provide for traffic control to and from the various construction areas. Immediately clean-up any debris deposited along the access road as a result of construction traffic.
 - a. Keep driveways and entrances serving the premises clear and available to the Owner, Tenant, their employees at all times, and the public. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
 5. All material orders for delivery to the site will use as a delivery address the access point at the Contractor's storage site.
 - a. Coordinate with the OAR and allow for the least possible disruption of the facilities normal operations for delivery of materials and removal of demolished and discarded materials.
 - b. Delivery of materials and removal of demolished and discarded materials shall be scheduled as follows:
 - 1) Schedule and coordinate all deliveries and removal of debris between the hours of 10:00 PM and 6:00 AM each day of the work week.
 6. The limits of construction material storage areas, equipment storage areas, and parking areas shall be as indicated in the documents or as directed by the OAR. Erect and maintain suitable fencing, marking and warning devices suitable for both day/night use to delineate the perimeter of all such areas. Refer to specification Section 01 55 30 Requirements for Use of Canal Road.
 - a. Parking management cards may be used to provide contractor parking in the terminal garages and terminal top parking. These cards will cost \$60 per card per month, taxes not included.
- B. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.
- B.C. Adjacent Work: Contractor shall provide access as required, coordinate with and integrate the Project schedule with the schedules of the Baggage Handling System (BHS) DBOM contractor (Vanderlande Industries), the Virtual Ramp Control (VRC) contractor (SAAB), and all other adjacent civil contractors as well as any internal contractors for build out projects for tenants and concessions to ensure that the master schedule for all are fully coordinated to meet the Authority's substantial and final completion dates for all projects.

1.4 OWNER OCCUPANCY

- A. Full Owner Occupancy: The Owner, its tenants, and the public will occupy the site and existing building and adjacent facilities (outside the limits of the construction area unless specified) during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts, facilitate occupancy usage, and protect persons and property in the project area during the entire construction period. Perform the Work so as not to interfere with the Owner's operations.

1. All work may be carried out without time restrictions, unless otherwise directed by the Owner.
2. ~~Unless otherwise directed by the Owner, work shall be scheduled between the hours of 7:00 AM until 6:00 PM each day.~~

1.5 LAWS, PERMITS, AND REGULATIONS

- A. Comply with all applicable laws, ordinances, regulations, codes, ADA requirements.
- B. Obtain and pay for all license and permits, all fees and charges for connection to outside services and parking for Contractor's vehicles.
- C. Abide by FAA and Owner's safety and security regulations and procedures relative to access to, and work in, Airport Operations Areas and secured facilities.
- D. Comply with Owner's insurance requirements.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 11 00

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SECTION 27 05 00 - COMMON WORK ELEMENTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Project drawings and general provisions of the Contract, including but not limited to all; General and Supplementary Conditions, Division 01 Specification Sections and stipulated Specification Sections shall apply to this and all related Division 27 Specification Sections.
- B. Related Specification Sections:
 - 1. 23 09 00 – Instrumentation and Controls for HVAC
 - 2. 26 05 00 – Common Work Results for Electrical
 - 3. 26 05 19 – Building Wire and Cable
 - 4. 26 05 26 – Grounding and Bonding
 - 5. 26 05 29 – Hangers and Supports
 - 6. 26 05 33 – Conduit
 - 7. 26 05 34 – Outlet Boxes
 - 8. 26 05 35 – Pull & Junction Boxes
 - 9. 26 05 53 – Identification for Electrical Systems
 - 10. 26 07 17 – SCADA Monitoring and Control
 - 11. 26 09 24 – Architectural Lighting Controls for Public Spaces
 - 12. 26 27 13 – Electrical Metering and Monitoring System
 - 13. 27 05 00 – Common Work Elements for Communications
 - 14. 27 10 00 – Premise Distribution Systems
 - 15. 27 10 05 – Passive Optical Network
 - 16. 27 10 10 – Voice Over IP Telephone System
 - 17. 27 10 15 – Wireless Local Area Network System
 - 18. 27 10 20 – Visual Docking Guidance System
 - 19. 27 20 00 – Common Use Systems
 - 20. 27 24 00 – Electronic Gate Systems
 - 21. 27 41 33 – IP Master Antenna Television System
 - 22. 27 42 20 – Electronic Dynamic Signage System
 - 23. 27 51 13 – Emergency Communication System
 - 24. 27 53 10 – Distributed Antenna System - Cellular
 - 25. 27 53 20 – Global Positioning System – Public Safety and Facilities Radio
 - 26. 28 05 00 – Common Work Elements for ESS
 - 27. 28 13 00 – Physical Access Control System
 - 28. 28 16 00 – Intrusion Detection System
 - 29. 28 23 00 – Video Surveillance System
 - 30. 28 31 00 – Addressable Fire Detection and Alarm
- C. Reference Symbols:
 - 1. All device symbols are defined by the appropriate symbol schedule on the symbols and abbreviations sheet in the T-series Contract Drawings. Not all device symbols as indicated may be required for the project.

2. Because of the scale of the drawings, symbols are shown on drawings as close as possible to the mounting location. Contractor shall coordinate exact location of all network systems and related components with all related Contract drawings, specifications and affected trades prior to submittal of shop drawings.

D. Abbreviations:

AGC:	Automatic Gain Control
ADA	Americans with Disabilities Act
AHJ:	Authority Having Jurisdiction
AIDB	Airport Integrated Data Broker
APC	Automated Passport Control
APM	Automated People Mover
ASC	Airside Concourse
ASTM	American Society for Testing Materials
ATP:	Acceptance Test Plan
AWS:	Advanced Wireless Service
A/V	Audio Visual Systems – For purposes of this specification section A/V systems shall include all Media Management, Video Broadcasting, Intercommunications (Paging/Public Address, Clock, Auxiliary Sound), Video Intercom, Emergency Communications, Mass Notification, Multi-User Flight Information Displays (MUFIDS), and Internet Protocol Television (IPTV).
BAS	Building Automation System
BDA:	Bi-Direction Amplifier
BIDS	Baggage Information Display System. See also “MUFIDS.”
BICSI	Building Industry Consultant Services International - International organization whose primary objective is to enhance the reputation and skills of companies and individuals employed in the telecommunications and security industries by ensuring that current and developing standards are maintained.
BIDS	Baggage Information Display System
CBP	Customs and Border Protection
CFR	Code of Federal Regulations
CPU	Central Processing Unit
CUPPS	Common Use Passenger Processing
CUSS	Common Use Self Service
CWDM	Coarse Wave Division Multiplexing
dB	Decibel
DAQ	Delivered Audio Quality
DAS	Distributed Antenna System
DDC	Direct Digital Controller / Device Display Controller

DP	Demarcation Point - The point of interface between the Communications Networks, IPTV, any Auxiliary Systems, and the associated Service Providers or Public Utilities. Also see "EF." Shall also serve as the primary termination point for all incoming OSP cabling as well as the primary main grounding busbar for all communications systems. Refer to project documents for exact location and termination requirements.
DSS	(Electronic) Dynamic Signage System
DWDM	Dense Wave Division Multiplexing
ECS	Emergency Communications System
EF	Entrance Facility. See also "DP."
ELFEXT	Equal Level Far End Crosstalk.
EME	Experiential Media Environment
EMI	Electromagnetic interference
EMT	Electrical Metallic Tubing – Also known as thin-wall conduit.
ER	Equipment Room – See also "MDF"
ESMR	Enhanced Specialized Mobile Radio
FAA	Federal Aviation Administration
FAAP	Remote Fire Alarm Annunciator Panel
FACP	Fire Alarm Control Panel
FAS	Fire Alarm System
FCC	Federal Communications Commission
FEXT	Far End Crosstalk
FIDS	Flight Information Display System. See also "MUFIDS."
GFCI	Ground fault circuit interrupter
GIDS	Gate Information Display System. See also "MUFIDS."
GTF	Ground Transportation Facility
GUI	Graphical User Interface – A specialized program employing graphical display maps of a facility and/or site which, also provides a manual user interface for all system functions and operations by utilizing control and annunciation icons from dedicated human machine interface terminals.
HMI	Human/Machine Interface – A Computer-operated, video control terminal complying with FCC Part 15 CFR Title 47, Subparts A and B, and shall utilize multiple dynamic GUI based displays for annunciation and control LCD flat panel computer monitor or display screen as defined by related specification sections.
HTML	Hypertext Markup Language
IAMS	Integrated Airport Management System
IATA	International Air Transport Association - The global trade association for the airline industry
IBC	International Building Code
ICT	Information Communications Technology

IDF	Intermediate Distribution Frame – The room/space that shall serve as the local termination point for all horizontal and backbone cabling. Also shall be known as Equipment Room (ER), Horizontal Cross-Connect (HC) or Floor Distributor (FD).
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics Engineers
IO	I/O Input/Output
IP	Internet Protocol
IPTV	Internet Protocol Television
IR	Infrared
ISO	International Organization for Standardization
ITF	Intermodal Transportation Facility
Lab	Computer, Science, and/or Education Laboratory.
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light-Emitting Diode
LIU	Light Interface Unit (also known as Fiber Optic Patch Panel)
LMR	Land Mobile Radio
LST	Landside Terminal
LTE	Long Term Evolution (Commonly known as “4G”)
LV	Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power- limited circuits.
Mbps	Megabits per second.
MCO	Orlando International Airport (IATA Code)
MDF	Main Distribution Frame – The room/space that shall serve as the primary termination point for all backbone cabling to each IDF locations and horizontal connection point for local communication drops. May also serve as a local IDF location as well as the cross-connection and interconnection of all entrance cables from the DP for all PSTN and WAN connections. Also shall be known as Main Cross Connect (MC), Telecommunications Room (TR) and/or Campus Distributor (CD)
M-JPEG	Motion – Joint Photographic Experts Group
MPEG	Moving picture experts group.
MTBF	Mean Time Between Failures
MUFIDS	Multi-User Flight Information Display System
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NEXT	Near End Crosstalk
NFPA	National Fire Protection Association
NRTL	Nationally Recognized Testing Laboratory
NTSC	National Television System Committee.
NVR	Network Video Recorder
NVW	Network Video Workstation
OAR	Owner’s Authorized Representative

OFE	Owner-Furnished Equipment
OLT	Optical Line Terminal
ONT	Optical Network Terminal
OSP	Outside Plant Cabling
OTDR	Optical Time Domain Reflectometer
PA	Public Address System
PACS	Physical Access Control System
PDS	Premise Distribution System
PCS	Personal Communications System
POL	Passive Optical Local Area Network
PON	Passive Optical Network
POS	Passive Optical Splitter
POTS	Plain Old Telephone Service
PSTN	Public Switched Telephone Network
RCDD	BICSI-accredited Registered Communications Distribution Designer
PSN	Public Safety Network
RFI	Radio-frequency interference / Request for Information
RGS	Rigid Galvanized Steel conduit: Galvanized steel tubing, with a tubing wall that is thick enough to allow it to be threaded.
RoF	Radio-over-Fiber
RoHS:	Restriction of Hazardous Substances
RSL	Received Signal Level
RSSI	Received Signal Strength Indication
RSRP	Reference Signal Receive Power
RS-232	An ANSI/TIA standard for asynchronous serial data communications protocol between terminal devices. This standard defines a 25-pin connector and certain signal characteristics for interfacing computer equipment.
RS-485	An ANSI/TIA multipoint communications protocol standard.
SCADA	Supervisory Control and Data Acquisition
SLA	Service Level Agreement
SMR	Specialized Mobile Radio
SMS	Security Management System / Short Message Service
SNIR	Signal-to-Noise Interference Ratio
SNMP	Simple Network Management Protocol
SOW	Statement of Work
STC	South Terminal Complex
TCP/IP	A standard protocol stack on which the Internet and data communications networks operate
TGB	Telecommunications Grounding Busbar
TMC	Technology Master Contractor
IDF	Intermediate Distribution Frame – See also “TR”
TIA	Telecommunications Industry Association
TMGB	Telecommunications Main Grounding Busbar
TP	Transition Point – A location in the horizontal cabling where flat under carpet cable transitions to a horizontal cabling consolidation point (CP).

TR	Telecommunications Room -- See also "IDF"
TPM	Technical Project Manager
TSA	Transportation Security Administration
TSB	Technical Service Bulletin
TVSS	Transient Voltage Surge Suppressor
UHD	Ultra High Definition
UPS	Uninterruptible Power Supply
UTP	Unshielded Twisted Pair
VDGS	Visual Docking Guidance System
VLAN	Virtual Local Area Network
VoIP	Voice Over IP telephone Network
VPN	Virtual Private Network-- A technique made possible by switching technologies that permits the logical grouping of any number of network devices into one or more sub-networks.
VSS	Video Surveillance System
VSWR	Voltage Standing Wave Ratio
WAN	Wide Area Network
WAP	Wireless Access Point
WLAN	Wireless Local Area Network
WSP	Wireless Service Provider
10BASE2	10 Mbps data throughput over coaxial cable.
10BASE-T	10 Mbps data throughput over twisted pair cable.
10BASE-FL	10 Mbps data throughput over fiber.
100BASE-T	100 Mbps data throughput over twisted pair cable.
100BASE-TX	100 Mbps data throughput over Category 5 twisted pair or greater.
100BASE-FL	100 Mbps data throughput over fiber.
1K-BASE-T	1Gbps data throughput over Category 5 twisted pair or greater.
1K-BASE-LX/LH	1Gbps data throughput over 9-micron single mode fiber.
1K-BASE-ZX:	1Gbps data throughput over 8-micron single mode fiber.
10GBASE-T	10Gbps data throughput over Category 6A/6e twisted pair or greater.

E. Definitions:

1. Authority: Greater Orlando Aviation Authority (GOAA) (Owner).
2. Authority Vendor (GOAA Vendor): Third party supplier/provider contracted directly by the Authority to provide goods or services as part of this project.
3. Contractor: The Technology Master Contractor - a sub-contractor to the General Contractor that shall have overall responsibility for performing and delivering all scopes of work as defined in the Division 27 and 28 specifications, T-series, TS-series, and TA-series Contract Drawings and related Contract Drawings. Additionally, the TMC shall have responsibility for the related scope of work in referenced Division 23 specification sections.

4. Contract Documents: The documents consisting of the Form of Agreement between Authority and Contractor, Conditions of the Contract, (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda, RFI responses, Change Directives, and Bulletins.
5. Contract Drawings: The drawings that form a part of the Contract Documents that provides the graphical representation of the project requirements intended design and/or performance criteria to be delivered by the Contractor.
6. Furnish: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
7. Install: Receive, Unload, verify, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
8. Provide: Furnish and install, complete and ready for the intended use.
9. Reference Drawings: A drawing and/or set of drawings produced by a proprietary supplier, manufacturer, subcontractor, or fabricator included in the Contract Documents for informational purposes, providing specific information related to the installation of related appurtenances, components, devices, hardware, products, and/or systems. Reference Drawings shall also include any Contract Drawings from prior bid packages that may have pertinent information or require coordination of trades related to this contract.
10. Shop Drawings: A drawing and/or set of drawings produced by the Contractor, supplier, manufacturer, subcontractor, or fabricator as a detailed representation of the proper installation of the related, appurtenance, component, device, hardware, product, and/or system to be delivered in conformance to the requirements of the Contract Documents.
11. Technology Project Manager: A sub-contractor to the General Contractor that shall assume responsibility for oversight of all Division 27 and 28 scopes of work and all related Divisions 23 and 26 scopes of work. The TPM shall serve as a single point-of-contact between the Authority/Owner's Authorized Representative (OAR) and all Division 27 and 28 sub-contractors [for the entire project through closeout](#).

1.2 SUMMARY

- A. This Section contains the overall requirements associated with all Division 27 and related Division 28 Specification Sections, and for all network communication cabling and equipment related to the installation of the following systems:
 1. Premise Distribution System
 2. VoIP Telephone System
 3. Passive Optical Network System
 4. Wireless Local Area Network (WLAN) and Bluetooth Wayfinding Beacons
 5. Automated Passport Control
 6. Common Use Systems (Self-Service & Passenger Processing)
 7. Queue Management System
 8. Visual Docking Guidance Systems (VDGS)
 9. Dynamic Signage (Including MUFIDS)
 10. Experiential Media Environment (EME) Multi-Media System
 11. IP Master Antenna Television System
 12. Global Positioning System (GPS)

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13. Public Address / Paging / Emergency Communications System
 14. Physical Access Control System (PACS)
 15. Intrusion Detection System (IDS)
 16. Video Surveillance System (VSS)
 17. Fire Alarm System
- B. In addition to the requirements of Division 1, this section shall address further requirements for submittals, quality assurance, product handling, record documents, project conditions, installation, system performance, demonstrations, testing, and certifications for all scopes of work related to network communication cabling for this project scope of work. Refer to related Division 26, 27 and 28 specification sections and all contract drawings for additional requirements.
- C. The intent of this project is to award, as a sub-contractor to the General Contractor, a TPM for the oversight and coordination of all related scopes of work described herein who will be a single point of contact to the Authority and the OAR. In addition to this requirement, the intent of this project is to also award, as a sub-contractor to the General Contractor, a TMC that shall have all the scope and responsibility for furnishing and installing all related scopes of work described herein.
1. The Technical Project Manager (TPM) shall manage and coordinate all technology, multimedia, control and security system aspects of the project.
 2. The Technology Master Contractor (TMC) shall be responsible for the overall performance of technology, multimedia, control and security system scopes of work under this project. These include, but are not limited to, systems that are connected to the Passive Optical network (PON), active ethernet network, or other types of communications, control, security, life safety and building management system equipment. The TMC shall be known as the "Contractor" in this and all related specification sections, T-, TA- and TS-series Contract Drawings.
 - a. TMC shall report full-time to the project site and serve as a main point of contact for the OAR staff for all aspects of the technology and security work. The TMC shall coordinate with the TPM to ensure all infrastructure and systems between buildings, including any connections to the existing airport systems are completely coordinated and operational.
 - b. The TMC shall have overall responsibility for all final installations, equipment and all technical support related to all technology scopes of work and shall ensure full coordination of all work as required to provide fully operational communications infrastructures and systems in accordance with all requirements of the Contract Documents and applicable Codes and Standards.
 - c. The TMC shall ensure the technology scope of work including planning, installation, and commissioning of technology and multimedia systems are closely coordinated with Authority and Authority Vendor-Furnished equipment and systems. This planning shall include coordination of device level tracking, delivery time, and location for pick-up and installation of GOAA provided equipment to ensure Authority and Authority-Vendor furnished equipment and components are installed at specific locations.

- 1) In addition to general construction meetings, the TMC shall attend technology, multimedia, and security coordination meetings with TPM, General Contractor, Authority, OAR, and/or Authority Vendors.
- d. The TMC shall be responsible for, at a minimum, the following tasks and activities:
- 1) Project Management
 - 2) Schedule Management
 - 3) IT System Impact Analysis
 - 4) Staff Training
 - 5) Performance Management
 - 6) Change Management
 - 7) Project Closeout
 - 8) Estimating
 - 9) Scheduling
 - 10) Weekly Status Meetings including look-ahead
 - 11) Cost Controls
 - 12) Status Reporting
 - 13) Contract Administration
 - 14) Document Review
 - 15) Contractor Change Order Review
 - 16) Trend & Variance Reporting
 - 17) Document Controls
 - 18) "As Built" Schedule Updates
- e. Systems within the TMC scope shall include, but not be limited to:
- 1) Common Use Systems
 - 2) Electronic Dynamic Signage
 - 3) IP Master Antenna Television (IPTV)
 - 4) Elevator Status/Control (Liftnet) and Lobby Vision
 - 5) Passive Optical Network (PON) and Local Area Network (LAN)
 - 6) Premise Distribution System (PDS)
 - 7) Communication Rooms / Spaces (MDFs, IDF, Control Rooms)
 - 8) Distributed Antenna System (DAS) – Operations (460MHz), Public Safety (800MHz), Cellular
 - 9) Physical Access Control System (PACS)
 - 10) Video Surveillance System (VSS)
 - 11) Advanced Visual Docking Guidance System (A-VDGS)
 - 12) Wireless Local Area Network (WLAN)
 - 13) Bluetooth Indoor Wayfinding
 - 14) Building Management System / Building Automation System
 - 15) Emergency Communication System (ECS) / Paging
 - 16) Electronic Gate Systems
 - 17) VoIP Telephone System
 - 18) Fire Alarm System

3. All sub-contractors shall meet the minimum technical capabilities, certifications, and licensing requirements as defined by the “Quality Assurance” chapter as specified herein as well as all related specification sections. All qualifications submittals required of the Contractor shall apply to all sub-contractors utilized by the Contractor on this project.
- D. It shall be the responsibility of the Contractor to furnish and install all necessary cabling, conduits/raceways, cable terminations, controls, systems, materials, devices, components, electrical power, equipment racks/cabinets and software as well as all appurtenances, programming, commissioning and testing necessary to deliver a complete and fully operational communications network infrastructures and systems as indicated by the contract documents.
- E. The installation, performance, features, functions, software, licenses, and programming criteria as specified herein as well as all related drawings and Division 27 and 28 specification sections have been designed to offer the maximum system efficiency, ease of operation, occupant safety and the protection of equipment as recommended by the Authority and Owner’s Authorized Representative (OAR).
 1. Any deviations from the specified criteria shall be documented, reviewed, and agreed to in writing by the Authority and OAR prior to submission of bids. Refer to Division 01, and all related Division 27 and 28 Specification Sections for any substitutions and/or project deviation requests.
 - a. The required information shall include but not be limited to: reason for deviation, all differences in performance, operation, and function from the herein specified requirements, all benefits, and added features to the Authority and OAR as a result of the deviations and any additional incurred costs to the Authority for maintenance and long term ownership.
 - b. Failure to provide the Authority and OAR with the required information shall result in any shop drawing submissions being returned for non-conformance with the contract requirements.
 2. The submission of a bid or proposal for this work shall serve as acknowledgement that the Contractor and all Sub-Contractors have read, understood and accepted all of the General Conditions, Special Requirements, General Requirements, and all related specification sections and in the execution of all work shall be bound by all of the conditions and requirements therein.
 - a. Prior to the submission of a Bid or proposal for this work, all anomalies, inaccuracies, discrepancies or inconsistencies noted within these Contract Documents shall be brought to the immediate attention of the Authority and OAR in written form. The submission of a bid or proposal for this work shall serve as acknowledgement that, apart from any such anomalies, inaccuracies, discrepancies or inconsistencies noted, the Contractor and all Sub-Contractors believe the Contract Documents to be complete and sufficient to provide a complete and fully-functional project as intended by the Authority.

- b. During the execution of all work, the Contractor shall immediately notify, in written form, the Authority and OAR of any and all anomalies, inaccuracies, discrepancies or inconsistencies discovered within the Contract Documents. The Authority shall not be responsible for any additional costs associated with correcting any such anomalies, inaccuracies, discrepancies or inconsistencies incurred as a result of a delay by the Contractor in notifying the Authority and OAR of any such discovery.
 - c. Where ambiguity or conflict exists within the Contract Documents, the most stringent requirement and/or that which is superior in system design and performance shall prevail, and shall be delivered by the Contractor at no additional expense to the project.
- F. All device symbols are defined by the appropriate symbol schedules as indicated by the symbol and abbreviation drawing sheets for each discipline. The Contractor shall coordinate exact locations with all architectural, mechanical, electrical, reflected ceiling, furniture drawings and door hardware specifications as well as all affected trades prior to submittal of bids.
- 1. All symbols are shown on the contract drawings as close as possible to their intended location. Contractor shall coordinate with GOAA and GOAA's Vendor the installation of all equipment, devices, controls, components, cabling conduits/raceways and integration of other systems along with all affected trades and specified system sub-contractors. The Contractor shall document all coordination requirements at the time of shop drawing submission.
 - 2. Drawings for this work are diagrammatic and intended to convey the extent, general arrangement, and locations of the work. Because of the scale of the drawings, certain basic items such as access panels, conduits, cabinet sizes, penetration sleeves, pull boxes, back-boxes and junction boxes may or may not be shown on the contract drawings. Include all items where required by code and related specification sections for proper installation of all work.
- G. Project specifications and drawings may not deal individually with every part, control, device, component, or appurtenance which may be required to produce the equipment performance for the specified system and/or as required for compliance with all specified systems integration.
- 1. Include such items and components, as required, for complete operational systems as defined by the project documents, whether specifically indicated or not. Subject to the responsibility matrices shown on the Contract Drawings, the Contractor shall be responsible for providing conduits/raceways, cable terminations, controls, systems, equipment, materials, devices, components, electrical power, equipment racks/cabinets, software, programming, commissioning, testing and all appurtenances as well as the integration of any ancillary systems or Authority provided equipment/components/systems.
 - 2. Coordinate with other applicable trades in submittal of shop drawings and the installation of all systems. All shop drawings shall detail space conditions in order to accommodate other concerned trades, all equipment locations are subject to final review by the Authority and OAR.

- H. All Division 27 and 28 scopes of work shall include all necessary labor, coordination and interfacing with the Owner/OAR, other trades and existing systems, software, equipment, materials, devices, cabling, conduits and electrical power as well as the performance of all system programming, testing and commissioning as required to provide fully operational systems in accordance with all requirements of the project documents.
1. Coordinate the installation of all systems, equipment, components, materials, conduits, cabling, devices and all existing system modifications with the Authority and OAR prior to the submission of any shop drawings.
 2. All Division 27 and 28 systems work shall include the labeling of all systems and components, including but not limited to wire terminations, cabling, patch cords, pathways, enclosures, racks and cabinets in accordance with Contract documents, Authority labeling standards, requirements and guidelines. All wiring shall terminate on fixed terminal strips, punch blocks, or patch panels in accordance with all requirements of the project drawings and related specifications.
 - a. No splices shall be permitted in underground maintenance holes and non-accessible junction boxes. All junction boxes containing any system splices shall be uniquely identified.
 - b. All mounting heights and accessibility to all equipment requiring access by individuals with disabilities shall comply with ANSI A117.1 requirement.
 - c. All equipment enclosures located outside or in all areas with high moisture or high humidity shall be NEMA 4X enclosures and rated for that application.
 - d. All interior devices exposed to the general population shall be installed in secured equipment enclosures and installed in such a manner that resists tampering and/or removal without the use of specialized tools.
 3. All work shall be neat in appearance, free of rough edges, scratches, blemishes, cracks and exposed gaps. All equipment shall be secured to the mounting surface, and fastened with hardware approved by the manufacturer and capable of supporting the rated load. All backbone/permanent cables within enclosures shall be neatly routed and secured with hook-and-loop (Velcro) at 6 inches on center. Patch cables shall be secured with hook-and-loop (Velcro) or wire management guides. All wire splices shall be terminated on terminal strips and/or soldered in place. Any splices utilizing wire nuts or crimp/pressure-type connectors shall not be acceptable.
- I. Use of Premises
1. Refer to Specification Section 01 10 00 in addition to the following.
 2. The Contractor shall design, prepare, schedule, and coordinate all scopes of work without disruption of any existing system functions or in the daily operations of the existing facility.

- a. Include all costs related to any phased construction methodologies having to do with the scope of work defined herein, including, but not limited to, all necessary temporary equipment, devices, components or systems as well as any labor costs associated with any installation, commissioning, testing, demolition of any technology components, devices, or systems required to be performed outside of normal business hours of the facility, Contractor or Sub-Contractors.
 - b. Prior to the disabling, modifications, switchover and/or demolition of any existing system components and/or cabling, all new system components, equipment, conduits, cabling, shall be in place, tested and fully operational.
 - c. Contractor shall submit a Utility Outage Notice (UON) following GOAA UON protocol prior to any system disruptions.
3. Contractor shall plan, schedule and install all scopes of work in accordance with all requirements of the project construction schedule. Refer to related specification sections for additional information related to project scheduling and facility access.
- a. The Contractor shall coordinate all installation and demolition activities so as not to disrupt the daily routine of the existing facility or negatively impact the integrity of the facility's security and life safety measures.

J. Coordination

1. The Contractor shall coordinate with all other affected trades in the submittal of comprehensive shop drawings and the installation of all equipment, devices, and systems. All shop drawings shall detail space conditions in order to accommodate all impacted trades, all equipment and device locations are subject to final review by the Authority and OAR.
 - a. If installation of equipment, enclosures, raceways, cable trays and/or conduits is performed prior to submission and/or approval of shop drawings, the Contractor shall make any adjustments or corrections as required by the Authority/OAR and/or as indicated in the shop drawing review at no additional cost to the Authority.
 - b. If installation of equipment, raceways, cable trays, and/or conduit is performed prior to coordination with all other trades, which interferes with work of other trades or the performance of the system, the Contractor shall make necessary changes to correct the condition at no additional cost to the Authority.
 - c. The premise distribution infrastructure shall provide for the support and connectivity of the Building Automation System (BAS). The Contractor shall coordinate with the work specified in Division 23 and Division 28 as required for the connectivity and proper integration of the BAS, all life safety and security system requirements in accordance with the Contract Documents.

- d. Provide all cabling, conduits, terminations, and programming to properly interface the BAS, fire alarm, emergency communications system (ECS) and access control systems with all related mechanical, elevator fire and security systems in accordance with all applicable life safety codes and/or in accordance with all requirements of the project drawings and related specifications.
 - e. Coordinate with all affected systems providers to ensure the proper integration and performance requirements of all Division 28 systems as required by Code, Contract Documents, and the AHJ.
2. Where applicable, Contractor shall coordinate all service, rework, and relocation of existing utilities. Bid shall include all work required for any connections/interfaces with existing systems and/or utilities.
 - a. Contractor shall coordinate all work with vendors for rework, relocation, and addition of equipment and devices, including any modification to existing system infrastructure.
 3. Coordinate all work involving tenant leased areas or equipment for rework, relocation, and addition of equipment and devices, including any modification to existing system infrastructures with the Authority and OAR.
 4. Communication rooms including, but not limited to, MDF, IDF and control room spaces require activation in advance of other portions of the project to facilitate installation and commissioning of Authority-furnished and Authority Vendor-furnished equipment, Division 23 building automation / building management systems, and selected other systems. The Contractor shall schedule all work impacting communications room spaces to ensure completion adheres to the Project Schedule.
 5. Refer to 3.1 Coordination for additional information.

1.3 SCOPE OF WORK

- A. Refer to individual Specification Sections for further system requirements.
- B. Refer to drawing sheet T0.00.03, TA0.00.03, and TS0.00.03 for work responsibility matrix and for any work provided by the Authority and/or Authority Vendors.
- C. Authority-Furnished Equipment (Owner-Furnished Equipment (OFE))
 1. Refer to the Technology Responsibility Matrices in the Contract Drawings for additional information.
 2. The Contractor shall coordinate with the Authority and OAR for all Authority and Vendor OFE.
 3. The Contractor shall coordinate with the Authority and OAR for pick-up of all OFE to be installed by the Contractor. The Contractor shall coordinate with the Authority in advance for specific pick-up location of OFE and to obtain access to such locations. The Authority shall not be responsible for delivery of OFE to be installed under this contract to the construction site. The hand-off of OFE between the Authority and the Contractor may occur multiple times throughout the project to permit configuration by either party after delivery and prior to installation.

4. Immediately inspect all OFE upon pick-up for damage and/or defects. Notify the Authority and OAR in writing of any damage or defects immediately upon discovery. The Contractor shall assume full responsibility for any unreported damage and/or defects to OFE.
 5. The Contractor shall provide all vehicles, hand trucks, carts and other means of transporting OFE to and from the Authority or Authority Vendor and within the project site. The Contractor shall transport OFE to and from the designated pick-up location, and ultimately to the point of installation.
 6. Refer to Part 1 Delivery, Storage and Handling requirements of this specification section and all related Division 27 and 28 specification sections for additional requirements.
 7. Refer to Part 3 Protection requirements of this specification section and all related Division 27 and 28 specification sections for additional requirements.
- D. Authority and Authority Vendor-Furnished Equipment and Services
1. Portions of this project shall be furnished and installed by the Authority and/or Authority Vendors. The Contractor shall identify elements of the project provided by Authority and/or Authority Vendors that impact the Contractor's scope of work and coordinate all work with such parties. Schedule work to permit authority vendors' access to required work areas with sufficient time to complete tasks in accordance with the Project Schedule. Refer to related specification sections for additional information.
 2. The Authority Vendor shall actively attend meetings to coordinate work and construction with the Contractor.
 3. The Authority Vendor shall provide all equipment, tools, and services to complete work as described in the Contract Documents.
- E. Where listed on the drawing responsibility matrix, the following components shall be defined as follows:
1. Network Components: GOAA will furnish and install all required network switches and other active elements for network connectivity. The network includes layer 2 access and distribution or layer 3 core and router switches to connect a system to the GOAA Passive Optical Lan and Local Area Network. Contractor shall provide patch cables and coordinate patching into the network with GOAA. Passive Optical LAN components are specified in Section 27 10 05 and include Optical Line Terminals (OLTs) and Optical Network Terminals (ONTs). Refer to related specification sections for additional information.
- F. The Contractor shall coordinate with the OAR for work related to any GOAA furnished, GOAA installed, and GOAA vendor work.

1.4 REFERENCES

- A. References to industry and trade association standards and best practices, as well as all building codes are minimum installation requirements. The codes, standards and agencies listed below shall form a part of all related specification sections and all work shall comply with the latest adopted standards.

- B. Authority Having Jurisdiction: The system shall comply with all applicable Codes, Ordinances and Standards as interpreted and enforced by the local authority having jurisdiction.
- C. Local Adoption and Amendments: Follow the locally adopted version of all codes and standards. Where local jurisdictions or governments include amendments to codes including the National Electrical Codes, national health & safety codes, radio frequency regulations, or other building codes, the Contractor shall follow the locally amended versions and amendments.
- D. Publication Dates: Comply with published standards in effect as of date of the Contract Documents unless otherwise indicated.
 - 1. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity.
 - 2. Copies of applicable standards are not bound with the Contract Documents.
 - 3. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
- E. Where the contract drawings and specifications mandate a greater requirement or performance than those specified by any of the below referenced codes and standards, the Contract Documents shall then be the governing requirements for this project. The minimum codes and standards to be applied for this project shall be the following;
 - 1. National Fire Protection Association (NFPA):
 - a. NFPA-70: National Electrical Code (NEC)
 - b. NFPA-72: National Fire Alarm and Signaling Code
 - c. NFPA-75: Standard for the Protection of Information Technology Equipment
 - d. NFPA 76: Standard for the Fire Protection of Telecommunications Facilities
 - e. NFPA-101: Life Safety Code
 - f. NFPA 1221: Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems
 - g. NFPA 780: Standard for the Installation of Lightning Protection Systems
 - 2. American National Standards Institute (ANSI) / Telecommunications Industry Association (TIA):
 - a. ANSI/TIA-455-61 FOTP-61: Measurement of Fiber or Cable Attenuation Using an OTDR
 - b. ANSI/TIA-455-78 FOTP-78 / IEC 60793 Optical Fibers Part 1-40: Measurement Methods and Test Procedures, Attenuation
 - c. ANSI/TIA 526-7-A: Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 edition 2: Fibre-Optic Communications Subsystem Test Procedures – Part 4-2: Installed Cable Plant – Single-Mode Attenuation and Optical Return Loss Measurement.
 - d. ANSI/TIA-526-14-C: Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant

- e. ANSI/TIA-568-D.0 : Generic Telecommunications Cabling for Customer Premises, and Annex E from ANSI/TIA-568-C.0: Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling
- f. ANSI/TIA-568-D.1: Commercial Building Telecommunication Standard
- g. ANSI/TIA-568-D.2: Balanced Twisted-Pair Telecommunication Cabling and Components Standard
- h. ANSI/TIA-568-D.3: Optical Fiber Cabling Components
- i. ANSI/TIA-569-D: Telecommunications Pathways and Spaces
- j. ANSI/TIA-606-B: Administration Standard for Telecommunications Infrastructure
- k. ANSI/TIA-607-C: Commercial Building Grounding and Bonding Requirements for Telecommunications
- l. ANSI/TIA-758-B: Customer Owned Outside-Plant Telecommunications Infrastructure Standard
- m. ANSI/TIA IS-811: Telephone Terminal Equipment, Performance and Interoperability for VoIP Feature Telephones.
- n. ANSI/TIA-854: Full Duplex Ethernet Specification for 1000Mbps Operating Over Category 6 Balanced Twisted Pair Cabling
- o. ANSI/TIA-862-A: Building Automation Systems Cabling
- p. ANSI/TIA-1005-A: Telecommunications Infrastructure Standard for Industrial Premises
- q. ANSI/TIA-1152: Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
- r. ANSI/TIA-1183: Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems
- 3. International Telecommunication Union
 - a. ITU-T G.984: Gigabit Passive Optical Networks (GPON)
 - b. ITU-T G.987: 10-Gigabit Capable Passive Optical Network (XG-PON)
- 4. Motorola
 - a. R56 Standards and Guidelines for Communication Sites
- 5. Americans With Disabilities Act (ADA) 2014 ADAAG.
- 6. Underwriters Laboratories, Inc.:
 - a. UL 486A: Wire connectors and soldering lugs for use with copper conductors
 - b. UL 1449: Transient Voltage Surge Suppressors
 - c. UL 1581: Standard for Electrical Wires, Cables, and Flexible Cords
 - d. UL 1666: Standard for Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
 - e. UL 478: Standard for Electronic Data-Processing Units and Systems
 - f. UL 83: Thermoplastic-Insulated Wires and Cables
 - g. UL 910: Test Method for Fire and Smoke Characteristics of Cables Used in Air-Handling Spaces." Provide products which are UL-listed and labeled.
 - h. UL 969: Standard for Marketing and Labeling.
 - i. UL Certified: UL's LAN Cable Certification Program
- 7. International Code Council
 - a. Florida Building Code 5th Edition (2014) Accessibility
 - b. Florida Building Code 5th Edition (2014) Building

- c. Florida Building Code 5th Edition (2014) Energy Conservation
- d. Florida Building Code 5th Edition (2014) Mechanical
- e. Florida Building Code 5th Edition (2014) Plumbing
8. Florida Fire Prevention Code, 5th Edition (2014)
9. Institute of Electrical and Electronic Engineers (IEEE)
 - a. IEEE 802.1, Bridging and Management
 - b. IEEE 802.3, Standard for Ethernet (2012 with published amendments)
 - c. IEEE 802.11 Wireless LANs
10. NEMA/ICEA Compliance:
 - a. WC-5 - "Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy,"
 - b. WC30 - "Color Coding of Wires and Cables," pertaining to control and signal transmission media.
11. Internet Networking Standards: Network hardware and software shall be able to communicate with the Internet and provide for the creation of IP based networks for the Authority. All supplied hardware shall comply with the following minimum standards and RFC's as appropriate.
 - a. RFC 950 - Internet Standard Sub-Netting Procedure
 - b. RFC 1140 - Official Protocol Standards
 - c. RFC 1156 - MIB Base for IP Networks
 - d. RFC-1213 - MIB-II
 - e. RFC-1757 - Remote Monitoring (RMON)
 - f. RFC 1157 - Simple Network Management Protocol
 - g. RFC 1720 - TCP/IP, OSI Compliant
 - h. RFC 1918 - Address Allocation for Private Subnets
 - i. RFC 1583 - OSPF, Version II
 - j. RFC 1723 - RIP -II
12. ASTM Compliance: Comply with applicable requirements of D-2219 and D-2220. ASTM Compliance: Comply with applicable requirements of D-2219 and D-2220.
13. Building Industry Consulting Service International (BICSI)
 - a. ANSI/BICSI-002, Data Center Design Standard and Recommended Practices
 - b. Electronic Safety and Security Design Reference Manual (ESSDRM)
 - c. Information Technology Systems Installation Manual (ITSIMM)
 - d. Outside Plant Design Reference Manual (OSPDRM)
 - e. Telecommunications Distribution Methods Manual (TDMM)
 - f. ANSI/BICSI N3-20: Planning and Installation Methods for the Bonding and Grounding of Telecommunication and ICT Systems and Infrastructure
14. Safety Code for Elevators and Escalators – American Society of Mechanical Engineers (ASME 17.1).
15. Federal Communications Commission:
 - a. FCC Regulations Part 15 Title 47.
 - b. FCC: Federal Communication Commission Part 68 as modified by Wiring Docket 88-57.

- F. Refer to the Responsibility Matrices in the Contract Drawings for additional information regarding the scope of work under this contract, and for information regarding items to be furnished by the Authority, which shall be designated as “Owner Furnished Equipment (OFE)”.
1. Where listed on the responsibility matrix, the following line items shall be defined as follows:
 - a. Headend And Software: Includes any servers, management/administrative software, software licenses, and components which serve the purpose of performing system-wide coordination, monitoring, data processing, control and other global functions. Refer to related specification sections for additional information.
 - b. Integration to Existing System: Includes all hardware, software, wiring, cabling, programming, protocol converters, interface devices and appurtenances as required to extend the physical or logical scope of an existing system, or to incorporate a new or disparate system into an existing system. Refer to related specification sections for additional information.
 - c. Interfaces: Includes all hardware, software, wiring, cabling, programming, interface devices and appurtenances as required for communication between systems, or between a given system and an operator to provide the specified functionality. Refer to related specification sections for additional information.
 - d. Network Switch: Includes layer 2 (access / distribution) or layer 3 (core / router) network switches to connect a system to the GOAA Passive Optical Lan (POL) / Local Area Network (LAN). Refer to related specification sections for additional information. Where noted as “PON”, this line item shall include Passive Optical LAN active components including Optical Line Terminals (OLTs) and Optical Network Terminals (ONTs).
 - e. Backbone Cable: The segment of the premises distribution system that provides connection between telecommunications spaces, including zone enclosures. Refer to specification section 27 10 00 for additional information.
 - f. Horizontal Cable: The segment of the premises distribution system that provides connectivity from telecommunications spaces to field devices. Refer to specification section 27 10 00 for additional information.
 - g. Field Devices: Components of a system which are served by the system headend and are the network endpoint or “edge” device. Refer to individual specification sections for additional information.
- G. Additional System specific requirements may be included in the Sections referenced in 1.1. The Contractor shall meet the requirements in this Section in addition to those specific requirements for each System. Where common work results within this Section conflict with Sections listed in 1.1, the more stringent shall apply.

1.5 SYSTEMS DESCRIPTIONS

- A. Refer to individual specification sections for systems descriptions.

1.6 SUBMITTALS

- A. In addition to all submittal requirements as stipulated by Division 01 and any related specifications sections, the Contractor shall provide all submittals in accordance with the following:
1. The Authority and OAR approvals shall be obtained for all equipment and material before delivery to the job site. Delivery, storage, or installation of equipment or material which has not had prior approval will not be permitted at the job site.
 2. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings, and other data necessary for the Authority and OAR to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.
 3. Prior to any submission the Contractor shall be responsible for performing the following quality control items to ensure compliance with all project requirements:
 - a. Review all Shop Drawings and Product Data
 - b. Review all field measurement criteria.
 - c. Review all field construction criteria and methodologies.
 - d. Review all catalog numbers and similar data.
 - e. Review all coordination requirements of affected trades.
 - f. Review conformance to all appropriate specification sections.
 4. The Contractor shall have a registered RCDD professional review and seal shop drawings related to network installations, testing, certifications, and structured cabling layouts for communications systems confirming that the proposed network infrastructure is in conformance with all stipulated standards and requirements as herein specified. Failure to provide RCDD sealed shop drawings shall result in all shop drawings being returned for resubmission without any reviews taking place.
 5. Submit all system testing, commissioning and startup procedures to be employed. Include all estimated times for performance of all tests, all test equipment and manpower necessary for testing.
 6. Submit all sub-contractor qualifications and certifications in accordance with the requirements as specified elsewhere in this specification section.
 7. All product data and shop drawing submissions shall include specific reference to the related contract drawing sheet number, note, and specification paragraph numbers, where and what item(s) are used for and where item(s) occur in the contract documents. Generic references to entire Specification sections are not acceptable. Submissions provided without such specific reference shall be returned without review.

- B. In addition to items to be furnished and installed under this Contract, this project includes items to be furnished and/or installed by the Authority and Authority Vendors, known as Owner-Furnished Equipment (OFE). In order to provide for comprehensive review of all system designs by the Authority and OAR, the Contractor shall obtain all items and related information required as part of standard submittals from the Authority and or Authority Vendor(s) for Authority- or Authority-Vendor furnished equipment and submit them as part of the Contractor's submittal packages for each system. Examples of submittal items where OFE shall be incorporated include, but are not limited to:
1. Heat load calculations
 2. Power load calculations
 3. Rack space requirements
 4. Rack elevation drawings
 5. Floor plan drawings
 6. Mounting details
 7. Mock-ups as specified
- C. The Contractor shall schedule submittals to maintain the project schedule. For coordination requirements refer to Division 01 Specification Section, which outline basic submittal requirements and coordination. All Division 01 and related Specification Sections requirements shall be used in conjunction with all requirements as herein specified.
1. Submittals shall be provided as a complete submission; no partial submissions will be accepted. Failure to provide a complete submission shall result in all submittals being returned for resubmission.
 2. No substituted equipment shall be reviewed without prior approval in accordance with the requirements of "substitutions" under Division 1 Specification Section.
 3. Mark the submittals, "SUBMITTED UNDER SECTION__."
 - a. Submittals shall be marked to show specification reference including the section and paragraph numbers.
- D. All shop drawings shall be prepared using latest version of AutoCAD or REVIT, drawn accurately, and in accordance with the Authority's Standards and the requirements of Specification Section 01 33 23. Failure to provide a complete set of "Contractor prepared" installation drawings at the time of submittal shall result in all submittals being returned for resubmission.
1. Submission Packaging: The Contractor shall organize the submissions according to the following packaging requirements.
 - a. Electronic Copy Submission: One complete set of electronic equipment data sheets and drawings submitted in PDF format and collated in two distinct files:
 - 1) Equipment Data Sheets, equipment schedules, alarm matrixes cable termination spread sheets, and all related pertinent information.
 - 2) Drawings including all site plans, floor plans, risers, point to point wiring, grounding, bonding, installation details, rack/cabinet and mounting elevations.

- b. Hard Copy Submission: Submit hardcopies of all shop drawings and product datasheets in accordance with the requirements the of Division 01 Specifications
- E. Compliance Matrix
 1. The Contractor shall submit a compliance matrix that summarizes compliance or non-compliance with each specification component.
- F. Software
 1. The Contractor shall provide software submittals including manufacturer's/developer's documentation for each type of software used in the project. Documentation shall include, at a minimum:
 - a. Complete description of software features, proposed options and functionality.
 - b. Software version and revision identification.
 - c. Software manufacturer's contact information for technical support, including address, telephone numbers, fax numbers and e-mail/web URLs
 - d. Well-commented source code and an executable version for all custom and special purpose software. Source code shall be delivered in both hard copy and machine readable formats on a media acceptable to the Authority and OAR. All compilers, case tools, utilities, etc. that are needed to create the executable code shall be included.
- G. Re-submittals
 1. Submitted items, found unsuitable, rejected or returned for revision by the Authority and OAR, shall be reworked by the Contractor and resubmitted.
 2. Review of Contractor's submittals by the Owner's Representative will be limited to examination of an initial submittal and one (1) resubmittal. The Authority and/or OAR reserves the right to obtain reimbursement from the Contractor for amounts paid to the Owner's Authorized Representative for evaluation of any additional resubmittals due to incomplete information or non-compliance to the project documents on the part of the Contractor. An incomplete submittal (whether an initial submittal or a resubmittal) shall count as a submittal.
- H. Shop Drawings
 1. All shop drawings shall include sufficient information, clearly presented, to determine full compliance with all project drawings and specifications. At the minimum include the following information as applicable for review. Failure to provide all information listed below shall result in all shop drawing submittals being returned for resubmission:
 - a. All Building Floor and Site Plans.
 - b. All equipment, devices and components with manufacturer's name(s), model numbers,
 - c. All equipment, device and component electrical ratings and power requirements
 - d. All equipment, device, and component performance ratings.
 - e. All equipment /device battery calculations,

- f. All equipment /device cable voltage drop calculations,
 - g. All dB losses for all fiber optic devices and cabling,
 - h. All dB losses for all coaxial cabling taps and devices
 - i. All Speaker taps, voltages and zoning
 - j. All equipment rack/cabinet layouts and rack/cabinet sizes.
 - k. All device-mounting elevations.
 - l. All device wiring details.
 - m. All grounding and bonding connections.
 - n. Complete point-to-point-wiring diagrams for all systems, including the telecommunications bonding infrastructure. Include all equipment and wiring termination schedules and/or matrices.
 - o. Equipment, devices, cabling, and work related to Authority and Authority-Vendor furnished and/or installed work.
2. Provide a complete set of “Contractor prepared” installation drawings. Drawings at the minimum shall consist of all floor plans indicating all passive and active electronic component locations, field devices, device identifications, distribution racks, patch panels, control panels, auxiliary control panels, power supplies, conduits, cable trays, and cabling distribution, as well as all 120-volt electrical circuit locations and designations.
- a. Drawings shall be made at $1/8" = 1'-0"$ scale. Drawings shall include at the minimum the following:
 - 1) Detailed equipment layouts for all communications rooms. Coordinate all room layouts with affected trades.
 - 2) Floor plan drawings showing locations of all equipment, devices, equipment cabinets and/or rack locations. Identify type and sizes of all equipment cabinets and/or racks.
 - 3) All cable tray layouts, including methods of support, and conduit routing of all conduits 2 inches in diameter or greater.
 - 4) All equipment rack layouts showing locations of all rack mounted equipment items.
 - 5) System riser diagrams and single line drawings, showing detailed connections for all parts of the system, including wire numbers, terminal block numbers and layouts, and other designations and codings (point-to-point wiring diagrams). System performance measurements shall be documented as specified.
 - 6) Equipment wattage for each location and rack/cabinet and estimated BTU production.
 - 7) Detailed equipment layouts for all equipment consoles. Indicate all equipment locations, power connections, data connections and installation details.
 - 8) All equipment mounting hardware/brackets and installation details, identify type size, load capacities of all mounting hardware/brackets; include all mounting and installation details, all space requirements, any special architectural modifications required.

- 9) Outline drawings of all equipment cabinets/racks showing the relative position of all major components, all-wiring and grounding terminations. Include all panel, cabinet and/or rack dimensions.
 - 10) Point-to-point wiring diagrams for all cabling. Include all cable drop identification at edge device and at termination equipment. Include complete wiring termination schedules.
 - 11) Point-to-point wiring diagrams for the telecommunications bonding infrastructure and all grounding and bonding termination points
 - 12) All electrical circuit numbers and distribution panel locations.
 - 13) Equipment, devices, cabling, and work related to Authority and Authority-Vendor furnished and/or installed work.
3. Provide a complete termination schedule of all communications device drop/outlet locations. Indicate on the installation drawings all device drops/outlet locations, termination room locations, unique identifications, cable types, cable distances and all pertinent data to properly evaluate the performance and capabilities of each cable run.
 4. All drawings shall be prepared using an AutoCAD- or REVIT-based program; hand drawn mark-ups of the original Contract Drawings shall not be acceptable. Failure to provide a complete set of “Contractor-prepared” shop drawings at the time of submittal shall result in all submittals being returned for resubmission.
 5. Provide a sleeve layout for all penetrations through post tensioned concrete structures. Coordinate with Structural, Mechanical, Plumbing, Electrical, and Fire Protection Contractors. Submit sleeve layout no later than eight weeks prior to forming the post tensioned concrete.
 6. All shop drawings shall include input from related trades for coordination. Related trades include, but are not limited to architectural, structural, mechanical, electrical, plumbing, fire protection, interiors, FFE, signage, wayfinding, and similar elements.
 7. Contractor shall include Owner-Furnished Equipment in system block diagrams and MDF/IDF rack and cabinet elevations and details for coordination of power and overall space planning purposes.
 8. The Contractor shall be responsible for reconciling rack and cabinet elevations submitted by various sub-contractors into a comprehensive rack and cabinet elevation drawing for each telecommunications space. Comprehensive rack/cabinet elevations shall include all rack/cabinet mounted equipment provided and/or installed by the Authority, Authority Vendor, Contractor or sub-contractors in a single drawing for each telecommunications space.
- I. Equipment Submittals:
 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - a. Include all equipment data sheets pertinent to equipment provided. All data sheets shall be properly annotated indicating specific equipment and options supplied. Failure to provide the proper annotation of all equipment shall result in submittals being returned for resubmission.

2. Submit complete technical data necessary to evaluate the material and equipment. Include a complete technical specification for the submitted equipment, noting differences and adherence to this Section. Failure to provide the required data will result in all submittals being returned for resubmission.
 3. Submit performance data, equipment ratings, cable requirements, control sequences, GUI based control panels, programming matrices, logic diagrams and all other descriptive data necessary to describe the installation and operations of the system being provided. Failure to provide the required data will result in all submittals being returned for resubmission.
 4. Parts list, which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price, and availability of each part.
 5. Installation Instructions: indicate application conditions and limitations of use stipulated by the applicable NRTL. Include instructions for storage, handling, protection, examination, preparation and installation.
 6. Equipment, devices, cabling, and work related to Authority and Authority-Vendor furnished and/or installed work.
 7. Any material or equipment furnished and/or installed prior to a review and approval of properly submitted technical data is subject to rejection by the Authority or OAR. Material or equipment rejected by the Authority or OAR for this reason shall be replaced with material or equipment approved by the Authority or OAR at no additional cost to the Authority.
- J. Maintenance and Operation Manuals: Submit in accordance with all requirements of Division 01 Specification Section and as herein specified.
1. Maintenance and Operation Manuals: Submit as required for systems and equipment specified in the technical sections. Furnish four copies, bound in hardback binders, (manufacturer's standard binders) or an approved equivalent. Furnish one complete manual as specified in the technical section but in no case later than prior to performance of systems or equipment test, and furnish the remaining manuals prior to contract completion.
 2. Inscribe the following identification on the cover: the words "Maintenance and Operations Manual", include the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment.
 3. Provide a "Table of Contents" and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
 4. Furnish (1) copy of all Maintenance and Operation Manuals in PDF format on DVD media or flash drive.
 5. The manuals shall include:
 - a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
 - b. A control sequence describing start-up, operation, and shutdown.

- c. Description of the function of each principal item of equipment.
 - d. Installation and maintenance instructions.
 - e. Safety precautions.
 - f. Diagrams and illustrations.
 - g. Testing methods.
 - h. Performance data.
 - i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
 - j. Contractor contact information.
 - k. Appendix; list qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.
6. Approvals will be based on complete submission of manuals together with shop drawings.

1.7 QUALITY ASSURANCE

- A. Quality Assurance services as described below shall be provided by the Contractor. The Authority will only provide Quality Assurance inspection.
1. Quality Assurance services described in this section are a portion of the quality assurance activities which may be necessary to achieve full compliance with the Contract Documents and are not intended to limit the activities of the Contractor.
 2. These provisions do not relieve the Contractor of providing quality control services or other inspections to the Authority or authorities having jurisdiction over this project.
 3. A quality assurance supervisor whose responsibility it is to ensure compliance with the contract documents shall be included in the quality assurance program. This person shall be assisted by other quality assistance staff as warranted by the specific construction activities and workload.
 4. The Contractor shall submit signed Quality Assurance Summary reports to the Authority and OAR. These reports shall address both project progress and project quality control activity.
- B. Quality Assurance Program
1. The Contractor shall establish a Quality Assurance Program to perform inspection and tests of all items of work. This Program shall insure conformance to applicable specifications and drawings with respect to the materials, codes, workmanship, construction, finish, functional performance, and identification. This Program shall be established for all system rollout and phasing plan work performed under this Contract. The Contractor's Quality Assurance Program shall specifically include surveillance and tests required in the technical provisions of the specifications.
 2. The Contractor shall describe its Quality Assurance Program in detail. Descriptions shall be given for at least the following:
 - a. Organization
 - b. Inspection
 - c. Testing

- d. Documentation
 - e. Administration
 - f. Quality Awareness and Training
 - g. Forms
 - h. Schedules
 - i. Submittals
3. Before the Contractor's Quality Assurance Program description is submitted, the Contractor shall meet with the Authority and OAR and discuss the Contractor's Quality Control Plan. The meeting shall develop a mutual understanding of the details of the plan, including the forms to be used for recording the quality assurance operations, inspections, administration of the plan for both on-site and off-site work, and the interrelationship of the Contractor and the Authority inspection. The Contractor shall prepare meeting minutes which shall be incorporated in the Contractor's Quality Assurance plan.
- C. Contractor qualifications: Each Contractor or sub-contractor shall be an accredited and authorized distributor of the appropriate equipment manufacturer and shall be fully certified in the installation, testing and programming of all equipment being provided. These qualifications shall be submitted and approved by the Authority and Owner's Authorized Representative (OAR) for all persons performing work on any system.
1. The Contractor shall demonstrate not less than three (3) years of experience in management of airport systems. These qualifications shall be submitted and approved by the Authority, Contractor, and Owner's Authorized Representative (OAR) for all persons performing work on the systems.
 2. The Contractor or sub-contractor shall submit documented successful work experience of at least three (3) facilities of equivalent size and technical requirements utilizing the proposed equipment being provided. The Contractor shall have on staff a minimum of one full time individual that holds a current RCDD registration in good standing.
 - a. Experience shall be based on the individuals and not the company proposed and defined as the completion of the specific system being provided, with that system being successfully operated for its intended purpose for at least three (3) years.
 - b. In addition to the above "Experience" shall also be defined as the completion of modifications and renovations to any associated system being provided in any existing occupied facility of this size and magnitude.
 - c. For each facility submit the following:
 - 1) Name and location of facility
 - 2) Date of Occupancy or beneficial use by Owner
 - 3) Owner's representative to contact and telephone number
 - 4) Construction Manager or General Contractor
 - 5) Project Architect or Engineer
 - 6) Provide information on the installed locations with operational equipment
 - 7) Registration number and expiration date of RCDD professional

- 8) Registration number and expiration date of BICSI Certified Technician.
 3. All information technology system work shall be certified in writing to the Authority and OAR by the Contractor's on-staff RCDD professional asserting that all communications network system shop drawings and structured cabling is in conformance with all appropriate NEC requirements, ANSI/BICSI/TIA standards, and all related specification sections.
 4. Submit a technical resume of experience for the Contractor's Project Manager and on-site installation foreman who will be assigned to this project.
- D. Cable Installer Qualifications: The cable installation Contractor or sub-contractor shall demonstrate not less than five (5) years' experience in the installation of structured cabling systems.
1. The installing Contractor shall have on staff a minimum of one full time member that holds a current BICSI Technician Certification in good standing that has been active for a minimum of two (2) years and that has been employed by the Contractor for a minimum of one (1) year..
 2. NOTE: The installation of all communications cabling shall be under the direct supervision of a current BICSI Certified Technician who shall be knowledgeable in the following technical applications:
 - a. The Routing and installation of inside and outside plant shielded, unshielded, twisted pair, coaxial and fiber optic cables.
 - b. Telecommunications bonding per ANSI/BICSI/TIA requirements.
 - c. Fusion splicing of fiber optic cabling.
 - d. Testing copper conductors for electrical continuity.
 - e. Testing and Certifying of UTP/STP structured cabling per ANSI/TIA Standards.
 - f. Testing and Certifying of ALL fiber optic cabling employing an Optical Time Domain Reflectometer (OTDR) and an Optical Loss Test Set (OLTS) per ANSI/TIA Standards.
 - g. Testing and Certifying of coaxial cable networks for RF leakage
 - h. Termination, connection, and testing of shielded and un- shielded twisted pair cable, coaxial cabling, and fiber optic cabling on all specified connectors, electrical protection blocks, termination blocks, and patch panels.
 - i. Generally accepted industry standards, as well as manufacturers written installation instructions, will be used for in-process quality control and final acceptance of the work installation.
 3. Installing Contractor shall be currently licensed as a Certified Electrical Contractor or Certified Limited Energy System Specialty Contractor (ES 069).
 4. The Installing Contractor shall maintain an office within fifty (50) miles of the project with a permanent, local staff of specialists, including a Superintendent, for planning, installation and service and the capability to provide emergency service 24 hours per day, 7 days per week.
- E. Service Qualifications: All sub-contractors shall be a permanent service organization maintained and/or trained by the product manufacturer on the products being provided for this project.

1. The sub-contractors shall be (where required) properly licensed by the governing municipality to provide the services and work for the specific system being installed. In addition, all sub-contractors shall be capable of providing full service for the entire warranty period within an 4-hour response time 24 hours per day, 7 days per week upon notification of a service emergency.
- F. Manufacturer's Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and materials specified for this project, and shall have manufactured the items for at least five (5) years.
- G. Non-Compliance
1. The Authority may notify the Contractor of any non-compliance with the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered to the Contractor or its representative at the site of the work, shall be considered sufficient notice.
 2. If the Contractor fails or refuses to comply promptly, the Authority may issue an order stopping all or part of the work until satisfactory corrective action has been taken. It is understood and agreed to the following:
 - a. Time lost due to any such stop order is the responsibility of the Contractor.
 - b. Costs to repair, replace or otherwise remedy the defective work are the responsibility of the Contractor.
 - c. Costs incurred by the Authority to correct defective work shall be deducted from the total amount due the Contractor. An amount may be withheld from the payment due the Contractor to recoup expenses incurred by the Authority due to non-compliance.
 3. Failure of the Authority to notify the Contractor of non-compliance does not relieve the Contractor of the responsibility to comply fully with the requirements of the Contract Documents and does not preclude the Authority from taking the corrective action specified in this paragraph.
 4. In cases where implementation of the Quality Assurance Program does not comply with either the Contractor's Quality Assurance Plan or the Contract Provisions, or where the Contractor fails to properly operate and maintain an effective Quality Assurance Program, the Authority may:
 - a. Order the Contractor to replace ineffective or unqualified quality control personnel.
 - b. Assign the Authority or contracted outside professional staff to carry out the functions and operations of the Contractor's approved Quality Assurance Plan. Costs incurred by the Authority to operate a Quality Assurance Program or to otherwise remedy the Contractor's non-compliance with quality-related provisions of the contract shall be deducted from the total amount due the Contractor.

1.8 DELIVERY, STORAGE AND HANDLING

- A. In addition to the requirements below, refer to specific related specification sections for additional requirements.

1. Contractor shall store all equipment and materials in a climate controlled environment. Storage environment shall, at a minimum, comply with the following:
 - a. Temperature not to exceed: -20° C to +70° C (-4° F to + 158° F)
 - b. Relative humidity of 5% to 95%, non-condensing.
 2. Where manufacturer's storage requirements are more restrictive than those listed above, store such equipment and/or materials in compliance with all manufacturer's requirements.
 3. Do not store equipment or materials in areas where fire or explosion hazards exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers. Do not store equipment or materials in areas subject to corrosive agents, liquids or gasses.
 4. Do not store equipment or materials in areas that contain potential water hazards (including, but not limited to, restrooms, kitchens, or mechanical spaces), or adjacent to liquid-carrying pipes.
- B. Contactor shall store materials only in areas designated by the Authority and OAR.
- C. The Contractor shall coordinate and participate in product delivery and movement to installation locations with the Authority and OAR within both on- and off-hour periods as required to minimize impact to the Airport operations.
- D. The Contractor shall be responsible for product shipment, delivery and storage/staging/testing location onsite. The Contractor shall coordinate with the Authority and OAR regarding site readiness and refer to architectural drawings regarding placement.
- E. The Contractor shall provide a security plan for approval by the Authority and OAR describing the methods, areas, and access for equipment. The plan shall include how equipment will be securely stored and accessed by the Contractor, GOAA, and OAR within communications rooms, MDFs, IDF, control rooms, and similar spaces throughout construction.
- 1.9 RECORD DOCUMENTS (AS-BUILT DOCUMENTS)
- A. In addition to all general provisions of the Contract, including but not limited to all; General and Supplementary Conditions, Division 01 Specification Sections include the following project requirements;
- B. Project Record Documents
1. Provide record documentation to the Authority and OAR at the completion of each phased installation and at Contract Closeout. To ensure that this submittal reflects proper record keeping during the Work, maintain on-site one (1) set of the Contract Drawings, specifications, addenda, change orders and other modifications to the Contract, and reviewed shop drawings and product data.
 2. Legibly mark and record at each specification section a description of actual products installed, including the manufacturer's name and product model number, product substitutions or alternates approved and utilized, and changes made by Addenda and Modifications.

3. Legibly mark Record Documents and shop drawings to record actual installation including communication conduit, cabling and pathways used, field changes of dimensions and detail, changes in details from those indicated on drawings, details not on original Contract Drawings, and provide make and model of actual product installed.
4. Mark whichever drawing is most appropriate to showing “field” conditions fully and accurately. If necessary, provide scaled drawings of modifications and give attention to concealed work, which would be difficult to measure and record later. Note related change order numbers where applicable. Organize record drawing sheets into manageable sets, and print suitable titles, dates, name of installing company, name and signature of job superintendent, and other identification on the cover of each set.

C. As-Built Documentation

1. Provide complete set of finalized copies of record documents prior to final acceptance of the project by the Authority and OAR in accordance with all requirements of Division 01 specification sections. At the minimum the as-built documents shall contain all information, data, and drawings as described in the “Submittals” paragraph of this specification section as well as all shop drawing requirements of related specification sections.
 - a. As-built documents shall be submitted in both paper and electronic media formats in the quantities as specified by Division 01 specification requirements.
 - 1) All electronic record drawings shall be prepared and submitted utilizing an AutoCAD- or REVIT-based program as manufactured by Autodesk. Where electronic documents are prepared using other than an AutoCAD or REVIT program manufactured by Autodesk, the Contractor shall provide to The Authority and OAR the necessary software to electronically view the submitted documents.
 - 2) All electronic data sheets, control sequences, programming matrices and other descriptive data shall be provided in PDF formatted documents.
 - 3) Copies of all current system programming and associated software shall be provided on downloadable media formatted for the use in restoration all system operations and functionality in the event of a catastrophic failure.
2. As-Built documentation shall include finalized equipment locations, cable and conduit routing pathways, and installation details. The As-Built documentation shall not be redlined copies, but be finalized AutoCAD or REVIT drawings. The As-Built documentation shall build on the initial design details and further develop these based on specific installation details.
3. As-Built documentation shall be capable of being inserted into the Authority GIS system.
4. The level of detail defined in these As-Built documents shall be suitable to allow any third party to support system maintenance as well as support future integration and expansion of installed systems at the Airport.

5. All junction boxes containing any system splices shall be uniquely identified in the field and indicated on the as-built drawings with corresponding schedule identifying all related splices at the specific junction box locations.

1.10 OPERATION AND MAINTENANCE

- A. Refer to specific related specification sections for requirements in addition to the following.
- B. Provide complete set of operating and maintenance manuals in accordance with all requirements of Division 1 and related Division 27 and 28 specification sections. The manuals shall include all operational programming and maintenance information for the system being provided. Edit all manuals specific to the installation of the provided system; manufacturer's documentation alone shall not be acceptable. Include all, manufacturer's technical data sheets, programming matrixes and graphic screen representations.
- C. Operations Manuals
 1. Provide a clear and concise sequence of operation that gives, in detail, the information required to properly operate all equipment and systems. Include detailed programming matrixes, indicating at the minimum all manual and automatic functions for all system, components and devices comprising the system being provided.
- D. Maintenance Manuals
 1. Include maintenance instructions and other descriptive material as received from the manufacturer to enable designated personnel to maintain and test equipment.
 2. Include descriptions, specifications, layout drawings (showing component types and positions), and back-panel and assembly wiring diagrams.
 3. Provide instructions for preventative maintenance procedures that include examinations, tests, adjustments and periodic cleaning.
 4. Provide guidelines for isolating the causes of hardware malfunctions and for localizing faults.

1.11 SOFTWARE AGREEMENT

- A. The Authority shall retain the ownership and access rights of the source code for all custom system programs and software specifically developed and/or modified as part of this project. Additionally, the Authority shall retain ownership of all software licenses for "off the shelf" software furnished and installed as part of this project.
 1. The Contractor shall provide to the Authority and OAR complete copies of all current software programming and software licenses related to the operation of each system prior to final acceptance of the related Contract scopes of work.
 - a. All programming shall include but not be limited to all device identifications, device descriptions, Programming Logic Matrices, all program access level passwords as well as all function and sub-function routines.

2. Programming and software copies shall be provided to the Authority and OAR on DVD digital formatted media or flash drive. In addition, the Contractor shall provide a complete hard copy printout of all system programming and shall be included as part of closeout documentation for review by the Authority and OAR.
- B. Software and firmware upgrade provisions shall be included as part of this specification requirement and shall include the automatic upgrades as required to maintain all software and firmware to the manufacturers most current revision on all system components installed and or modified as part of this project for duration of the warranty period. This upgrade policy shall require the Contractor to install, test, and certify all software and firmware upgrades that become available from manufacturer for a period of one year from date of final acceptance to the expiration of the warranty.
1. Upgrading of software shall include all revised/new software, labor, testing certification as well as all licenses, software and all programming copies as described in the Record Documents paragraph of this section associated with the installation of all revised software.
 2. These updates shall be accomplished in a timely manner, fully coordinated with the system operators, and incorporated into the operations/maintenance and software documentation manuals.
 - a. One (1) scheduled final update shall be provided near the end of the warranty period, at which time the Contractor shall install and validate the latest released version of the Manufacturer's software and firmware for all systems installed and/or modified for this project.
 - b. All software changes shall be recorded in a log maintained in the unit control. An electronic copy of the most current software update shall be maintained within the log.
 - 1) At a minimum, the Contractor shall provide a description of the modification, when the modification occurred, and name and contact information of the individual performing the modification. The log shall be maintained in a white 3 ring binder and the cover marked "Software Change Log."
 3. Provide not less than thirty days' notice to the Authority and OAR to allow scheduling and access to system and to allow the Authority and OAR to upgrade computer equipment if necessary.

1.12 SPARE MATERIAL

- A. In addition to all general provisions of the Contract, including but not limited to all; General and Supplementary Conditions, Division 01 Specification Sections refer to related Specification Sections "Extra Material" for specific requirements.
- B. All spare materials shall be provided no later than at the time of final acceptance of the project and a signed packing list shall be obtained at the time of delivery. At no time is the Contractor to use the spare materials provided for this project to replace malfunctioning or damaged equipment and or components.

1.13 ENVIRONMENTAL CONDITIONS

- A. Systems, components, devices materials, and equipment shall be capable of withstanding the environmental conditions of the space without mechanical or electrical damage or degradation of operating capabilities or performance.
- B. All devices, components, or equipment installed on the exterior of the facility shall be provided in accordance with all manufacturers' requirements to ensure the proper operation when exposed to the environmental conditions and/or average annual highest and lowest temperature that can be anticipated for the geographic region of the facility, as well as anticipated temperatures within a sealed enclosure exposed to direct sunlight.
 - 1. Interior, Controlled Environment: System components, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of 2 to 50 °C (36 to 122 °F) dry bulb and 20 to 90 percent relative humidity, non-condensing and shall utilize NEMA 250, Type 1 enclosures.
 - 2. Interior, Uncontrolled Environment: System components installed in non-temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of -18 to 50 °C (0 to 122 °F) dry bulb and 20 to 90 percent relative humidity, non-condensing and shall be installed in NEMA 250, Type 4X enclosures.
 - 3. Exterior Environment: System components, conduits and back-boxes installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of -34 to 63 °C (-30 to 145 °F) dry bulb and 20 to 95 percent relative humidity, condensing. Rated for continuous operation where exposed to rain as specified in NEMA 250, winds up to 240 km/h (149 mph) shall utilize NEMA 250, Type 4X enclosures.
 - 4. Hazardous Environment: System components, conduits and back- boxes located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
 - 5. Corrosive Environment: System components, conduits, and back- boxes subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones, shall utilize NEMA 250, Type 4X enclosures.
 - 6. Submersible Environment: System components, conduits and back-boxes subjected to prolonged submersion in water, shall utilize NEMA 250, Type 6P enclosures.
 - 7. Areas where equipment and devices may be subject to damage by the general population shall be installed in vandal resistant enclosures; all fire alarm system and related devices shall be provided with wire guards.
 - 8. Console: All console equipment shall, unless noted otherwise, be rated for continuous operation under ambient environmental conditions of 15.6 to 29.4 °C (60 to 85 °F) and a relative humidity of 20 to 80 percent.

PART 2 - PRODUCTS

2.1 MANUFACTURED PRODUCTS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, that meet and/or exceed the specified performance and features of the equipment and/or systems and for which replacement parts shall be readily available to the Contractor and/or using agency. The equipment specified is based on the acceptable manufacturers listed. Where "or equal" is stated, equipment shall be equivalent in every way to that of the equipment specified, and subject to approval.
1. When more than one unit, device, or component of the same class of equipment is required, such units, devices, or components shall be the product of a single manufacturer.
 2. Acceptable manufacturers for each system shall be as specified and shall be provided in full compliance with the requirements of this and all related specification sections and contract drawings.
 - a. Manufacturers listed as acceptable shall not negate the Contractors' responsibility for providing all equipment, devices, components, and/or systems, in accordance with all functions and performance requirements of the Contract Documents.
 - b. Where manufacturer and/or manufacturer model numbers reference specific system components in the related specification sections, it is to establish the performance requirements and quality of the systems and components only.
 - 1) It is in no way an inference that the referenced model numbers are the manufacturer's current product and are the only acceptable components for this project unless specifically referenced as "no substitutions."
 - c. Equivalent UL- listed equipment may be substituted for the approved manufacturers unless stipulated by other Specification Sections as "No Substitutions." All substitutions shall be submitted for approval by the Authority and OAR in accordance with all requirements of Division 01 Specification Sections and "Submittals" chapter of this Specification Section.
 - 1) Where systems and/or components are referenced as "no substitutions" the specific system and/or components shall be provided.
 - 2) All substitutions shall comply with all requirements as specified above and all system performance standards shall be maintained.
 - 3) The Contractor shall stipulate the following information impacted by such a substitution.
 - a) Any and all extensions in time impacted by the substitution.
 - b) Any changes to the architectural or structural elements to the project
 - c) Differences in operation and/or performance from intended system criteria. Note all deviations from the requirements of the Contract Documents on the Compliance Matrix. Provide sufficient detail to enable thorough review of how the proposed equipment or solution differs from the requirements of the Contract Documents.

- 4) Failure to provide the required substitution information shall result in “without consideration” the immediate rejection of the substituted equipment and/or systems.
 3. Due to the rapid advancement and antiquation of hardware technology, the supplied hardware shall be the “contemporary technical and operational equivalent” of the specified hardware. The following requirements shall be met:
 - a. Contemporary technical and operational equivalent shall be based on a comparison of technology at the time of publication to the technology at the time of ordering the equipment.
 - b. Hardware shall be ordered as close to the actual installation date for a given phase as reasonable (i.e., latest responsible date). Final hardware approval and scheduled order date are at the sole discretion of the Authority and OAR.
 - c. Hardware equivalence shall be based on both technical equivalence and operational equivalence.
 - d. Contemporary technical equivalence shall be based on device performance and class specifications.
 - e. Contemporary operational equivalence shall be based on industry standards, maintainability and functions.
 4. The Manufacturer's product or product line/series shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years. The Authority and OAR reserves the right to require the Contractor to submit a list of installations where the products have been in operation for the specified period of time prior to approval of shop drawings.
 - a. The manufacturers shall submit the appropriate documentation certifying that the installing sub-contractor is a qualified service provider of all manufacturers' products being provided for this project.
 - b. The Manufacturer shall certify that the submitted product will continue to be fully supported for a minimum of (5) years after acceptance by the Authority and OAR.
- B. Equipment Assemblies and Components:
1. Components of an assembled unit need not be products of the same manufacturer.
 - a. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
 - b. Components shall be compatible with each other and with the total assembly for the intended service.
 - c. Constituent parts which are similar shall be the product of a single manufacturer.
 - d. Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.
- C. Electrical Components, Devices and Accessories

1. Shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Compatibility and Interoperability of System Components and Devices
1. Where multiple components, devices, and/or systems are intended to be interconnected and components of a complete system in accordance with any related specification sections, it shall be the Contractor's responsibility to verify interoperability and compatibility of said components, devices, and/or systems in full conformance to the specified performance criteria prior to the submission of shop drawings.
 2. Where specified devices are found to be incompatible or incapable of performing as specified in a seamless manner, the Contractor shall notify the Authority and OAR in writing prior to submission of shop drawings. Failure to properly identify such functional discrepancies shall not relieve the Contractor from providing a complete and fully functional system in accordance with the requirements of all related specification sections.
- E. Where Factory or Off-Premises Testing of any equipment, product or assembly is recommended by the product manufacturer or where specified as part of this section and/or any related specification section:
1. The Authority and OAR, shall have the option of witnessing all factory tests. The Contractor shall notify the Authority and OAR at a minimum of thirty (30) working days prior to the performance of any factory or off-premises tests.
 - a. Where the factory or assembly point for all off-premises testing is not within two (2) hours driving time from the project location, the Contractor shall include as part of this project all per diem costs (travel, meals and lodging) for two representatives from the Authority and OAR to witness all testing. Any travel overseas shall include business-class airfare. Lodging shall consist of 3-star or better accommodations.
 2. Provide four (4) copies of certified test reports containing all preliminary test data and testing procedures shall be furnished to the Authority and OAR prior to any final testing and not more than ninety (90) days after completion of any tests.
 3. When equipment, product, or assembly fails to meet any factory or off-premises tests, retesting of equipment, product, or assembly shall be mandated, the manufacturer/Contractor shall be liable for all additional expenses, including all expenses incurred by the Authority and OAR for witnessing the retesting of any equipment, product, or assembly.

PART 3 - EXECUTION

3.1 COORDINATION

- A. Coordinate with all trades at the time of shop drawing submission detailing all space and/or room conditions. The Contractor shall coordinate with the appropriate trade all conditions impacting the installation of any system including but not limited to all equipment locations, ceilings, lighting fixtures, fire protection piping, and ductwork layouts to the satisfaction of all concerned trades, subject to final review by the Authority and OAR.

1. Coordinate exact location of all desktop/counter mounted equipment with the Authority and OAR, as well as all affected trades and tenants prior to the installation of any equipment and/or cabling.
 2. Coordinate exact location(s) of all ceiling mounted cable, conduits, cable tray, equipment, and/or devices with all architectural plans, reflected ceiling plans and affected trades prior to installation.
 3. For equipment installations requiring coordination with other trades, the Contractor shall provide all supplemental framing, bracing, templates, backboxes and equipment anchor bolts for mounting or flush mounting preparation, (e.g. pedestals or other devices requiring mounting on walls, concrete pads or other materials). Coordinate delivery of templates and equipment anchor bolts to preclude any delay in the construction schedule or the work of the affected trade.
 4. If installation of equipment, raceways, cable trays, J-hooks and/or conduit is performed prior to coordination with other trades, which interferes with work of other trades or operation and maintenance of the facility, make necessary changes to correct the condition at no additional cost to the Authority.
 5. Contractor to provide all component MAC addresses to GOAA IT in device labeled floor plans and spreadsheet form for GOAA IT network configuration.
- B. Prior to final programming of all systems review with the Authority and OAR all system features, functions, system operations and related operational programming for all systems provided.
- C. Provide coordination with all system sub-contractors and trades for the proper installation of all equipment, components, and all integration requirements in order to provide fully operational systems in accordance with all applicable specification sections.
- D. Each Contractor shall maintain a complete set of current and up to date shop drawings and equipment submissions at the job site at all times. Shop drawings and all other submissions shall be made available to the Authority and OAR upon request.
- E. Coordinate the work of this contract with the work of the Authority and all Authority Vendors. Schedule all work to ensure that the work of the Authority and all Authority Vendors can proceed in accordance with the Project Schedule.
1. Notwithstanding information provided in other specification sections, all communications room spaces including, but not limited to IDF, MDF and control rooms spaces shall be constructed and complete six (6) months ahead of project substantial completion in order to allow the Authority and Authority Vendors to complete additional work within these spaces. Completion shall, at a minimum, include the following elements:
 - a. The room shall be secured in accordance with the approved Security Plan described in 1.8 Delivery, Storage and Handling.
 - b. The following work items relating specifically to these spaces shall be completed as part of this requirement:
 - 1) Architectural finishes
 - 2) Secure doors
 - 3) Electrical Power

- 4) Grounding and Bonding
 - 5) Mechanical Systems
 - 6) Equipment Racks and Cabinets including, but not limited to complete installation, bonding and labeling. All work within equipment racks and cabinets shall be complete including, but not limited to installation and labeling of patch panels, wire management, surge protectors, and similar work.
 - 7) Premise Distribution System Backbone Cabling including, but not limited to complete installation, termination, testing, labeling, and programming of any PDS cabling and pathways within, terminating, or routing through the space. Work shall also include all terminations, cross-connects, securing, and fiber channeling for a complete and operational backbone system. Backbone PDS shall be entered in the GOAA PDS Administration Database.
 - 8) The room shall be deep cleaned to a condition acceptable to the Authority or OAR for the installation and operation of Owner Furnished Electronics.
- c. Notify the Authority and OAR upon completion of each communications room space to obtain written acceptance. Rooms shall not be considered complete until final written acceptance is issued by the Authority and OAR. Acceptance for the purposes of this section does not constitute turnover of the space to the Authority. The Contractor shall still be responsible for the space and any additional work required to complete the project.

3.2 EQUIPMENT PROTECTION

- A. Protect all materials, equipment, devices, or components permanently installed and/or stored on the job site. Protect all materials, equipment, cabling, devices, or components during construction and after installation. Provide appropriate protection of all materials, equipment, components, and/or devices until time of substantial completion. All materials, equipment, components and/or devices shall be protected during shipment and storage against any physical damage, dirt, moisture, extreme temperatures, precipitation, theft and/or vandalism:
1. During installation, enclosures, racks/cabinets, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of any foreign matter; and shall be deep cleaned both inside and outside before testing and operating and repainting if required.
 2. Any materials, equipment, components and/or devices, stored on site, which have been deemed by the Authority and OAR to exhibit any indications of damage or exposure to dust or moisture shall not be installed and shall be returned to the source of supply for immediate replacement.
 - a. The use of spare parts or the return of defective equipment for repair to mitigate the damage of defective materials, equipment, components, and/or devices shall not be acceptable. All materials, equipment, components, and/or devices shall be new and unused until final acceptance by the Authority and OAR.
 3. Provide and apply protective material immediately upon receiving the products and maintain throughout the construction process.

- a. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
 - b. Any damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired area is not obvious or detectable.
4. Failure to properly protect all materials, equipment, components and/or devices prior to final acceptance shall constitute sufficient cause for rejection of materials, equipment, components and/or devices should any defects, damage or degradation in performance is observed.
- B. Seismic Performance: The Contractor shall furnish and install all equipment bracing, and anchoring rated for the seismic zone of the geographical area in which the project resides, and shall withstand the effects of earthquake motion and wind forces in accordance with the current editions of the IBC and ASCE/SEI 7. Refer to Refer to Division 01 and Division 26 – Hangers and Supports for additional seismic information and requirements.
1. Equipment shall include, but not be limited to, racks/cabinets, video monitors, TV's, cable trays, conduits, junction boxes, and all associated appurtenances.
- C. Immediately replace all malfunctioning materials, equipment, components, and/or devices with new unused products up until the time the Authority and OAR issues final acceptance of the system. The returning of any malfunctioning equipment, devices, and/or components to the manufacturer for repair and then reinstallation at the project site shall not be acceptable.
1. All replacement materials, equipment, components, and/or devices shall be factory new and not obtained from the Project's spare parts inventory or use factory recycled products unless expressly identified by Contractor prior to replacement and approved beforehand by the Authority and OAR.

3.3 WORK PERFORMANCE

- A. Receipt, storage, transport, handling, installation, final termination, testing, start-up and commissioning of all systems, system components and cabling infrastructures shall be under the direct supervision of the appropriate system sub-contractor. The sub-contractor shall be an accredited and authorized distributor of the appropriate equipment manufacturer and shall be fully certified in the installation, testing, commissioning, and programming of all equipment, devices, components, and/or systems being provided as part of this project.
- B. Job site safety and worker safety is the responsibility of the Contractor. Ensure that safe access and egress from all work areas is maintained during movement and installation of materials. Clean up all debris generated by installation activities. Keep all communications equipment rooms free of debris at all times. Communications rooms are not to be used for the storage of tools or project materials at any time during the project.
- C. Pre-installation Conferences: Include provisions to attend all Preconstruction/Preinstallation conferences at Project site in compliance with all requirements in Division 01 Specification Section and as herein specified. Review methods and procedures related to installation and operations of all communications systems, including, but not limited to, the following:

27 05 00 - 40

1. Inspect and discuss electrical and equipment roughing-in related to all communications systems as well as other preparatory work required to be performed by other trades.
 2. Review and discuss all work, equipment deliveries, installation procedures, and related scopes as required to conform to the phased construction schedule.
 3. Review sequence of operations for each type of system, control, cabling and/or integration to any systems and/or equipment provided by other trades.
 4. Review and finalize construction schedule and verify availability of materials, installation personnel, equipment, and any preparatory work by other trades needed to make progress and avoid delays.
 5. Review required start-up, testing, commissioning, and certifying procedures to be employed for each system and any impacts to other trades.
- D. For work on existing facilities, arrange, phase, and perform work to assure the operation of all communications systems for other buildings and contiguous spaces at all times. Refer to Division 01 Specification Section for additional requirements.
- E. All new work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Division 01 Specification Section.
- F. Remove all unnecessary tools and equipment, unused materials, packing materials, and debris from each area where work has been completed unless designated for storage.
- G. Coordinate the installation of all cabling, conduits/raceways and cable trays and equipment with applicable trades to ensure proper operation and function of all integrated systems in accordance with all related specification sections. Refer to Division 01 Specification Section for additional project coordination requirements.
- a. Prior to the final programming of any systems review with The Authority all system features, functions, system operations, network mapping, system integrated responses and all related programming as required for the proper operation of the respective communications systems.
- H. The Contractor shall prepare the necessary documents required for installing, testing, and bringing each system online. Such documents include but are not limited to:
1. Project management and quality assurance plans
 2. Testing plans
 3. Component and system submittal documents
 4. Installation plans
 5. Component design plans
 6. System user documentation
 7. As-built drawings and documentation
 8. Authority-required documentation including, but not limited to Cable Management Reports and Device Schedules.
- I. The Contractor shall coordinate with the Authority and OAR to ensure each system meets the project requirements. The Contractor shall meet all ADA requirements.

3.4 EQUIPMENT INSTALLATION

A. General

1. 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.
2. The Contractor shall install products detailed in the specifications, system requirements, drawings and Contractor designs including those purchased by the Contractor and those provided by other parties.
3. All equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Specification shall be subject to the control and approval of the Authority and OAR.
4. All system equipment installations shall be in accordance with good engineering practices, NEC, local building codes, industry standards and all manufacturer's requirements. Cable terminations at all equipment locations shall comply with all state and local electrical codes and industry standards. All wiring shall test free from all grounds, shorts, stray voltages, and EMI.
5. Follow manufacturers' instructions for installing, components and adjusting all equipment and cabling. Submit two (2) copies of such instructions to the Authority and OAR a minimum of fourteen (14) days before installing any equipment related to the submitted instructions. Provide an additional copy of such instructions at the equipment during any work on the equipment. Where no instructions are included with the equipment, follow referenced industry standards, best practices, and workmanlike installation standards.
6. Equipment location shall be as close as practical to locations as indicated on the contract drawings.
 - a. Provide all equipment clearances in accordance with NEC requirements and industry standards. Arrange equipment to facilitate unrestricted access for maintenance and service around all equipment, components, and/or cable terminations.
7. Where the Authority and OAR determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the project.
 - a. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.
8. System/Hardware and mounting must comply with IBC Seismic Requirements.
9. Comply with manufacturer's published rated load for all fasteners, brackets, enclosures, racks, cabinets, cable trays and supports for system components.
10. For equipment mounted in drawers or on slides, provide the 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.

11. The Contractor's quality assurance Inspector shall conduct a visual inspection of all installations to verify that the installations are in accordance with the project's and manufacturer's specifications. Records of the inspections signed and dated by the Quality Assurance Inspector shall be provided to the Authority and OAR. Prior to any scheduled inspections the Authority and OAR representative shall be notified by the Contractor of any inspection(s) so they may witness.
- B. Software Installation
1. The Contractor shall test all custom and packaged "off-the-shelf" software in development, test, stage and production environments, and have successfully passed factory acceptance testing, prior to installation on-site.
 2. Contractor shall install and configure all software in accordance with the software manufacturer's installation instructions. Apply the latest patches and security updates, unless otherwise noted.
- C. Hardware Installation
1. Final hardware selected and installation of hardware shall be coordinated with the Technical Project Manager. Additionally, the Contractor shall ensure the ventilation requirements for the all hardware components are met.
 2. The Contractor shall install and inspect all hardware required in this specification in accordance with the manufacturer's installation instructions. Final placement of hardware is subject to the Authority and OAR approval.
 3. 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 Authority.
 4. The Contractor shall obtain written permission from the Authority and OAR 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 obtain written permission from the Authority and OAR before cutting into or through any part of the building structures where fireproofing or moisture proofing could be impaired. In any such case the Contractor shall be responsible for restoring the affected area to "like-new" condition or to a condition to match the existing conditions.
 5. The Contractor shall take all steps necessary to ensure that all public areas remain clear or are properly marked during installation or maintenance.
 6. The Contractor shall coordinate installation with the Authority and OAR, to minimize disruption of existing business functions at the airport.
 7. The Contractor shall place materials only in those locations that have been previously approved. Any other locations shall be approved, in writing, by the Authority and OAR.
 8. The Contractor shall label all cabling and patch cords in accordance with the Authority approved labeling plan. Coordination with the Authority and OAR shall be performed, and all labeling shall be approved, prior to implementation.
- D. System Startup
1. Subject to the responsibility matrix on the Contract Drawings, the Contractor shall not apply power to the system until after:

- a. System and components have been installed and inspected in accordance with the manufacturer's installation instructions.
- b. 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.
- c. System wiring has been tested and verified as correctly connected as indicated.
- d. All system grounding and transient protection systems have been verified as properly installed and connected, as indicated.
- e. Power supplies to be connected to the system and equipment have been verified as the correct voltage, phasing, and frequency as indicated.
- f. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installations, defective equipment items, or collateral damage due to Contractor work/equipment.

3.5 COMMUNICATIONS CABLING REQUIREMENTS

- A. All wiring and cables shall be properly dressed and/or bundled with hook-and-loop (Velcro) straps or cable ties. Twisted wire, tape, rope, twine, phone wire and similar bits of debris usually available on site are not acceptable substitutes for proper securing hardware. All inter-rack cables and wiring must be properly routed, and where available, in cable trays. Overhead cables must be easily removed or reworked within the cable trays. Proper care must be taken to ensure that new cables added to the trays are not stressed or intertwined with existing cables. Cables shall not be broken out of their outer jackets except within enclosures designed to support and protect cable break-outs. Overhead cables may not cross perpendiculars or be suspended in mid-air without supports.
 1. Cables exiting conduits at a height exceeding 18" above cable tray shall be supported by conduit waterfall fittings. Cables shall not exit conduits at a height exceeding 3 feet above the supporting cable tray.
- B. Cabling shall be sized to support the appropriate communication system. All communications cable installations shall be in accordance with good engineering practices as established by the ANSI/TIA, IEEE and the NEC and all referenced standards and best practices. All cabling shall meet all state and local electrical codes. All cabling shall test free from all grounds, shorts, and EMI.
 1. Contractors shall have the option to combine all cable home runs and conductors of same type and voltage "class" in accordance with NEC requirements unless specified elsewhere. Size all conduits and cable trays to meet the required fill ratios and install all conductors in accordance with NEC requirements, referenced standards and manufacturers recommendations.
 - a. All communications cabling located above accessible suspended ceilings shall be installed in conduit.
 - b. Cabling installed above hard ceiling spaces shall be installed in dedicated conduits.
 - c. No exposed cabling will be acceptable in finished or occupied spaces of the facility without approval by the Authority and OAR.

- d. Any communications system cabling installed exterior to the building and/or all cabling being routed from the facility to any remote location external to the project location shall utilize OSP rated fiber optic cable installed in conduit system.
2. Do not install bruised, kinked, scored, deformed, abraded, or otherwise damaged cable. Do not splice cable between indicated terminations, taps, or junction points. Remove and discard cable where damaged during installation and replace it with new cable.
3. Ensure that all communications cabling supports (conduits, support grips, cable trays, and cable termination panels) are fully installed before proceeding with cable installation.
4. At no time shall any cables be installed and left unsupported, nor shall cables be tie-wrapped to any other supporting structure in lieu of specified cable supports. Do not tie-wrap or permanently affix cable bundles to approved cable supports.
 - a. NOTE: Cable bundles shall not be cinched too tightly; all cable ties shall be hook-and-loop ("Velcro") strips only.
5. The Contractor shall not permit any communications cabling to lie unprotected on the floor at any time. If cables must be left on any floor, protect the cables so that they may not be walked on or have any material or equipment placed or rolled on top. Replace all damaged cables from demarcation to termination point; no splicing of damaged cables shall be permitted.
6. Maintain manufacturers recommended minimum bend radiuses of all cabling. Where referenced standards stipulate a larger bend radius than that specified by the manufacturer, comply with the larger requirement. Do not stretch, stress, tightly coil, bend, or crimp cables. The Contractor shall keep all cabling out of the way of other trades during staging of any work. The Contractor at the Contractor's expense will replace all severely stressed or damaged cables, equipment, and materials as determined by the Authority and OAR.
7. Do not exceed the manufacturer's maximum specified pull tension during installation. Where the manufacturer does not specify a maximum pull tension, follow those specified in the applicable referenced standard(s). Contractor shall utilize a winch with tension control or a "break-away" link designed to break away at or below the recommended maximum pulling tension.
8. Special care shall be taken to avoid damage to the cable. While under pulling tension, the cable shall not be bent into a curve with a radius of less than twenty (20) times the cable diameter, or no less than manufacturers minimum.
9. Use methods and lubricating compounds on cables and wires to prevent damage to material and products during roughing-in. Provide compounds that are not injurious to the cable and wire jackets that do not harden or become adhesive.
10. No media, fiber or copper, shall be installed in lengths surpassing Standards based length requirements.
11. Wire and cable routing shown on the Contract Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project conditions.

12. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required. Record actual routing on as-built for all conduit larger than one inch.
 13. Cables shall not be broken out of their jackets except within enclosures designed to support and protect cable breakouts, splices, and/or terminations.
 14. Installation of all cabling shall be in accordance with all guidelines established by the product manufacturer and all referenced industry standards and best practices.
- C. Unshielded Twisted Pair (UTP) and Shielded Twisted Pair (STP) Cable
1. All TCP/IP-based copper network cabling shall be Category 6 or Category 6a rated as noted and installed in conduit except within dedicated communications rooms. All communications raceway shall not contain any AC carrying conductors or non-associated communications network cables.
 2. Refer to related specification sections for additional requirements related to Category 6 or 6a cabling types, and testing requirements.
 - a. All network cabling located above accessible suspended shall be installed in dedicated conduits, exposed cabling supported by the use of "J" hooks shall not be accepted.
 - b. All horizontal data drops shall be terminated on Category-6 or 6a patch panels installed on the 19" equipment racks\cabinets.
 - c. All data drops and backbone cabling installed above inaccessible ceiling spaces or areas containing no ceiling shall be installed in dedicated conduits. In no case shall cable be supported on ceiling tiles, T-bars, or tie- wrapped to any conduit or pipes.
 - a) Category-6 or 6A cables shall not be cinched too tightly; all cable bundles at patch panel locations and in the field shall be VELCRO type strips only. Plastic wire ties shall not be accepted on any Category-6 or 6a cabling.
 - b) Each horizontal cabling drop shall be a dedicated Category-6 or 6a cable and shall not exceed a maximum cable length of 295 feet (including slack and service loops)..
 - c) Communications drops installed inside walls shall be installed in dedicated conduit terminating in a junction box at the jack location.
 - d) Cable and wiring shall not lay loose on ceiling tiles or grids. Cable must be supported in all areas. Bridle rings or tie-wrapped supporting methods are not acceptable. Conduit stub-ups shall extend to the cable tray.
 - e) Install all cabling parallel and perpendicular to building lines and follow building structure. Use cable support equipment/hardware recommended by the manufacturer and/or as herein specified.
 - f) Provide all terminations, cross-connects, wire management, surge protectors, etc. for a complete and operational system.

2. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque-tightening values for equipment connectors.
 3. Rack and terminal cabinet wiring shall be neatly routed or bundled and routed along rack sides. All splices and connections shall be by plug, solder or screw terminal strips, etc. Splices shall not hang in racks or terminal cabinets.
- G. Conduits/Raceway/Cable Trays
1. Provide conduit and raceway systems for all communications networks as indicated below. Refer to all related specification sections for additional conduit and raceway information.
 - a. Exposed structure: Provide conduit run from each drop to the designated communication room.
 - b. Vertical cabling shall be installed in dedicated conduits and shall be supported between floors in closets or accessible locations; in no case shall any cable risers be unsupported.
 - c. Cables entering all communications equipment rooms shall be supported with Cable tray from entrance to rack/cabinet location as indicated on the contract drawings and/or herein specified.
 - d. Conduits containing horizontal cables shall enter IDF Rooms as close as possible to the furthest distanced ITO in order to minimize cable lengths.
 2. All conduits/raceways shall be concealed and shall be installed above accessible finished ceilings and/or in walls. Any conduits/raceways installed in areas requiring installation to be exposed, shall be installed as tight as possible to ceilings and at right angles to walls/building lines and shall not obstruct any access hatches, equipment service panels, lighting or other equipment and/or devices. No exposed conduits/raceways shall be installed without prior approval of the Authority and OAR.
 - a. Where conduits cannot be concealed above ceilings or in walls and must be installed in finished or public areas of the building, all conduits shall be finished wire-mold type raceways or approved equal. Finished wire-mold type raceways shall not be installed without prior approval in writing by the Authority and OAR.
 - b. Where any equipment and/or junction boxes are installed above non-accessible finished ceilings, the Contractor shall provide access hatches listed for the intended application. Access hatches shall be located so that service access to the equipment and/or junction boxes is unimpeded.
 - 1) Access hatches shall not obstruct any equipment, service panels, lighting equipment, devices, or any architectural elements of the ceiling. At the time of submittals, the Contractor shall submit all proposed access hatch locations for review by the Design Professional.
 - c. All conduits/raceways shall be supported in accordance with NEC requirements and referenced standards.
 - d. All conduits/raceways shall be installed in a manner that prevents tampering or removal when installed in areas exposed to the general population.

- 1) Provide tamper-resistant installation utilizing “torx with peg” security-fastening devices for all conduits/raceways, equipment, devices and appurtenances in all areas accessible to the general population and/or areas subjected to tampering or vandalism.
- e. Interior raceways shall be a minimum 1 inch unless otherwise noted. Exterior raceways shall be a minimum 1 1/4-inch. Size all raceways and install conductors in accordance with NEC requirements. Fill ratio shall not exceed 40 percent for indoor raceways or exterior raceways.
 - 1) EMT conduit with compression fittings may be utilized in all inaccessible ceiling areas unless otherwise restricted by code.
 - 2) Threaded Rigid metal conduit shall be used on all exterior applications, stub-ups and all interior areas where concealed conduit requirements cannot be met and are exposed to tampering or damage by the general population.
 - a) All areas considered being of high risk due to the nature of the occupancy or the need to protect and maintain the integrity of the cabling shall be installed in rigid threaded conduits.
- f. Conduit expansion couplings shall be furnished and installed in all areas where expansion/contraction of structure may occur in order to couple two sections of a conduit runs to support longitudinal movement. The Contractor shall refer to architectural drawings for exact locations of all building expansion joints.
 - 1) Conduit expansion couplings shall be consistent with the size the conduit being installed, shall be steel electrogalvanized, and shall meet all environmental and seismic conditions.
 - 2) Expansion couplings shall be weatherproof and approved for use indoors or outdoors without an external bonding jumper.
 - 3) Expansion couplings shall be UL Listed and approved for use in wet locations.
 - 4) Expansion couplings shall comply with UL 514B, CSA 22.2 No. 18 3-12, NEMA FB1.
- g. Exterior raceways: PVC schedule 40 conduit at the minimum shall be utilized in all underground applications unless otherwise specified by related specification sections. The conduit shall be buried at a minimum 36” below grade. Warning flagging tape shall be buried 12” below grade to indicate the conduit routing location. Refer to related specification sections for additional requirements.
 - 1) All exterior conduits larger than 2” in diameter shall be provided with dedicated inner-duct conduit systems, segregated by network type (i.e. security, etc.) and shall include a minimum of one spare empty inner-duct per conduit at the completion of the project.
 - 2) The Contractor shall have the option to utilize the same trench/routing location as other utilities. In no case shall any system conduits or duct banks be combined with other electrical utilities without providing the required separation between conduits as necessary to ensure the minimal transmission or conduction of any RF and/or EMI signals.

- h. Outlet Boxes: shall be 4-11/16 x 4-11/16 x 2-1/8 inches deep with single gang reducer plate where required for all data outlet locations and single gang for wall mounted telephone locations.
 - 1) All outlet boxes shall be provided with single or dual gang device mud-rings flush to finished wall as required based on type and configuration of outlet and type of wall construction.
 - 2) Use deep masonry boxes at masonry construction. T-Bar hangers or other appropriate mounting hardware shall be utilized to support boxes mounted in the ceiling.
- 3. Cable Tray – Ladder Type: Provide a two-tier cable tray system in all communications rooms and closets for routing horizontal distribution and backbone communications cables as detailed on the Contract Drawings. Refer to Specification Section 27 10 00 for Cable Tray specifications and additional requirements. Cable tray shall be complete with all materials, miscellaneous hardware and all appurtenances required for a complete cable distribution and support system. All cable trays shall be furnished with swept bends/corners within telecommunications room (IDF/MDF) spaces. Provide drop-out/waterfall fittings above racks/cabinets and any other location where cabling lays over a side rail or drops through the cable tray.
 - a. All cable tray widths shall be sized according to the total number of cables to be supported within the various trays plus an additional 100% spare capacity for future expansion capability. Minimum tray width shall be 18".
 - b. Install cable tray in a manner ensuring that all cables fully comply with all ANSI/TIA standards.
 - 1) Maintain a minimum clearance of 24" between top of uppermost cable tray and ceiling structure or other equipment or raceway.
 - 2) Maintain a minimum clearance of 12" between bottom of cable tray and top ceiling grid or other equipment or raceway. Maintain 12" of clearance between upper and lower cable tray tiers.
 - 3) Maintain a minimum clearance of 24" from all conduits or cables used for electrical power distribution.
 - 4) Maintain a minimum clearance of 12" between bottom of lower cable tray and top of equipment racks and/or cabinets
 - 5) Maintain a minimum clearance of 24" from fluorescent lighting. All Pathways shall cross perpendicular to fluorescent lighting and electrical power cables or conduits.
 - 6) Cable tray supports shall be attached to the structural ceiling or walls with hardware or other installation and support aids specifically designed for the cable tray and designed to support the cable tray's weight and required cable weight and volume.
 - 7) Do not attach cable tray supports to ceiling support system or other mechanical support systems.
 - 8) Cable tray installed adjacent to walls shall be supported from the wall using brackets.
 - 9) Do not support cable trays from cabinets or racks. Connections between cable tray and cabinets or racks shall be for the purposes of stabilization only.

- 10) Load span criteria: Install tray supports in accordance with the load criteria of L/240, with minimum 5/8" threaded rod for ceiling support within telecommunications spaces.
 - 11) Cable Trays shall be supported in accordance with manufacturers' published recommendations, or at a maximum of 6-foot intervals, whichever is lesser in spacing, and within 2 feet of each end.
 - 12) All Cable trays shall be installed without burrs, sharp edges, or projections, which may damage cable insulation.
 - 13) All lengths or sections of cable tray shall be bonded and grounded in accordance with NEC, ANSI/TIA, IEEE.
- c. Follow manufacturers' instructions for installing, components and adjusting all equipment and cabling. Submit two (2) copies of such instructions to the Architect before installing any equipment. Provide a copy of such instructions at the equipment during any work on the equipment. Where no instructions are included with the equipment, follow referenced industry standards and best practices, and workmanlike installation standards.
 - d. Acceptable Manufacturers: Subject to compliance with these specifications, ladder tray shall be as manufactured by:
 - 1) Chatsworth (CPI)
 - 2) Homaco
 - 3) Eaton B-Line
 - 4) Or approved equal.
4. Cable Tray - Basket Type
- a. Acceptable Manufacturers: subject to compliance with these specifications, wire cable trays and support systems as manufactured by:
 - 1) Chatsworth (CPI)
 - 2) Legrand
 - 3) Eaton
 - 4) B – Line Systems
 - b. General
 - 1) Provide wire cable tray where indicated by the contract documents; the Contractor shall include all required types, sizes, necessary connector assemblies, clamp assemblies, connector plates, splice plates and splice bars. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.
 - c. Materials and Finishes specifications for each wire cable tray as follows:
 - 1) Electroplated Zinc: Straight sections shall be made from steel meeting the minimum mechanical properties of ASTM A510 and shall be electro-plated zinc in accordance with ASTM B633 SC2.
 - 2) Stainless Steel: Straight sections and accessories shall be made from AISI Type 304 Stainless Steel.
 - 3) Paint: Straight sections shall be painted "Computer White" over Electrodeposited Zinc.

- 4) Pre-Galvanized Zinc: Wall brackets and other pre-galvanized accessories shall be coated with zinc in accordance with ASTM A653.
 - 5) Electro-Galvanized Zinc: Support accessories and miscellaneous hardware shall be coated in accordance with ASTM B633 SC3. All threaded components shall be coated in accordance with ASTM B633
 - 6) All straight section longitudinal wires shall be straight (with no bends).
 - 7) Wire cable tray shall be made of high strength steel wires and formed into standard 2 inch by 4-inch wire mesh pattern with intersecting wires welded together. All wire ends along wire cable tray sides (flanges) shall be rounded during manufacturing for safety of cables and installers.
 - 8) Wire cable tray sizes shall conform to the following nominal criteria:
 - a) Straight sections shall be furnished in standard 120-inch lengths.
 - 9) Wire basket shall have at the minimum 4-inch usable loading depth by 16 inches wide.
- d. **Cable Tray Support System**
- 1) All fittings shall be field formed as needed.
 - 2) All splicing assemblies shall be the bolted type using serrated flange locknuts. Hardware shall be either yellow zinc dichromate in accordance with ASTM B633 SC2 or AISI Type 304 Stainless Steel.
 - 3) Wire basket supports shall be center support hangers, trapeze hangers or wall brackets as manufactured by Cooper B-Line, Inc. or Architect approved equal.
 - 4) Trapeze hangers or center support hangers shall be supported by 1/4 inch or 3/8-inch diameter rods.
 - 5) Special accessories shall be furnished as required to protect, support, and install a wire basket support system.
- e. **Installation**
- 1) Install wire cable tray where indicated on the contract drawings in accordance with manufacturers requirements and recognized industry practices (NEMA VE-2 2000). Ensure that the cable tray equipment complies with requirements of NEC, and applicable portions of NFPA 70 and NECA's "Standards of Installation" pertaining to general Electrical installation practices.
 - 2) Coordinate wire cable tray with other electrical work as necessary to properly interface installation of cable tray with other trades.
 - 3) Provide sufficient space encompassing cable tray to permit access for installing and maintaining cables. Provide a minimum clearance of at least 6" clear AFC and 12" clear above cable tray.
 - 4) Basket type cable tray shall be installed so as to be electrically continuous, but under no circumstances shall cable tray be configured for use as an electrical bonding conductor.

H. Penetrations of Walls and Floors:

1. All wall/floor penetrations are to be sleeved and fire stopped with approved fire stopping material or sealant as applicable for the type of penetration. Coordinate all cable and conduit penetrations of building with all affected trades. Refer to all related specification sections for additional wall/floor penetration requirements.
 - a. All penetrations of rated walls and floors shall be fire stopped in accordance with the ASTM and NFPA standards. Refer to related specification sections for additional requirements.
 - b. Floor penetrations shall be sleeved with a minimum sleeve diameter of 4 inches. An additional penetration shall be provided for future use, sleeved, and capped and fire stopped as required.
 - c. Coordinate size of wall penetration with conduit size, number of conductors. Comply with all NEC requirements.
 - d. 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.
 - e. Install fire-stopping in open penetrations and in the annular space of penetrations for fire rated barriers.
 - f. 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.
 - g. 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.

3.6 ELECTRICAL POWER DISTRIBUTION

- A. Refer to Division 26 specifications in addition to the following:
1. Primary power for all system controls, sub-control panels, processors, and power supplies shall be configured to switch to emergency backup power sources automatically when primary power is interrupted without degradation of any critical system functions.
 2. All electrical power shall be hardwired to the panel. System components or panels employing the use of plug-in transformers, extension cords or cheater cords for the connection to electrical power shall not be acceptable.

3.7 TRANSIENT VOLTAGE SUPPRESSION

- A. Transient Voltage Surge Suppression: All cables and conductors extending beyond building façade (except nonconductive fiber optic cables) which serve as communications, control, or signaling circuits shall be protected against Transient Voltage surges and have Transient Voltage Surge Suppression (TVSS) protection.
1. The TVSS device shall be UL listed in accordance with Standard TIA 497B installed at each end. Lighting and surge suppression shall be a multi-strike variety and include a fault indicator.

2. Protection shall be furnished at the equipment and additional triple solid state surge protectors rated for the application on each wire line circuit shall be installed within 914.4 mm (3 ft) of the building cable entrance. Fuses shall not be acceptable for surge protection applications. All inputs and outputs shall be tested in both normal mode and common mode to verify there is no interference at the minimum surge suppression test shall meet the following criteria.
 - a. All system power supplies serving exterior system components or devices shall be provided with the appropriate transient surge suppression protection on both the line side as well as the load side.
 - 1) A 10-microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and a peak current of 60 amperes shall be the minimum performance requirements. Provide surge suppression in accordance with all manufacturers requirements.
 - 2) An 8-microsecond rise time by 20-microsecond pulse width waveform with a peak voltage of 1000 volts and a peak current of 500 amperes shall be the minimum performance requirements. Provide surge suppression in accordance with all manufacturers requirements.
 - 3) Maximum series current: 2 AMPS. Provide units manufactured by Advanced Protection Technologies, model # TE/FA 10B or TE/FA 20B or approved equal.
 - 4) Operating Temperature and Humidity: -40 to 85 degrees C (-40 to 185 degrees) shall be the minimum performance requirements. Provide surge suppression in accordance with all manufacturers requirements.

3.8 GROUNDING AND BONDING

- A. All electronic equipment, telecommunications Grounding Busbars, conduits, cable trays, racks/cabinets and cable shields shall be properly grounded and bonded in accordance with all requirements of ANSI/TIA 607-C, ANSI/BICSI N3-20, NEC 250 and IEEE 1100. Additionally, all communications space, IDF, and MDF room grounding and bonding shall be in accordance with all related specification sections and Motorola R56 Standards and Guidelines for Communications Sites (where Motorola radio equipment is installed).
- B. A Telecommunications Grounding System shall be installed in all communications equipment rooms. Grounding system shall provide equalization of the grounding potentials between the building power system and the telecommunications main grounding bus-bar (TMGB) as well as all telecommunications grounding bus-bars (TGB).
 1. Telecommunications Main Grounding Busbar

- a. The TMGB shall serve as the dedicated extension of the building grounding electrode system for the telecommunications infrastructure as well as the central attachment point for all TGBs. The TMGB shall be located and provided in the Main Telecommunications Room (MDF) in each building. The TMGB shall be listed by a nationally recognized testing laboratory (NRTL).
- b. The TMGB shall, at a minimum, meet the following requirements:
 - 1) Material: Copper or copper alloys having a minimum of 95% conductivity when annealed as specified by the International Annealed Copper Standard (IACS).
 - 2) Thickness: minimum 1/4" thick
 - 3) Width: No less than 4"
 - 4) Length: The length of the TMGB shall vary based on the installation requirements. The Contractor shall ensure the length of the bar is sufficient to include enough pre-drilled holes for all necessary bonding conductors. The bar shall be no less than 14" long. The minimum number of pre-drilled holes required in the TMGB shall include, but not be limited to the following:
 - a) Two holes for the Telecommunications Bonding Conductor (TBC) termination.
 - b) Two holes for each Telecommunications Bonding Backbone (TBB) termination.
 - c) Two holes for each Alternating Current Equipment Ground (ACEG) termination.
 - d) Two holes for each Telecommunications Equipment Bonding Conductor (TEBC) in the room.
 - e) Two holes for each protector block in the room.
 - f) Two holes for each ladder tray, or independent section thereof in the room. Each independent section of ladder tray must be independently bonded to the TMGB in a manner consistent with referenced standards. Bonding one tray through another that is directly bonded to the TMGB (serial bonding) is prohibited.
 - g) Two holes for each set of conduit sleeves or metallic communications pathways entering the room.
 - h) Two holes for each bonding conductor to structural steel (as required).
 - i) 20% of spare capacity shall be available after all terminations are done and the project is complete.
 - j) If quantity of holes exceeds the maximum available by a manufacturer, multiple bars shall be provided as to match the criteria indicated above.
 - k) Pre-drilled holes: Shall be configured for use with correctly matched listed lugs and hardware. All pre-drilled holes shall have a minimum diameter of 5/16"
 - l) Hole spacing: All pre-drilled holes shall have a minimum spacing of 5/8"

- 5) The TMGB shall be installed on the wall with stand offs and isolators. Isolators shall be rated at 600V.
 - 6) Only one lug shall be installed per hole mounting pair on a bonding surface. Lugs shall not overlap or use the same mounting holes on a bonding surface.
 - 7) Basis of design: Harger GBI144xTMGB or approved equal.
2. Telecommunications Grounding Busbar
- a. The TGB shall serve as the bonding connection point for the Telecommunications systems and equipment in the area served by a Communications Room (IDF). The TGB shall be located and provided in each Telecommunications Room (except the main telecommunications room) in each building and any other locations indicated on the drawings. The TGB shall be listed by a nationally recognized testing laboratory (NRTL).
 - b. The TMGB shall, at a minimum, meet the following requirements:
 - 1) Material: Copper or copper alloys having a minimum of 95% conductivity when annealed as specified by the International Annealed Copper Standard (IACS).
 - 2) Thickness: minimum ¼" thick
 - 3) Width: Minimum 2"
 - 4) Length: The length of the TGB shall vary based on the installation requirements. The Contractor shall ensure the length of the bar is sufficient to include enough pre-drilled holes for all necessary bonding conductors. The bar shall be no less than 12" long. The minimum number of pre-drilled holes required in the TGB shall include, but not be limited to the following:
 - a) Two holes for the Telecommunications Bonding Backbone (TBB) termination.
 - b) Two holes for each Alternating Current Equipment Ground (ACEG) termination.
 - c) Two holes for each Telecommunications Equipment Bonding Conductor (TEBC) in the room.
 - d) Two holes for each protector block in the room.
 - e) Two holes for each ladder tray, or independent section thereof in the room. Each independent section of ladder tray must be independently bonded to the TMGB in a manner consistent with referenced standards. Bonding one tray through another that is directly bonded to the TMGB (serial bonding) is prohibited.
 - f) Two holes for each set of conduit sleeves or metallic communications pathways entering the room.
 - g) Two holes for each bonding conductor to structural steel (as required).
 - h) 20% of spare capacity shall be available after all terminations are done and the project is complete.

- i) If quantity of holes exceeds the maximum available by a manufacturer, multiple bars shall be provided as to match the criteria indicated above.
 - 5) Pre-drilled holes: Shall be configured for use with correctly matched listed lugs and hardware. All pre-drilled holes shall have a minimum diameter of 5/16"
 - 6) Hole spacing: All pre-drilled holes shall have a minimum spacing of 5/8"
 - c. The TGB shall be installed on the wall with stand offs and isolators. Isolators shall be rated at 600V.
 - d. Only one lug shall be installed per a two-hole mounting on a bonding surface. Lugs shall not overlap or use the same mounting holes on a bonding surface.
 - e. Basis of Design: Harger GBI142xxTGB or approved equal
- 3. Telecommunications Bonding Conductors
 - a. Telecommunications Bonding Conductors referenced in this section are not intended to be comprehensive. Reference ANSI/TIA-607 for more information on all telecommunications bonding requirements.
 - b. Ferrous metallic conduits containing bonding conductors for telecommunications shall be bonded, at each end of the conduit, directly to the bonding conductor, using a listed exothermic weld, listed irreversible compression-type connectors, or approved equivalent, using a grounding bushing and a minimum 6 AWG bonding conductor. In situations where the bonding conductor exits the conduit within 18" of a TMGB or TGB, the bonding conductor from the bonding bushing may be terminated directly to the TMGB or TGB, following the path of the bonding conductor contained within the conduit and/or the shortest, most direct path possible to the TMGB or TGB. The bonding conductor contained within the ferrous metal conduit shall not be twisted around and passed through the grounding lug on the ground bushing to bond the conduit.
 - c. The minimum included bend angle for all bonding conductors shall be 90°.
 - d. Bends of bonding conductors terminating at the TMGB or TGBs shall have a minimum inside bend radius of 8 inches.
 - e. bends of bonding conductors at all other locations shall be made with the greatest practical inside bend radius. The minimum bend radius of all bonding conductors other than those at the TMGB and TGB shall be 10 times the bonding conductor diameter.
 - f. Telecommunications Bonding Backbone (TBB)
 - 1) The TBB is a conductor that interconnects all TGBs with the TMGB. The intended function of a TBB is to reduce or equalize potential differences. The TBB originates at the TMGB, extends throughout the building using the telecommunications backbone pathways, and connects to the TGBs in Telecommunications Rooms.

- 2) The minimum TBB conductor size shall be a 6 AWG. The TBB shall be sized at 2 kcmil per linear foot of conductor length up to a maximum size of 750 kcmil. Refer to ANSI/TIA-607 for more information.
- 3) All TBBs shall:
 - a) Be protected from physical and mechanical damage
 - b) Originate from the TMGB
 - c) Follow the backbone pathways
 - d) Be continuous from the TMGB to the furthest TGB to which it is connected. Daisy-chaining from busbar to busbar is prohibited.
 - (1) Intermediate TGBs shall individually tap off of the TBB using a listed exothermic weld, listed irreversible compression type connector, or an approved equivalent.
 - e) Minimize to the extent practical the length of the conductor
 - f) Be installed without splices
4. Telecommunications Equipment Bonding Conductor (TEBC)
 - a. The TEBC connects the TMGB/TGB to equipment racks/cabinets.
 - b. More than one TEBC may be installed from the TMGB/TGB.
 - c. The TEBC shall be a continuous copper conductor that is sized not less than a 6 AWG or as the largest size equipment grounding conductor in the ac branch power circuit(s) serving the racks/cabinet lineup.
 - d. Connections to the TEBC shall be made with listed irreversible compression connectors, suitable for multiple conductors, and with all cable bends from racks and cabinets toward the TMGB/TGB.
 - e. TEBCs shall not be routed within or on top of ladder trays or close to other cables
 - f. Maintain minimum required separation from other cable groups per NEC and referenced standards and best practices.
 - g. The TEBC shall be connected to the cabinets/equipment racks, via a vertical rack Bonding Bussbar (RBB). Each cabinet or equipment rack shall have a suitable connection point to which the bonding conductor can be terminated.
5. The TMGB and each TGB shall be provided where indicated on the drawings and shall provide an effective bonding connection to the nearest approved building grounding electrode (e.g., structural steel) as well as to the local power distribution panel grounding system (e.g., ac branch circuit panel board's equipment grounding busbar).
 - a. Equipment Grounding: Metallic structures, equipment racks, cabinets and enclosures as well as all raceways, cable trays, junction boxes, outlet boxes, machine frames, and other conductive items shall be bonded and grounded.
 - b. Cabinets, racks, electrical panels, ladder trays, and other enclosures shall not be bonded serially; each shall have their own dedicated bonding conductor to the TMGB/TGB or TEBC.

- c. Equipment containing metallic parts and patch panels for shielded cabling in cabinets and racks shall be bonded to the telecommunications bonding system in accordance with the manufacturer instructions.
 - 1) Where instructions are not given, all bonding conductors that connect these installed products shall be a minimum sized conductor of 10 AWG.
- d. Cabinets and racks including an isolated RBB will require a separate minimum 6 AWG bonding conductor, from both the cabinet/rack and the RBB, back to the TMGB/TGB or TEBC.
- e. Duct Banks and Manholes: Provide an insulated equipment grounding conductor in each duct containing any voltage conductors, sized per NEC except that minimum size shall be No. 2 AWG. Bond the equipment grounding conductors to the grounding bus, to all manhole hardware and ground rods, to the cable shielding grounding provisions for all cable splices, terminations and equipment enclosures.
- f. Metallic Fences equipped with communications equipment: Fences shall be grounded with a ground rod at each fixed gate post and at each corner post.
 - 1) Drive ground rods until the top is 300 mm (12 inches) below grade. Attach a No. 4 AWG copper conductor, by exothermic weld to the ground rods and extend underground to the immediate vicinity of fence post. Lace the conductor vertically into 300 mm (12 inches) of fence mesh and fasten by two approved bronze compression fittings, one to bond wire to post and the other to bond wire to fence.
 - 2) Each gate section shall be bonded to its gatepost by a 3 by 25 mm (1/8 by one inch) flexible braided copper strap and ground post clamps. Clamps shall be of the anti- electrolysis type.
- 6. All connections of grounding conductors to ground rods, bus bars, rebar, structural members, pipes and fences, as well as splices of any ground conductors, shall be made by exothermic welds except where otherwise noted. All connections to bar lugs shall be exothermic weld or compression type connections. Bolted type connection of ground conductors may only be made where terminal lugs or blocks have been furnished and installed in equipment by the manufacturer.
 - a. Insulation color shall be continuous green for all bonding and equipment grounding conductors, except as otherwise approved by Authority or OAR.
- 7. Refer to related specification sections for any additional grounding and bonding requirements.

3.9 EQUIPMENT IDENTIFICATION

- A. Identify all system control, component and equipment cabinets, enclosures, and racks using plastic laminate engraved ("lamicoid") labels, or approved equal. Firmly affix to the panel, device, and/or component. Refer to Specification Section 27 10 00, Attachments and all related specification sections for additional requirements.

- B. Permanently label all horizontal and backbone cabling, conduit, pathways, innerduct, pullboxes, junction boxes and enclosures in accordance with Specification Section 27 10 00 and Attachments.
 - 1. Warning Tags: At each location where the fiber cable is exposed to human intrusion, it shall be marked with warning tags. These tags shall be yellow or orange in color, and shall contain the warning: "CAUTION FIBER OPTIC CABLE." The text shall be permanent, black, block characters, and at least 3/16" high.
 - a) A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not more than five (5) feet. Any section of exposed cable which is less than five (5) feet in length shall have at least one warning tag affixed to it.
 - 2. Provide typewritten circuit directories installed in 3-ring binders with transparent page protectors in each control and sub control cabinet and/or equipment rack.

3.10 MAINTENANCE & SERVICE

A. General Requirements

- 1. The Contractor shall provide all services required and equipment necessary to maintain all Contractor-furnished communications systems associated with this project during the Warranty period.
 - a. Provide all necessary material required for performing scheduled adjustments or other non-scheduled work. Impacts on facility operations shall be minimized when performing scheduled adjustments or other non-scheduled work. Refer to Division 01 specification section for additional requirements.
 - b. The adjustment and repair of the communications systems shall include all software and firmware updates on all computers, servers, CPUs, terminals, devices, communications and data transmission media (DTM), facility interface processors, signal transmission equipment and processors.
 - c. Test, inspect, and service each system on a quarterly basis (three month intervals) during the warranty period from the time of final acceptance. The Contractor shall compare quarterly test results with the test results at the time of final acceptance.
 - 1) The Contractor shall include as part of the quarterly test the calibration and/or adjustment of any device, component, and/or system that has deviated from the original test results at the time of final acceptance.
 - d. For each quarterly maintenance period, provide written notification to the Authority and OAR of the systems condition before and after service, the exact components that were tested and serviced, and overall status of the system.

B. Personnel

1. Service personnel shall be manufacturer certified in the maintenance, testing, and repair of the type of system and equipment provided for the project. Provide the Authority and OAR the name of the designated service representative, and of any change in personnel.
 - a. The Authority and OAR shall be provided copies of system manufacturer certifications for all designated service representatives.
 2. Schedule of all work to be performed during regular working hours, Monday through Friday, excluding federal holidays.
- C. Emergency Service
1. The Authority shall initiate service calls whenever the system is not functioning properly. The Contractor shall provide the Authority with an emergency service center telephone number. The emergency service center shall be staffed 24 hours a day 365 days a year. The Authority shall have sole authority for determining catastrophic and non-catastrophic system failures.
 - a. For catastrophic system failures, the Contractor shall provide same day eight (8) hour service response with a defect correction time not to exceed sixteen (16) hours from arrival on site. Catastrophic system failures are defined as any system failure that the Authority determines will place the facility(s) at increased risk.
 - b. For non-catastrophic failures, the Contractor within 1 business day with a defect correction time not to exceed 48 hours from time of notification.
- D. Records & Logs
1. The Contractor shall maintain records and logs of each task and organize cumulative records for each component and for the complete system chronologically. A continuous log shall be submitted for all devices. The log shall contain all initial settings, calibration, repair, and programming data. Complete logs shall be maintained and available for inspection on site, demonstrating planned and systematic adjustments and repairs have been accomplished for the system.
- E. Work Request
1. The Contractor shall separately record each service call request, as received. The record shall include the serial number identifying the component involved, its location, date and time the call was received, specific nature of trouble, names of service personnel assigned to the task, instructions describing the action taken, the amount and nature of the materials used, and the date and time of commencement and completion.
 2. The Contractor shall deliver a record of the work performed within five (5) working days after the work was completed.
- F. System Modifications
1. The Contractor shall make any recommendations for system modification in writing to the Authority and OAR. No system modifications, including operating parameters and control settings, shall be made without prior written approval from the Authority. Any modifications made to the system shall be incorporated into the operation and maintenance manuals and all related documentation.

3.11 WARRANTY

- A. Warrant material and workmanship for a period of at least one (1) year. Warranty period shall be longer if specified in related specification sections, or if provided by the furnished product's manufacturer. The warranty period shall commence from the date the Contactor received written notification of final acceptance from the Authority and/or OAR. At the minimum the Contractor shall provide warranty provisions:
1. Warrant the replacement of defective components/materials and/or correct defective work when given notice by the Authority and OAR during the warranty period.
 - a. At no time is the Contractor to use the extra materials provided under the scope of this project to replace malfunctioning or damaged equipment and or components. The Contractor shall replace all malfunctioning or damaged equipment and or components with new. The repair and then reinstallation of malfunctioning or damaged equipment shall not be acceptable.
 - b. During the Warranty period, replace failed equipment per the terms specified in this section. As such, the Authority and OAR shall not be bound to the terms and conditions of the manufacturer's warranty, pertaining to the replacement of failed equipment. In any situation, it is the Vendor's responsibility to keep the system operational during any hardware or software failures. Replacement equipment shall be provided to maintain operations while equipment manufacturer addresses warranty issues.
 - 1) Warranty replacements and repairs shall include any necessary shipping, handling and materials.
 - c. Establish a single point of contact for the Authority and OAR and provide any coordination responsibilities with manufacturers, suppliers, or Contractors to resolve warranted issues and on all maintenance and service actions related to items included in the Warranty. Process and procedures for engaging technical support shall be developed and communicated to the Authority, OAR, Authority Vendor.
 2. Warranty excludes liability for consequential incidental, or special damages due to vandalism, misuse, or acts of god.
 3. Onsite warranty response time by qualified technician shall be no more than 8 hours upon receipt of request from Authority, unless otherwise noted in related Division 27 and 28 specification sections.
 4. Warranty repairs shall be provided to the Authority at no cost. This shall include but not limited to replacement of all defective components/materials, all labor charges, all travel costs and all vehicle charges.
 5. Response time shall be 7 days a week / 24 hours a day / 365 days a Year.
 6. Provide test, inspection, and service of each system on a semi-annual basis at six month intervals.

7. Contractor must provide verification that they maintain their principle base of operation along with the personnel that will be responsible for providing service within 3 hours driving time to the project site. This tenet of the warranty shall remain in effect for the life of the warranty.
 8. All TCP/IP-based communications systems cabling and related appurtenances shall be provided with the manufacturer's 25-year extended warranty in addition to all requirements above.
- B. The Contractor shall, as a condition of final payment, execute a written warranty certifying all contract requirements have been completed in accordance with all requirements of the Contract Documents.
1. All system testing, commissioning, demonstration and training shall be performed prior to final system acceptance. All defects or damages due to faulty materials or workmanship shall be replaced without delay, to the satisfaction of the Authority's Representative, at the Contractor's expense.
 - a. The Contractor shall provide written documentation of test results and stating what was done to correct any deficiencies. The first inspection shall occur 90 calendar days after the acceptance date. The last inspection shall occur 30 calendar days prior to the end of the warranty.
 - b. The warranty period shall be extended until the last inspection and associated corrective actions are complete. Where any equipment and/or labor covered by Contractor's or manufacturer's warranty, has been replaced, due to failure, the warranty period for any replaced equipment or restored work shall be reinstated for a period equal to the original warranty period, and commencing with the date of completion of the replacement or restoration work.
 2. In the event any manufacturer customarily provides a warranty period greater than one (1) year, the Contractor's warranty shall be for the same duration for that component.
- C. The Technical Project Manager, GOAA OAR and GOAA Information Technology Department retain the right to use additional repair personnel as necessary to correct any warranty trouble calls and back charge the Contractor if the Contractor has been considered non-responsive to repair requests by the Owner.

3.12 FIELD SERVICES

- A. In addition to all testing requirements as specified by Division 01 specification section and all related Division 27 and 28 Specification Section, testing of all systems, sub-systems and cabling infrastructures shall be provided in accordance with all requirements of this section.
- B. Notify the Authority and OAR in writing, prior to the closing of any ceilings and ten (10) days advance of testing all system cabling to prevent delays in construction schedules.
- C. Test all cabling to confirm that no grounds, shorts, sneak currents, RFI and EMI conditions exist prior to start-up and commissioning of all, components, devices, equipment and/or systems.

- D. Before requesting a final inspection, the Contractor shall perform a series of end to end installation performance tests. The Contractor shall submit for approval by the Authority and OAR all test procedures to be employed, test result forms, and timetable for testing all fiber optic and UTP structured copper wiring.
- E. Acceptance of the simple test procedures discussed below is predicated on the Contractor's use of the specified products including but not limited to, all Division 27 and 28 systems, sub-systems, system components, fiber optic cable, category structured cable, cross-connect blocks, patch panels, and outlet devices as specified by all related specification sections and installed in accordance the Contract documents, manufacturer's recommended practices and all applicable codes, standards and industry practices. Acceptance of the completed installation for each system will be evaluated in the context of each of these factors.
- F. Testing Requirements
1. Phases of Testing:
 - a. Factory Acceptance Test (FAT) / Manufacturer's Proof of Concept Test (as applicable)
 - b. On-Site Performance Verification Testing
 - c. On-Site Endurance Testing
 2. Test Plan/Procedure: The Contractor shall provide six (6) hardcopies and an electronic copy of the test plan/procedures for each testing phase for the review and approval of the Authority and OAR. The test plan for each phase 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 forty-five (45) days prior to the scheduled start of each test. Test plans shall contain at a minimum:
 - a. Functional procedures including use of any test equipment
 - b. Test equipment is to be identified by manufacturer and model
 - c. Interconnection of test equipment and steps of operation shall be defined
 - d. Test records shall include test equipment serial number, calibration date and calibration certification of test equipment
 - e. Expected results required to comply with specifications
 - f. Traceability matrix referencing specification requirements with specific test procedures
 - g. Record of test results with witness initials or signature and date performed
 - h. Pass or fail evaluation with comments.
 - i. The test procedures shall provide conformity to all specification requirements. Satisfactory completion of the test procedure is necessary as a condition of system acceptance.
 - j. 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 a conformity between the conducted test, the test results and specification requirements.

- k. Documentation verification, both interconnects and functionality 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.
 - l. All testing must be witnessed by the Authority and OAR. The Contractor shall cooperate fully in this regard.
 3. Test Reports: The Contractor shall prepare, for each test, a test report document that shall certify successful completion of that test. Six (6) hardcopies and one electronic version of the test report shall be submitted to the Authority and OAR 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.
 4. Test Resolution: Any discrepancies or problems discovered during these tests shall be corrected by the Contractor at no cost to the Authority and OAR. The problems identified in each phase shall be corrected and the percentage of the entire system re-tested determined by the Authority and OAR, before any subsequent testing phase is performed.
- G. Factory Acceptance Testing
1. Test Setup Equipment: Equipment shall be actual products or identical models of products to those designated to be delivered and installed at the site. The following equipment shall be setup and used for conducting pre-delivery test:
 - a. Operator equipment associated with system.
 - b. End devices and displays associated with system.
 - c. Software associated with system.
 - d. Administrative console equipment.
 - e. Sufficient signal transmission media (STM) and associated equipment and accessories to provide a fully integrated system model. Include at least one of each type STM circuit.
 - f. Number of field processors required for system to be installed at site.
 - g. Enough load and data simulators to provide simulation of full load operational conditions as required by design. Loads shall be manually or software generated.
 2. Preparation: Ensure that development of system is complete, required approvals of submittals have been obtained, and sufficient equipment procured to completely demonstrate and test system. Schedule pre-delivery test with Technical Project Manager at least 45 days prior to test:
 3. Time: any equipment to site. Conduct on weekdays during standard business working hours.

4. Location: Manufacturer's plant or other location approved by the Authority and OAR.
 5. Items to be tested shall be set up and performance verified prior to arrival of the Authority and OAR at test site.
 6. 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, but not limited to:
 - a. Functionality including reporting and response.
 - b. System capacity.
 - c. Hardware interaction.
 - d. Hardware and software interaction.
 - e. Demonstrate report generation.
 7. Acceptance: Acceptance of system to perform sufficiently and provide specified functions shall be determined by the Authority and OAR witnessing the factory acceptance test. In addition to the Authority, testing shall be witnessed by up to two (2) additional Owners Authorized Representatives (OAR).
 - a. Acceptance Criteria: Performance of system shall equal or exceed criteria stated in individual specification sections.
 - b. If system does not perform satisfactorily, the Contractor shall make corrections and modifications and schedule new test with the Authority and OAR. Compliance is at the sole discretion of the Authority and OAR. If compliance cannot be met, or is insufficient, the Authority and OAR shall have the right to terminate the contract.
 8. Completion:
 - a. At successful completion of test, dismantle equipment so as to prevent damage. Replace all defective or worn items.
 - b. Re-pack in original containers all equipment to be delivered to site for installation. Mark on containers that items were used in factory test.
 9. Reporting:
 - a. Record all test procedures and results.
 - b. Submit report in accordance with reporting requirements in General Testing Requirements Section.
- H. Performance Verification Testing
1. Complete operational testing of all components and systems shall be witnessed by the Authority and/or OAR.
 2. Schedule test with the Authority and OAR. Do not begin testing until:
 - a. All systems have been installed and individually and jointly tested to ensure they are operating properly.
 - b. Written permission from the Authority and OAR has been received.
 3. Testing: As part of performance verification, test all components of system. The tests shall demonstrate system features.
 4. Verification: Verify correct operation of the required system functionality as defined in these specifications.
 5. Adjustment, Correction, and Completion:
 - a. Correct deficiencies and retest affected components.

- b. Make necessary adjustments and modification to system after obtaining approval of the Authority or authorized representative.
 - c. Completion: Performance verification test shall be complete when testing or retesting of each component has produced a positive result and has been approved in writing by the Authority or authorized representative.
 6. Recording:
 - a. Describe actual operational tests performed and equipment used and list personnel performing tests.
 - b. Record in tabular form all test results, deficiencies, and corrective measures.
 7. Termination
 - a. Performance verification test shall be terminated by the Authority and OAR when:
 - 1) Individual systems, system components, subsystems, or cabling infrastructure fail to perform as specified.
 - 2) It is determined that a system or sub-system is missing any components or installation is not complete.
 - b. Upon termination, corrective work shall be performed and performance verification test rescheduled with the Authority and OAR.
 - c. Retesting shall be performed by Contractor at no additional expense.
 - d. Contractor shall continue to perform corrective actions and retest until system passes all tests to satisfaction of the Authority and OAR.
- I. Endurance Testing
 1. Endurance testing shall verify that all technology hardware can withstand the typical processing load it is expected to endure for a given period. The test shall measure the response of the overall system under conditions that simulate typical-to-heavy daily use for the specific (14) fourteen-day window with all observations recorded during the full period of the test.
 2. The Contractor shall develop, document, and submit specific testing procedures for approval prior to initiating the test. The test procedure documentation shall clearly indicate how typical usage load will be simulated and applied to the system, and define the performance metrics to be measured and recorded.
 3. For each device, perform the following steps:
 - a. Access the device's administrative command line, if available, via terminal connection or SSH using the device's management IP address.
 - b. Configure the device to store syslog messages of severity level 0 ("emergency") through 4 ("warning") to a text file on a designated network location. Due to internal buffer storage constraints, syslog files shall not be saved locally on the device itself.
 - c. Once 14 days has elapsed, obtain syslog text files for all connected network devices, compile, and submit for review.
 - d. Obtain, from the device's administrative command line, the current system uptime and output to a text file to verify that the device has been operating continuously for 30 days. Submit text files for review.

4. Provide personnel to monitor the system operation 24 hours per day, including weekends and holidays during endurance testing.
 5. Start test after:
 - a. Successful completion of performance verification testing.
 - b. Training as specified has been completed.
 - c. Correction of deficiencies has been completed.
 - d. Receipt of written start notification from the Authority and OAR.
 6. Monitor all systems during endurance testing. Coordinate monitoring with the Authority and OAR.
 7. Recording: Record data on approved 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. Authority activities in process.
 - e. Description of all alarm annunciations, 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 Authority's representative designated to observe monitoring of system.
 8. The Authority and OAR may terminate testing at any time when any system, sub-system, system component or cabling infrastructure fails to perform as specified. Upon termination of testing, the Contractor shall commence an assessment period.
- J. Adjustment, Correction, and Maintenance
1. During endurance testing make adjustments and corrections to system only after obtaining written approval of the Authority or authorized representative.
 2. During endurance testing, perform required maintenance on systems including provision of replacement parts.
- K. Final Inspection and Acceptance
1. After endurance testing is complete, review tabulated records with the Authority and OAR.
 2. The 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 Authority furnished power, communications, and control circuits provided failure was not due to Contractor furnished equipment, installation, or software.
 - c. Failure of existing Authority equipment provided failure was not due to Contractor furnished equipment, installation, or software.
 3. When performance of integrated system does not fall within the above rates, determine cause of deficiencies, correct, and retest.

- a. When requested by the Authority and OAR, extend monitoring period for a time as designated by the Authority or authorized representative.
- b. Submit final report of endurance testing containing all recorded data.
4. The Contractor shall submit written certification that:
 - a. The Contract Documents have been reviewed.
 - b. All required as-built documentation has been submitted and approved by the Authority and OAR.
 - c. The Project had been inspected for compliance with the Contract Documents.
 - d. The Work has been completed in accordance with the Contract Documents.
 - e. The equipment and systems have been tested and are shown operational in the presence of the Authority and OAR.
 - f. The Project is completed, and is ready for final inspection.

3.13 TRAINING

A. General

1. By means of training classes augmented by individual instruction as necessary, the Contractor shall fully instruct the Authority's designated staff in the operation, adjustment and maintenance of all products, equipment and systems. The Contractor shall be required to provide all training aids, e.g., notebooks, manuals. The Contractor shall provide an appropriate training area equipped with all required equipment. The location of the training area shall be coordinated with the Authority.
2. All training shall be completed a minimum of two weeks prior to system cut over. Training schedule shall support the various work shifts of airport and tenant personnel and shall be subject to the Authority and OAR approval.
3. Training shall be conducted by experienced and factory authorized personnel and supported by training aids. An adequate number and amount of training material shall be provided by the Contractor. The following is considered a minimum.
 - a. Functional flow-charts, overall block diagrams, and descriptive material for all software;
 - b. Schematic drawings for each of the hardware components;
 - c. All procedure manuals, specification manuals, and operating manuals;
 - d. Detailed as-built drawings.
4. Participants shall receive individual copies of technical manuals and pertinent documentation at the time the course is conducted. The courses shall be scheduled such that Authority personnel can participate in all courses (no overlap).
5. A final course schedule and syllabus shall be prepared by the Contractor for each course to be conducted for Authority personnel, and submitted for review at least four (4) weeks prior to the scheduled date of the course commencement.
6. Each course outline shall include, in addition to the subject matter, a short review of the prerequisite subjects (where appropriate); how this course fits into the overall training program; the objective; the standards of evaluation; and any other topics that will enhance the training environment.

7. Provide detailed video recordings in high quality digitally formatted media of all demonstration and training of all systems and system operations.
 - a. Utilize remote microphones as may be required to ensure high quality audio of the recorded demonstrations.
 - b. Permanently and professionally label all recorded materials and provide self-sealing plastic cases for each training session.
 8. All training requirements identified are minimum requirements.
- B. Types of Training
1. User Training: System users shall be instructed in all aspects of operations of the system, including the business intelligence tool and all reporting functions and shall conform to the following minimum requirements:
 - a. Training classes shall be scheduled not less than 48 hours apart to allow The Authority's User/Operators to familiarize themselves with all system operations.
 - 1) Basic Training: Provide twelve (12) hours of basic user training shall be provided. User training shall be conducted at a location that is coordinated with the Authority.
 - 2) Advanced Training: Provide twelve (12) hours of advanced user training shall be provided. User training shall be conducted at a location that is coordinated with the Authority.
 - 3) System Administrator Training: System Administrator Training shall be provided. System Administrator Training shall include both classroom work and field training.
 - 4) Software/Operational Training: Provide twenty-Four (24) hours of software training.
 2. The Contractor shall structure each training course to describe all systems, software and applications as well as support programs. This course shall include a functional overview of the complete software and operations of each system. The course material must be presented in depth by a factory authorized instructor and shall covering in detail at the minimum all system functions, features rebooting and maintenance criteria.
 3. Provide operation, parts, and maintenance manuals defining operation and troubleshooting methods of all systems and review with The Authority's User/Operators as part of training demonstrations.
 4. Provide detailed video recordings in high quality digitally formatted media of all demonstration and training of all systems and system operations.
 - a. Utilize remote microphones as may be required to ensure high quality audio of the recorded demonstrations.
 - b. Permanently and professionally label all recorded materials and provide self-sealing plastic cases.

3.14 PROJECT CLOSEOUT REQUIREMENTS

- A. In addition to all final close requirements as specified by Division 01, Specification Section 270500 Specification Section, the Contractor shall comply with all requirements of this Section.
- B. Final System Acceptance

1. In addition to the requirements set forth in Division 01, the Contractor shall prepare and issue a Certificate of Project Completion, containing:
 - a. The date of project completion.
 - b. A list of items that have been corrected by the Contractor.
 - c. The time and date the Authority will assume possession of the system (transfer of ownership).
 - d. The date that warranty begins.
2. The Authority and OAR will perform an inspection after receipt of written certification. The project completion inspection shall include, but not be limited to:
 - a. The project's contracted work and any additional change orders.
 - b. All equipment and systems tested and shown operational in the presence of the Authority and OAR.
3. After the inspection the Authority and OAR will prepare and submit to the Contractor, a list of items to be completed or corrected, as determined by the inspection, along with the designated timeframe for completion.
4. Should the Authority or OAR consider the work to be incomplete, the Authority or OAR will immediately notify the Contractor, in writing, stating the reasons. Upon receipt of such written notice from the Authority or OAR, the Contractor shall take all steps necessary to complete the work in a timely manner to minimize any impact to operations. Once the incomplete work has been completed, the Contractor shall prepare and issue a Certificate of Project Completion per the requirements set forth in this specification. The Authority and OAR shall then re-inspect the work upon Contractor's request at a scheduled re-inspection time.
 - a. The written notice issued by the Authority and/or OAR will include a maximum compliance period, not to exceed 30 calendar days. The Authority or OAR, at its discretion, may define a compliance period which is shorter based on project needs, project schedule constraints or other extenuating circumstances. If the nature or complexity of the work required to comply with the written notice is such that it cannot be completed within the required compliance period, the Contractor shall immediately notify the Owner and OAR in writing. The notification from the Contractor shall include a detailed, resource-loaded schedule indicating when and how the work will be completed, subject to approval by the Authority or OAR. Until such a schedule is approved by the Authority or OAR, the original compliance period specified will stand.
 - b. If, at any time during the compliance period, the Authority or OAR determines that the Contractor is not progressing satisfactorily with the steps necessary to complete the work in a timely fashion, or if the Contractor fails to complete the work within the compliance period or by the completion date approved by the Authority or OAR, the Authority shall have the right to pursue liquidated damages and/or Contract with a third party in order to complete and/or inspect any work of which Contractor failed to conform with the Contract requirements. All costs associated with the Authority's actions to complete and/or inspect any work not conforming with contract documents shall be borne by the original Contractor responsible for delivering the project.

C. Inspections

1. At the completion of the project and prior to final acceptance of the Work, provide evidence of final inspections and approvals to The Authority, in accordance with all requirements of the Contract Documents as well as required by the authorities having jurisdiction.
2. Authority approval is required prior to final system acceptance and payment.

END OF SECTION 27 05 00

SECTION 27 51 13 – EMERGENCY COMMUNICATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. General provisions of the Contract, including Contractual Conditions and Division 0 and Division 01 specifications sections apply to this section.
- B. Related Specification Sections:
 - 1. Refer to Specification Section 27 05 00 for requirements

1.2 SUMMARY

- A. Refer to Specification Section 27 05 00 in addition to the following.
- B. This section includes the requirements for provision and installation of the extension of existing emergency communications/paging system (ECS).
- C. The Emergency Communications System (ECS) shall provide code compliant emergency voice evacuation and airport operational public address functions. The headend and amplifiers shall be capable of performing voice evacuation announcements as required by NFPA 72. Programming and installation of speaker circuits and related circuit monitoring equipment shall be provided as required by NFPA 72. The ECS shall interface to the South Terminal Complex Fire Alarm System to provide code compliant voice evacuation. Refer to Section 28 31 00, Addressable Fire Detection and Alarm for additional requirements.
- D. The ECS shall be installed in compliance with FBC 907
- E. Provide a complete and operational system throughout project area in accordance with current codes, standards, manufacturer's recommendations and available guidelines.
- F. Work will included updates and expansion to the existing STC System, NTC Comm Center head end, and associated ECS LAN to provide connectivity between new system and existing Head-End.

1.3 SCOPE OF WORK

- A. Refer to Specification Section 27 05 00 in addition to the following.
- B. Refer to drawing sheet TA0.00.03 for the work responsibility matrix for the scope of work required for the system and for any work provided by the Authority.
- C. Where listed on the drawing responsibility matrix, the following components shall be defined as follows.

1. Headend and Software: Contractor shall furnish, install, and program all required headend equipment and software including, but not limited to licensing, system expansion, redundancy, workstation licenses, operating software license or any other software required to expand the existing system to support all new elements added under this contract. Contractor shall be required to coordinate requirements as well as scheduling license installation. Headend and software include any amplifiers, cabinets, management/administrative software, software licenses, programming, and components which serve the purpose of performing system-wide coordination, monitoring, data processing, control and other global functions.
2. Integration to Existing System: Contractor shall provide all hardware, software, programming, licenses, wiring, cabling, protocol converters, interface devices and appurtenances as required to extend the physical or logical scope of the existing system.
3. Interfaces: Contractor shall provide all system interfaces including, but not limited to all hardware, software, wiring, cabling, programming, devices and appurtenances as required for communication between systems, or between a given system and an operator, to provide the specified functionality.
4. Network Switches: Refer to specification section 27 05 00 for requirements. Coordinate network programming requirements with GOAA IT for ECS operation on the GOAA network. Contractor shall coordinate patching into the network with GOAA.
5. Backbone Cable: Refer to specification section 27 10 00 for requirements. Coordinate system backbone requirements with backbone cable Contractor.
6. Horizontal Cable: Contractor shall provide dedicated PAS signal cabling as described in this section.
7. Field Devices: Contractor shall provide all field devices including, but not limited to power supplies, microphones, speakers, mounting hardware, and similar equipment or appliances.

1.4 DESCRIPTION

- A. Contractor to rework the existing paging system to facilitate additional devices and modifications to the existing system to increase functionality as shown on drawings and included in these specifications. Contractor shall submit to GOAA for approval for all modifications to the existing system. These items shall include but not be limited to:
 1. Updating of existing GUI to indicate additional zones and areas
 2. Updating of existing messages as required for new areas being served
 3. Rework and/or update of NTC/STC system programming and firmware
 4. Providing and scheduling new area specific messages.
- B. The ECS is an extension of the existing IED GlobalCommACS system utilizing Cobranet network audio protocol which is located thru-out the South Terminal Complex main communications room and communicates with the North Terminal Complex (NTC) Comm. Center. All devices, equipment, and software shall be compatible with this existing system.

- C. All control and supervision of the ECS system shall be from Comm Center in NTC. Rework NTC interface to support additional devices and areas.
- D. The ECS shall be interfaced with the EME control system to reproduce dedicated audio channels in areas around multimedia displays. This audio will be overridden during an airport paging of emergency message. The system shall provide a warning trigger prior to airport page to the EME controller to soft mute (fade out) the audio prior to paging message.
- E. Contractor shall include in his bid all required components and labor to support the extension of the existing STC/NTC ECS system. This shall include but not be limited to:
 - 1. Head end equipment
 - 2. Power Amplifiers
 - 3. Ambient Sensing Microphones
 - 4. Paging Microphone Stations
 - 5. All Wire and Cable
 - 6. Programming / Firmware / Software / Licenses
 - 7. GUI
 - 8. Speakers and Speaker mounting hardware
 - 9. Terminal cabinets
 - 10. Labeling
 - 11. Testing and Tuning of system
 - 12. Interface with third party systems
 - 13. Interface with Fire Alarm system to perform Emergency Voice Messaging
 - 14. Visual Paging Interface for all way finding monitors.
- F. Parking Garage: Match existing NTC /STC parking garage configuration and messaging for ECS system and include all additional requirements indicated in these drawing and specifications.
- G. LST/ASC/GTF: Match existing NTC / STC messaging for ECS system and include all additional requirements indicated in these drawing and specifications.
 - 1. Configure system to page by ZONE as indicated in ECS zone plans, with the additional capability to create on demand paging zones which may include ADS areas as well as ECS ZONES.
- H. Contractor shall provide an ECS paging workstation and local desktop paging station in the Fire Command Room for local override and control of the ecs system in the event of an emergency. This shall be provided at each building (ASC and LST)
- I. Provide interface with existing FIDS database to incorporate Automated Announcements with flight information. Use FAS and T-CAS to provide this functionality, coordinate with GOAA and provide messaging required. Upgrade existing STC APM ACS as required to provide this capability between existing and new building ACS's.

- J. Contractor shall interface with owners Weather alert / lighting warning system vendor to provide interface for activation of dedicated weather alert visual notification devices and warning speakers at ASC.
- K. System shall provide a “MUTE” trigger to IPTV controllers where indicated on drawings and be configured to provide audio / video mute to selected local TV’s during an airport page or emergency notification.

1.5 REFERENCES AND REGULATORY REQUIREMENTS

- A. Refer to Specification Section 27 05 00 in addition to the following.
 - 1. All requirements of Federal Communications Commission.
 - 2. UL 6 Rigid Metal Conduit
 - 3. UL 797 Safety Electrical Metallic Tubing
 - 4. EIA-219: Audio Facilities for Radio Broadcast Standards
 - 5. EIA-310-D: Cabinets, Racks, Panels and associated equipment
 - 6. Supplementary References: The publications listed are listed as they contain design and technical criteria that are pertinent to the project and they shall be used as minimum standards governing work performed on the project.
 - a. System installation and construction practices shall conform to standard industry practices as defined by the National Association of Broadcasters Engineering Handbook (latest edition), Sound System Engineering (Don and Carolyn Davis, Howard W. Sams, publisher).
- B. Contractor shall coordinate with other divisions required for complete functionality of this system these shall be included but not be limited to the following:
 - 1. Fire Alarm Systems
 - 2. PON communications infrastructure
 - 3. EME Multimedia Systems
 - 4. Horizontal Network Cabling System

1.6 SUBMITTALS

- A. Submit in accordance with Section 27 05 00 Common Work Results for Communications Systems and Section 01 33 23 Shop Drawings, Product Data, and Samples.

1.7 PROJECT RECORD DOCUMENTS

- A. Submit in accordance with Section 27 05 00 Common Work Results for Communications Systems and Section 01 78 00 Closeout Submittals .

1.8 O & M MANUALS

- A. Submit in accordance with Section 27 05 00 Common Work Results for Communications Systems and Section 01 78 00 Closeout Submittals .

1.9 QUALITY ASSURANCE

- A. Refer to Specification Section 27 05 00 in addition to the following.
- B. Work performed as part of this contract shall be in accordance with relative sections of the Electrical Code.
- C. Standards of workmanship shall meet or exceed accepted audio/video systems industry installation practices.
- D. 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.
- E. Conflicts
 - 1. Between referenced requirements: Comply with the one establishing the more stringent requirements.
 - 2. Between referenced requirements and contract documents: Comply with the one establishing the more stringent requirements.
- F. Provide documentation for any sub-Contractor who will assist the Contractor in performance of this work shall be required.
- G. Contractor personal shall have been to factory training and received a certificate of completion within 18 months of project start.

1.10 QUALIFICATIONS

- A. Refer to Specification Section 27 05 00 in addition to the following.
- B. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- C. Supplier: Authorized distributor of specified manufacturer with five years documented experience.
- D. Quality Assurance: Contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size. The Contractor shall own and maintain tools and equipment necessary for successful installation and testing of audio and visual systems and have personnel who are adequately trained in the use of such tools and equipment.
 - 1. A resume of qualification shall be submitted with the Contractor's bid indicating the following:
 - a. A list of five completed SPS projects over the past five years of similar type with an audio system scope over \$1,000,000 with contact names and telephone numbers for each. One of the five projects must have included a LAN based networked audio system
 - b. A list of test equipment proposed for use in testing and verifying the systems on this project.

- c. A technical resume of experience for the Contractor's Engineer and on-site installation foreman who will be assigned to this project.
- E. Installer: Authorized installer of specified manufacturer with five years documented experience and service facilities within 50 miles of Project.

1.11 EQUIPMENT WARRANTY

- A. Refer to Specification Section 27 05 00 in addition to the following.
- B. Warrant all equipment to be new and free from defects in material and workmanship, and will, within one year from date of acceptance by Owner, repair or replace any equipment found to be defective.
 - 1. No charges shall be made by the installer for any labor, equipment or transportation during this period to maintain functions.
 - 2. Respond to trouble call within twenty-four (24) hours after receipt of such a call.

1.12 SPARE MATERIAL

- A. Contractor shall provide the following spare equipment and turn over to GOAA electronics shop:
 - 1. (5) of each style AMP Card used
 - 2. (2) AMP Mainframes
 - 3. (2) Multifunction IO
 - 4. (5) Ambient Sensor Collectors
 - 5. (5) of each style Mic stations
 - 6. Ceiling Speakers
 - a. (20) Type 00
 - b. (5) Type 01
 - 7. Wall Speakers
 - a. (10) Type 01
 - b. (2) Type 06

1.13 ADDITIONAL DEVICES FOR JURISDICTIONAL COMPLIANCE

- A. Prior to bid, Contractor shall review plans and specifications carefully for compliance with all codes, and in particular the ADA requirements and NFPA 72. Contractor shall include in bid price any devices required to provide a fully compliant ECS system. Said additional devices shall be shown on shop drawings submitted by Contractor.

- B. In addition to the above-mentioned devices, Contractor shall include in his bid price the cost of installing 20 additional audible notification devices wall mount Type 01 (over and above those shown on drawings, required by specifications, or determined by system installed to be required) whose location/need may not become apparent until just prior substantial completion date. At least two weeks prior to substantial completion system shall be fully operational. After system is operational GOAA OAR, EOR and the system installer shall review the placement of and coverage provided by audible signals throughout the facility for compliance with all codes and in particular, the ADA requirements and NFPA 72. System installer shall provide the additional devices at locations where the Architect/Engineer requests for complete coverage. The additional devices shall be installed and fully operational prior to date of Substantial Completion.
- C. After the project has had its first annual safety inspection, the system installer shall install within one week notice any additional audible signals that have been determined to be required during said inspection from the balance of the additional devices noted above. There shall be no cost for these added devices provided the total does not exceed the balance remaining of the devices noted above. The final balance of the additional devices included in bid price shall be turned over to the Owner as spare material after any ECS issues identified during the first annual safety inspection are resolved.

1.14 TRAINING

- A. Refer to Specification Section 27 05 00 in addition to the following.
- B. System orientation: Contractor shall conduct a walking tour for the Owner, tenants, and host organizations (separate from the systems testing) of the system to demonstrate the scope of the work and the completeness of the systems.

1.15 REFERENCES AND REGULATORY REQUIREMENTS

- A. Refer to Specification Section 28 05 00 in addition to the following.
- B. The equipment and installation shall comply with, but not be limited to the current or applicable provisions of the following:
 - 1. National Electric Code, Article 760.
 - 2. National Fire Protection Association Standards:
 - a. NFPA 70 - National Electrical Code.
 - b. NFPA 72 - Application, performance, installation and maintenance of fire alarm systems and their components.
 - 1) NFPA 72: Chapter 24 Emergency Communications System
 - 2) NFPA 72: Chapter 24.3.3 Required Emergency Communications Systems
 - 3) NFPA 72: Chapter 24.3.5.2 Loudspeakers for ECS
 - c. NFPA 101 - Life Safety Code.

3. Underwriters Laboratories Inc. The system and all components shall be listed by Underwriters Laboratories Inc. for use in fire protective signaling system under the following standards as applicable:
 - a. UL 1480: Speakers.
 - b. UL 1424: Cables.
 - c. UL 1711: Amplifiers for Fire Protective Signaling Systems.
 4. Florida Building Code: Latest adopted edition.
 5. General: The system shall comply with all applicable Codes, Ordinances and Standards as interpreted and enforced by the local authority having jurisdiction.
 6. State of Florida: Division of State Fire Marshal.
- C. Each item of the fire alarm system shall be listed and classified by UL and FM as suitable for purpose specified and indicated.
- D. All Control Equipment shall be listed under UL category UOJZ.
- E. The system controls shall be UL listed for Power Limited Applications per NEC 760. All circuits must be marked in accordance with NEC article 760-23.
- F. IEEE: The fire alarm system includes solid state electronic components. Therefore, the equipment manufacturer shall provide certification that all such equipment is internally protected from, or can withstand, power line surge voltages and currents as specified in Table 1, Location Category a High Exposure of ANSI/IEEE Standard C62.41-1980 (formerly IEEE Standard 587).

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide all components, equipment, parts, accessories and associated quantities required for complete extension of existing system. All components may not be specified herein.
- B. All devices/components/products shall be suitable for use intended, and meet all stated performance requirements for Sound/Paging system specified in this section.

2.2 PATHWAYS

- A. All pathways (conduit, raceways, and wireways, pullboxes, and outlet boxes) shall comply with applicable requirements of Division 27.

2.3 ECS EQUIPMENT PDU

- A. Provide (2) PDU's minimum at each ECS cabinet location and connect to Life Safety branch UPS power. Provide additional PDU's where required due to power consumption.
- B. Basis of Design: APC# AP9626

2.4 SOFTWARE

- A. Update existing Globalcom ACS software and licenses
- B. Update existing GCK – Advanced notification software
- C. Update existing FAS - Automated Announcement System
 - 1. T-CAS – Text-to-speech Announcement System (Client and Server) Include Text to speech engine and language pack
- D. Coordinate with GOAA for configurations required for software setup and installation.

2.5 ANNOUNCEMENT CONTROL SYSTEM

- A. IED ~~GLOBALCOM.IP~~ ACS (ANNOUNCEMENT CONTROL SYSTEM)
 - 1. The ACS is a turnkey on-premise server incorporating enough processing power and hard drive storage to seamlessly operate a GDS-4W™ digital signage infrastructure.
 - 2. Two-socket entry rack server delivers outstanding performance, configuration flexibility, high availability and intuitive management in a short-height (1U), short-depth (24-inch) chassis.
 - 3. Designed for rack environments requiring peak two-socket performance, sizeable internal storage capacity and short chassis depth to overcome space constraints, the rack server is an excellent fit for high-performance computing (HPC), web tech and infrastructure scale-out.
 - 4. Shall be compatible with GLOBALCOM.IP system implementation.
 - 5. Drive powerful performance across a wide range of workloads with the latest Intel® Xeon® processor family.
 - 6. Accelerate performance and grow memory capacity throughput with 12 DIMM slots and DDR4 memory. Boost I/O performance with up to 10 high-IOPS hard drives and two PCIe 3.0 I/O slots, driving 2x data throughput compared to previous generations.
 - 7. Height (1U), short-depth (24-inch) chassis. Harness data explosion with scalable internal storage capacity — up to 10 x 2.5" hard drives. Adapt flexibly to changing workload conditions with an expandable platform ready for virtualization and high-availability clustering.
 - 8. Monitoring and control of data center hardware is provided with anytime, anywhere mobile access. Server Configuration Management capabilities that automate server and OS deployments, quick and consistent replication of configurations and ensure compliance to a predefined baseline with automated drift detection.
 - ~~4.9.~~ The ACS shall be provided at each Head end ~~(LST/ASC/GTF)~~ and shall have a parallel secondary ACS configured for backup if the primary ACS fails.
 - ~~2.10.~~ Contractor shall provide additional ACS's with backup as required to support total device counts per manufacture recommendation.

- ~~3.11.~~ The ACS shall manage announcements and messages using dynamically routed data on a standard Ethernet Network. It shall include an integral multi-channel message server providing simultaneous record and playback capability for up to 16 play and 16 record channels in multiple languages.
- 4.12. The ACS shall manage AtlasIED GLOBALCOM® Series peripherals including Digital Communications Stations, Network Power Amplifier Systems, Input/Output Devices, Zone Controllers and IP End Points.
- ~~5.13.~~ The ACS shall ~~include internal support for~~ be provided ~~(with~~ (8) logic inputs, (8) relay outputs, and (2) balanced audio inputs.
- ~~6.14.~~ The ACS shall manage dynamic requests for live and delayed announcements, pre-recorded and assembled messages, actions, defined events, and two-way full duplex intercom connections.
- ~~7.15.~~ An integrated visual paging server shall deliver visual messaging to supported visual displays that shall be synchronized to the audio regardless of message length.
- ~~8.16.~~ Announcements and messages shall be initiated by contact closures, microphone paging stations, DIRECTOR® software, open standard IP network commands, and VoIP.
- The ACS shall include an integral interface for VoIP telephones via SIP and PBX trucking as well as standard 3rd party FXO gateways.
 - The interface shall support standards G.711, G.722 and RTP protocols.
 - Operating modes shall provide for both direct dial zone paging access and well as voice prompted actions for announcements and messages.
- ~~9.17.~~ The ACS shall support CobraNet® and Dante™ Audio-over-Ethernet protocols with VoIP, RTP, and RTCP.
- ~~10.18.~~ The ACS shall supervise all associated end-point devices, report system abnormalities, and log faults to be reported via SMNP, E-mail, and SMS via E-mail notifications.
- ~~11.~~ ~~The ACS shall be designed for high reliability with no moving parts including an Intel® 64-bit Quad Core™ low power processor, solid state hard drive, and available hot swap redundant power supply.~~
- ~~12.~~ ~~The ACS shall fit into 1 RU of 19" rack space and weigh 3.0 kg.~~
- ~~13.19.~~ The ACS shall be safety listed to UL Standard 60950.
- ~~14.20.~~ The ACS shall include GLOBALCOM®.IP system configuration and management software and shall include internally hosted web page for configuration and monitoring the System Management Console.
- ~~15.21.~~ Provide additional ACS controllers with backup as required to support number of devices / amplifiers at head end.
- ~~16.22.~~ Basis of Design: IED Globalcom. IED0591RU-S1 IP Model – IP116

2.6 INPUT/OUTPUT MODULES

A. Logic Relay Module

- Provide where indicated on plans and where required for interface with 3rd part equipment

2. 2 electro-mechanical relays
3. 2 optically isolated inputs
4. Communication shall be via RJ-45 LAN connection.
5. Power shall be via PoE from LAN
6. DIN rail mounted. Provide rack mounted DIN rail for installation of modules in ECS cabinets.
7. Basis of Design: IED ~~1516LI~~[1522LR](#)

B. Input Module

1. Provide where indicated on plans and where required for interface with 3rd part equipment
2. 16 optically isolated inputs (expandable to 32 using expansion module)
3. Communication shall be via RJ-45 LAN connection.
4. Power shall be via PoE from LAN
5. DIN rail mounted. Provide rack mounted DIN rail for installation of modules in ECS cabinets.
6. Basis of Design: IED 1516LI

2.7 POWER AMPLIFIERS

A. ECS Amplifier Mainframe (AMP FRAME)

1. General:
 - a. Provide power amp frames in ECS equipment cabinets shown on drawings as required to support all local speaker circuits.
 - b. Provide additional 25% spare capacity in amp mainframe at each IDF room location (for additional amp cards in the future).
 - c. Provide backup amp card in each mainframe sized to match the largest amp card in use in same mainframe
2. The Smart Mainframe Power Amplifier shall house, supply power to, and control up to seven (7) TitanONE Series amplifier cards and a DSP/CPU card. In addition, the Smart Mainframe Power Amplifier shall have a provision to provide digital audio connections via a CobraNET audio distribution.
3. Local program or BGM (background music) inputs shall connect via (12) analog inputs at the rear panel via provided connectors.
4. The integrated NIC (Network Interface Card) shall include dual ports for redundant network connections.
5. The Smart Mainframe Power Amplifier shall house six (6) active single or dual channel amplifier cards (150W, 300W or 600W 70.7V/100V load) and a seventh (7th) active spare that is automatically engaged should a failure condition be reported. The system shall detect a failure in any of the primary amplifier cards and replace the effected amplifier without loss of service.
6. The integrated digital signal processor shall provide up to 12 channels of processing to include level control of individual circuits, up to 8 bands of parametric equalization, high pass filter, signal delay, compression (on analog inputs) and ambient analysis control.
7. All setup, monitoring, configuration, testing and control shall be under software control.

8. The Smart Mainframe Power Amplifier shall be capable of live or delayed paging, pre-recorded message playback, and muting of individual amplifier channels, zones and zone groups in any combination when used with optional GCK software deployment. Ambient analysis and control shall be accomplished via an adjustment of signal levels via external noise sensing and/or computer commands.
 9. Connections for 24 ambient sensors shall be incorporated via rear panel connections and allow for single or dual sensor control of desired zones. Ambient analysis and control shall be in real time.
 10. The Smart Mainframe Power Amplifier shall include internal audio bus monitoring and provide for visual as well as audio monitoring of the internal signal chain. Testing of the Smart Mainframe Power Amplifier shall be automatic or manually on demand and allow selection of the monitor points in the signal chain internal to the amplifiers and current level to the speaker lines and report with a resolution of 0.5dB.
 11. The Smart Mainframe Power Amplifier shall require 4 rack units of vertical space in a 19 inch rack and all connections shall be in on the rear panel. The front panel shall provide for slide in cards and a visual indicator of amplifier status.
 12. Basis of Design: AtlasIED T112 TitainONE with DSP and Processor
- B. ECS Amplifier Cards
1. General:
 - a. Provide amp card as required per drawings schedules. All power amp cards shall be 1200W 2ch cards unless specifically noted on drawings.
 - b. Contractor may not load any amp card more than 80% rate power handling once final tap values are set.
 2. Line Driver Card
 - a. 2-Channed Line Level Driver for long distance audio feeds.
 - b. Utilized to support power line array speakers.
 - c. The 2-channel line driver has two low impedance, balanced, floating, active outputs which are designed to drive very long lines. Its transformer less output design provides wider bandwidth while minimizing distortion at all frequencies.
 - d. Basis of Design: IED T2LD-120V-T1
 3. Modular Amp Card (300W)
 - a. 2-Channed amplifier card providing 150W per ch.
 - b. Shall be rated for 70V distribution
 - c. The card shall have LED indicators for power and signal.
 - d. Each card shall be provided with a front accessible power switch
 - e. Basis of Design: IED T302-120V-T1
 4. Modular Amp Card (600W)
 - a. 2-Channed amplifier card providing 300W per ch.
 - b. Shall be rated for 70V distribution
 - c. The card shall have LED indicators for power and signal.
 - d. Each card shall be provided with a front accessible power switch
 - e. Basis of Design: IED T602-120V-T1

5. Modular Amp Card (1200W)
 - a. 2-Channed amplifier card providing 600W per ch.
 - b. Shall be rated for 70V distribution
 - c. The card shall have LED indicators for power and signal.
 - d. Each card shall be provided with a front accessible power switch
 - e. Basis of Design: IED T1202-120V-T1
- C. POE IP AMP (Elevators)
 1. Amp shall have 2 channels, each with 4 watt @ 8 ohms
 2. Provide NEMA enclosure and DIN mounting rail for installation
 3. Shall integrate with Globalcom via CobraNET Audio.
 4. Basis of Design: IED1542NA-C

2.8 MICROPHONE PAGING STATIONS

- A. Microphone Paging Station (Type 1)
 1. Provide where shown on drawings.
 2. Provide rack mounted paging station in ECS cabinet in each IDF room with associated paging equipment.
 3. Provide additional 5 stations and all associated cable, conduit, labor, programing and materials to be located where directed by GOAA. Contractor shall coordinate programing functions and locations with GOAA.
 4. Shall be a network device used for initiating audio/visual announcements, messages, and pages with the IED family of Announcement Control Systems via CobraNET audio.
 5. It is a network appliance with its own unique IP address, which simplifies its installation and configuration.
 6. Shall have fully customizable LCD touch screen interface.
 - a. Screen layout and button function Shall be coordinated with GOAA prior to installation
 7. The Digital Communication Station uses a single Ethernet interface for audio and control data. The station is fully compatible with IEEE 802.3af standard for Power Over Ethernet (PoE), allowing the station to be powered directly from any standard off-the-shelf PoE switch.
 8. Provide with back box and all required installation accessories.
 9. For desktop / counter top paging stations, provide handheld microphone with desktop mounting base with rubber feet. Connect to LAN outlet with patch cable.
 10. Where specifically noted on drawings, provide paging station with recessed wall mounted enclosure
 11. Manufacturer:
 - a. LCD Touch Screen Paging Station: IED IED550CS-H Series
- B. Microphone Paging Station (Type 2)
 1. Shall be a network device used for initiating audio/visual announcements, messages, and pages with the IED family of Announcement Control Systems.

- a. It is a network appliance with its own unique IP address, which simplifies its installation and configuration.
A 4 button full function keypad shall be provided for user shortcuts.
2. Magnetically held replaceable handheld paging microphone.
3. The Digital Communication Station uses a single Ethernet interface for audio and control data. The station is fully compatible with IEEE 802.3af standard for Power Over Ethernet (PoE), allowing the station to be powered directly from any standard off-the-shelf PoE switch.
4. Provide with back box and all required installation accessories.
5. Where noted on drawings provide paging station with recessed wall mounted enclosure
6. Manufacturer:
 - a. 4 Button Paging Station: IED IEDA524 Series

2.9 AMBIENT SENSING MICROPHONE

A. Flush Ambient Sensing Microphone

1. Condenser microphone for monitoring of ambient audio levels.
2. Omnidirectional condenser microphone, preamplifier, and an analog conversion module.
3. Provide with 2-Gang powder coated mounting plate to match wall color. Coordinate with architect for exact paint color code by location..
4. Mount in standard flush 4S box
5. Basis of Design: IED IED0540S

2.10 ECS SPEAKERS: ASC/LST/GTF

1. Ceiling Speaker (Type 0)
 - a. System shall include a high performance 6.5" coaxial loudspeaker, ported bass reflex enclosure and press-fit grille for conventional ceiling installation.
 - b. Frequency response for the system shall be 50Hz – 20kHz. Sensitivity shall be 90dB.
 - c. Loudspeaker shall be comprised of a 6.5" cone type driver. Cone shall be constructed of composite cone with polymer coated cloth surround.
 - d. Magnet shall be a minimum of 10 oz (264 g) and the voice coil diameter shall be 1" (25 mm).
 - e. The silk dome tweeter is 20mm and utilizes a Neodymium magnet.
 - f. Transformer shall be a 70.7V / 100V type with 4, 8, 16, and 32 watt primary taps (@70.7V) with a front mounted tap selector switch to include transformer bypass setting for 8Ω direct coupled operation.
 - g. The speaker shall be equipped with a universal line matching transformer for a 70V output line with taps at 2, 4, 8, 16, & 32 watts.
 - h. Mounting: Speaker shall be recessed mounted, and provided with Tile Bridge and all required mounting hardware.
 - i. Color: White

- j. Where mounted outside building envelope, provide additional Hyfidrophobic™ Treatment from manufacturer to prevent moisture intrusion.
 - 1) Basis of Design: Atlas Sound FAP63T-W or approved substitution
- 2. Ceiling Speaker (Type 1)
 - a. System shall include an 8" coaxial loud speaker, ported bass reflex enclosure and press fit grille.
 - b. Frequency response shall be 60Hz to 15Khz with a sensitivity of 92db average.
 - c. Loud speaker shall be rated at 150W, and be constructed with a polypropylene cone and a 1.25" titanium diaphragm compression driver. Woofer magnet shall be minimum of 25oz.
 - d. Two transducer section shall be coupled thru a built in 2000Hz crossover network.
 - e. Shall include a 70V transformer rated at 1.9, 3.8, 7.5, 15, 30, and 60 watt primary taps with front mounted selector switch.
 - f. Mounting: Speaker shall be recessed mounted, and provided with Tile Bridge and all required mounting hardware.
 - g. Color: White
 - h. Where mounted outside building envelope, provide additional Hyfidrophobic™ Treatment from manufacturer to prevent moisture intrusion.
 - i. Basis of Design: Atlas Sound FAP8CXT or approved substitution
- 3. Ceiling Speaker (Type 2)
 - a. Systems shall include a 250 watt loudspeaker that combines a 12" diameter, low frequency transducer and a 1" exit, true compression driver.
 - b. Frequency response range shall be 58 Hz to 15 kHz, ±3dB. Sensitivity shall be 99dB at 1 watt, 1 meter.
 - c. Voice coil impedance shall be 8 ohms (nominal). Low frequency voice coil diameter shall be 2.5" (63.5mm).
 - d. The maximum depth of the loudspeaker shall not exceed 8" (203mm).
 - e. The low frequency reproducer cone shall be a full 12" (305mm) in diameter and the high frequency reproducer diaphragm shall be 2.5" (65mm) in diameter. The woofer shall have a 70 oz. (1984g) ceramic magnet. The tweeter shall have a 20 oz. (567g) ceramic magnet.
 - f. The two reproducer sections shall be coupled through a built-in crossover network. The crossover frequency shall be at 1800 Hz. Conical dispersion shall be 90 degrees at 2kHz.
 - g. System shall be provided with an internal transformer with primary voltage of 70.7V with a frequency response range of 33Hz to 21kHz (±2dB) and power taps at 7.5, 15, 30 & 60 watts. Insertion loss shall not exceed 1dB.
 - h. Mounting: Speaker shall be recessed mounted, and provided with a Q series enclosure with a internal volume of 3cu/ft. provide speaker grille cover and mounting channels.
 - i. Color: White

- j. Where mounted outside building envelope, provide additional Hyfidrophobic™ Treatment from manufacturer to prevent moisture intrusion.
 - 1) Basis of Design: Atlas Sound 12CXT60 or approved substitution
- 4. Ceiling Speaker (Type 3)
 - a. System shall consist of a two-way woofer and tweeter assembly within an pendant mount environmental-resistant housing.
 - b. The 150 Watts system shall have an 8.25" (310 mm) woofer constructed with a polypropylene cone and a 1" (25 mm) titanium diaphragm compression driver.
 - c. Each system shall be complete with a built-in, 60 Watts 70.7/100V transformer with taps of 1.9, 3.8, 7.5, 15, 30, & 60 Watts (70.7V) and a transformer bypass position for 8 Ω direct coupled operation on a 8 position terminal block.
 - d. The frequency response for the system shall be 60 Hz – 15 kHz (±5 dB). The loudspeaker shall be the Atlas Sound PM8CX.
 - e. Mounting: Speaker shall be pendant mounted from structure above, refer to mounting detail on drawings for additional requirements. Install per manufactures recommendation.
 - f. Color: White
 - g. Where mounted outside building envelope, provide additional Hyfidrophobic™ Treatment from manufacturer to prevent moisture intrusion.
 - 1) Basis of Design: Atlas Sound PM8CX or approved substitution
- 5. Wall Speaker (Type 1)
 - a. Shall consist of a semi recessed horn driver.
 - b. Continuous power rating shall be (15, 8, 4, 2, 1, 1/2, 1/4 watts) at
 - c. 70V.
 - d. Frequency response shall be 600 to 5500 Hz (± 5dB).
 - e. Sensitivity shall be 96.9dB (at 1 watt, 1 meter).
 - f. Dispersion shall be greater than 190° (-6dB point, 1 and 2 kHz octave bands).
 - g. Model shall be water/moisture sealed and constructed of die-cast zinc.
 - h. Unit shall operate within the temperature range of 150°F (66°C) to -30°F (-35°C).
 - i. Mounting: Speaker shall be semi recessed mounted with the Semi-flush adapter plate mounted behind VT Series to cover any recessed 4" SQ x 1 1/2" D (102mm x 38mm) outlet box. CRS wall plate is stamped and painted.
 - k. Color: Shall be Grey
 - l. Basis of Design: Atlas Sound VT-157UC or approved substitution
- 6. Wall Speaker (Type 6)
 - a. The Speaker assemblies shall consist of 2-way, woofer and tweeter, within environment-resistant housings. Enclosure shall be constructed of paintable UV-resistant, talc impregnated, polypropylene, injection molded plastic finished.

- b. Each unit shall include a stamped, powder coated, aluminum grille and removable C-shaped mounting bracket. All hardware inserts shall be brass and threaded 1/4"-20.
 - c. The 100-Watt RMS system shall have a 5 1/4" (133mm) woofer, constructed of reinforced polypropylene, and a 1" (25mm) Ferrofluid cooled tweeter. The dividing network crossover frequency shall be 5kHz. The dividing network shall include protection circuits for the high-frequency component.
 - d. Each unit shall include an internally mounted 30 Watt 70.7V line matching transformer for use in distributed sound applications wattage taps shall be screwdriver selectable via a sealed switch located near the input section. Wattage taps shall be 0.94, 1.9, 3.7, 7.5, 15, 30 @ 70.7V plus transformer bypass setting for direct coupled 8Ω operation.
 - e. The loudspeaker system shall meet the following performance criteria:
 - 1) Power handling: 100 Watts RMS; Frequency response: 85Hz – 20kHz (±3dB); Pressure sensitivity, 90dB SPL at one watt, 100Hz – 10kHz measured at a distance of one meter on axis.
 - f. Input connectors shall include a two-pole barrier strip capable of accepting up to two #16AWG cables.
 - g. A tongue-in-groove cover with rubber wire exit grommet shall be provided to protect the input connectors from corrosion.
 - h. Mounting: Speaker shall be surface mounted in a horizontal configuration utilizing manufacturers provided mounting hardware.
 - i. Color: White
 - j. Where mounted outside building envelope, provide additional Hyfidrophobic™ Treatment from manufacturer to prevent moisture intrusion.
 - k. Basis of Design: Atlas Sound SM52T or approved substitution
7. Surface Speaker (Type S1)
- a. Speaker Shall be a constant-directivity paging loudspeakers for use in public address or paging applications.
 - b. Speaker shall be rated at 40 watts at 70V.
 - c. Speaker shall be environment-resistant and feature a 60° x 40° (±10°) constant-dispersion pattern across the controlled frequency band of 1.25-10 kHz.
 - d. Mounting shall be via a rotating bell which pivots in precise 15° increments for exact on-site positioning of projection angles. Shall include a triple lock security mounting method.
 - e. The Horn shall be equipped with an internal 25/70.7/100 volt transformer with screw terminal connections made beneath the rear cap. Rear cap shall facilitate armored cable.
 - f. Loudspeaker mounts to die-cast zinc base. Pre-mount the base to a standard 4" sq. E.O. box.
 - g. Basis of Design: Atlas Sound APX40TN or approved substitution
8. Surface Speaker (Type S4)
- a. Shall consist of (2) voice tone compression drivers mounted in opposite direction utilizing a two way ceiling mount.

- b. Continuous power rating shall be (15, 8, 4, 2, 1, 1/2, 1/4 watts) at
- c. 70V.
- d. Frequency response shall be 600 to 5500 Hz (\pm 5dB).
- e. Sensitivity shall be 96.9dB (at 1 watt, 1 meter).
- f. Dispersion shall be greater than 190° (-6dB point, 1 and 2 kHz octave bands).
- g. Model shall be water/moisture sealed and constructed of die-cast zinc.
- h. Unit shall operate within the temperature range of 150°F (66°C) to -30°F (-35°C).
- i. Color: Shall be Grey
- j. Mounting:
 - 1) Twin housing for bi-directional mounting of two independently powered VT Series models. Unit is recommended for wall or ceiling installation in corridors and walkways.
 - 2) Each unit includes 2 3/4" D (70mm) housing with base and adapter plate for parallel mounting to any 4" SQ or single-gang electrical backbox for distortion-free, bi-directional projection.
- k. Basis of Design: Atlas Sound VT-158UC or approved substitution

2.11 HIGH POWERED SPEAKER ARRAY (HPSA WEATHER ALERT SYSTEM)

A. HPSA (Speaker)

- 1. Provide where indicated on floor plans with all require mounting hardware and adapters
- 2. NEMA 3R Rated enclosure
- 3. Provide with pole mounting kit
- 4. 113db peak output
- 5. 250W Power Handling @ 70V
- 6. Color: Grey
- 7. Basis of Design: EST Hyperpike Series #MN-HSMG25P5N

B. Visual Device (Strobe)

- 1. Double Flash Dual Strobe, provide at all HPSA locations with all required mounting hardware and adapters
- 2. Color: Amber
- 3. Type 4X / IP69K
- 4. 120VAC Operation
- 5. Basis of Design: Federal Signal #371DST-120A

C. HPSA-PS (Power Supply)

- 1. Provide power supply on TTB in each local IDF room supporting a HPSA
- 2. Provide Power Controller and low voltage Power Supply boards
- 3. Four (4) independently controlled fuse protected outputs. These power outputs can be converted to dry form "C" contacts.
- 4. Outputs are activated by an open collector sink or normally open (NO) dry trigger input from an external trigger. Outputs will operate in both Fail-Safe and/or Fail-Secure modes.

5. Units are designed to be powered by two (2) totally independent power sources, one (1) providing power for board operation and the other for
6. lock / accessory power.
7. Enclosure shall be as recommended by manufacturer.
8. Basis of Design: Altronix ACM4CB

2.12 LOCAL VOLUME CONTROL

- A. Local volume control with a 3db per step attenuator.
 1. Provide with single gang SS faceplate.
 2. Wattage rating shall be as required based on load supported (10W, 35W, 100W)
 3. Removable terminal strip for all wiring connections
 4. Shall be rated at 70V
 5. Shall be provided with a priority page relay option, relay shall be an SPDT, 24 VDC type securely mounted to the attenuator assembly wired at the factory
 6. Basis of Design: AtlasIED AT##-PA (## = wattage rating)

2.13 WIRES/CABLES

- A. Network Cabling - Refer to Division 27 10 00 for all cabling requirements.
- B. Ambient Sensing Microphones shall be sized to allow no greater than 5 percent loss from source to head end. Lines shall be stranded twisted pair, jacketed with shield and drain wire.
 1. Minimum conductor strand count: 2
 2. UM type CMR/CMP as required based on application.
 3. Low capacitance
 4. Manufacturer
 - a. Belden or EQUAL
- C. Loudspeaker signal lines shall be sized to allow no greater than 5 percent loss from source to first speaker. Lines shall be stranded twisted pair, jacketed with no shield.
 1. Minimum conductor strand count: 2
 2. Cable size as noted on drawings or as required above. Maximum cable size: 12AWG
 3. UM type CMR/CMP as required based on application.
 4. Low capacitance
 5. Manufacturer
 - a. Belden or EQUAL

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Specification Section 27 05 00 in addition to the following.
- 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 and performance 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. Install system cabinets/racks in locations shown; arrange to provide adequate ventilation and access.
5. Properly ground system per applicable sections of these specifications.
6. Support raceways, backboards, and cabinets under the provisions of Division 26, or, if more restrictive as required by manufacturer's instructions.
7. Install raceways to conform to applicable sections of Division 26.
8. Install sound/paging system wiring and/or raceways away from any surface that may become hot, including and not limited to, hot water piping and heating ducts.
9. Install sound/paging system wiring with at least 12 inches of separation from line voltage power wiring on parallel runs. Wiring crossing power circuits shall be at right angles. For metal enclosed electric light or power or Class 1 circuits, separation may be reduced as described in 1990 NEC 800-52 (a) (1). Increase separation if so required to comply with EIA/TIA referenced standards.
10. Raceway for sound/paging system wiring shall not be shared by power or any other electrical wiring that is not part of the low-voltage sound/paging systems.
11. Final connections, balancing, adjustments, testing, etc. Shall be factory trained technicians. When system is complete, it shall be demonstrated to owner's representative who shall be given complete instructions, part, manuals and maintenance information.
12. Make cable shields continuous at splices and connect speaker circuit shield to equipment ground only at amplifier.
13. Install input circuits in separate cables and raceways from output circuits.
14. Provide protection for exposed cables where subject to damage.
15. Use suitable cable fittings and connectors.
16. Install equipment racks in location shown; arrange to provide adequate ventilation and access.
17. 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. Pathway

1. General
 - a. All raceways shall meet requirement for raceway per section, in addition to applicable requirement of sections within Division 27 of these Specifications.

- b. Raceway shall not be shared by power or any other electrical wiring that is not part of the low voltage Sound/Paging systems. Sound/Paging system wiring may be installed in underground pull boxes with other low-voltage systems provided:
 - 1) Installation meets/complies with all applicable codes and standards.
 - 2) Sound/Paging system cables are separated by at least 12 inches from any non-shielded voice/telephone/PDS wire/cable.
- c. Bend raceway with minimum inside radius of 6 times the internal diameter. Increase bend radius to 10 times for raceway larger than 2 inch size. Provide proper bend for all changes of direction. Pull and splice boxes shall not be used in lieu of a bend.
- d. Install raceways so no more than two 90o bends are in any raceway section without pullbox. Install additional pullboxes as required to maintain maximum of two 90o bends between pullboxes and/or termination points.
- e. Label all raceway at both ends to indicate destination and Sound/Paging source room. Also indicate length of raceway and this labeling/identification shall be fully documented in as-built drawings.
- f. Install polyethylene pulling string in each empty conduit over 10 feet in length or containing a bend.
- g. Properly support cables/wire not installed in raceways.
- h. Special Raceway Systems: Special raceway systems may be specified for some portions of the Sound/Paging system. Refer to other sections of these specifications to determine where or if such systems are used.
- i. Pathways/raceways at terminal board locations shall be neatly racked on a Kindorf type rack secured to wall above and below terminal boards.
- j. Fire Stop
- k. Where conduit penetrates a fire rated wall, floor, etc., firestopping shall be provided.
 - 1) Meet all requirements for UL assembly involved. Provide firestopping UL listed for assembly and/or conduit involved.

D. Grounding

- 1. Equipment grounds: Grounding methods used shall be dependent upon individual equipment interconnection of chassis ground, circuit common, and power supply common within the units. Ground methods shall vary with type as follows:
 - a. Type A: Equipment having a 3-wire power cord with green wire of the power cord connected to chassis and where signal common is not internally connected to chassis. Make no connection from chassis ground to primary systems ground busbar in Equipment Rack.
 - b. Type B: Equipment having a 3-wire power cord with green wire of the power cord connected to chassis and signal common can be connected to chassis ground at the user's option.

- c. Make no connection from chassis ground to primary system busbar, but do make connection with 14 AWG insulated wire from circuit common to primary system ground busbar in equipment rack. Be sure to separate circuit common from chassis ground.
 - d. Type C: Equipment having a 2-wire power cord, no green wire, neutral is not tied to chassis, and circuit common is tied to chassis. Make connection from chassis to primary system ground busbar using 14 AWG insulated wire.
 - e. Audio cable shields shall be grounded at one point only, without exception. For inter- and intra-rack wiring this requires that the shield be connected at one end only, this shall be at the input to a device. The shield shall be lifted at the device output. For ungrounded portable equipment, such as microphones, the shield shall be connected at both ends but grounded at only one end.
2. Contractor shall not deviate from the above, except if necessary to minimize crosstalk and to maximize signal-to-noise ratios.
- E. Speakers
1. Mount ceiling speakers in pattern acceptable to architect in coordination with lights, sprinkler heads, etc and as directed by ceiling system contractor, manufacturer, and installer. Provide all required mounting hardware and/or accessories. In general, all speakers shall be recessed mounted in the ceiling system.
 - a. Speakers mounted in acoustical tile ceilings shall have Support Bridge.
- F. Microphone Stations
1. Install microphone station where indicated on drawings.
 2. Mic station shall be programmed to provide paging to all required areas based on installation location. Match existing configuration of north terminal paging stations and coordinate with GOAA operations prior to programming to confirm exact paging requirements at each location.
- G. Elevators
1. Provide dedicated speaker circuit for each elevator shaft and connect to in cab speaker via elevator travel cable.
 2. Coordinate exact interface requirements with elevator installers prior to installation to ensure they are providing correct follower cable to support in cab speaker.
 3. Interface shall be made between paging system and elevator equipment in elevator control room. No connection allowed in shaft.
- H. Cable/Wire
1. Splice cable only at terminal block units located in terminal cabinets.
 2. Speaker cabling may not be "T" tapped and shall be supervised with EOL device. All speaker circuits shall be installed per IED manufacturer recommendations.

3. 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.
4. Install input circuits in separate cables and raceways/pathways from output circuits.
5. Install all cables no closer than 12" from any wire/cable installed for Premise Distribution System, power system cable/raceway, or fluorescent/ballasted light fixtures.
6. Leave 12 inches excess cable at each termination at speaker and termination blocks.
7. Leave 12 feet excess cable at the central system equipment/rack.
8. Provide protection for exposed cables where subject to damage.
9. Use suitable cable fittings and connectors.
10. 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.
11. Cables shall not be installed with bend radius less than that specified by the cable manufacturer.

I. Weather Alert System

1. Owners Vendor to provide PLC and Annunciators (Primary / Secondary) to be located in the ECS head end at ASC and provide inputs into the ECS system for the following alert conditions:
 - a. Level 1
 - b. Level 2
 - c. Level 3
 - d. All Clear
2. Contractor shall install vendor provided equipment into rack mounted panel in ECS Head End. Refer to details.
3. System shall activate visual devices under all Levels, and deactivate once all clear is received
4. Audible Notification shall be via pre-recorded message alerts
 - a. Coordinate with OAR for exact message content
5. Contractor shall coordinate with OAR to confirm final sequence of operation
6. Provided in ECS IDF rooms:
 - a. Provide Logic Relay with output to trigger wall mounted power supply for visual notification device.
 - b. Provide HPSA-PS (Visual device power supply) where indicated on drawings or as required to support local HPSA strobe.
 - c. Connect local HPSA to dedicated amplifier circuit in ECS cabinet
7. Contractor shall provide surge protection on both speaker and visual device circuits supporting the HPSA's
8. Mounting:
 - a. Coordinate all mounting with architect and structural engineer. Contractor to provide Signed and Sealed engineered shop drawings indicating exact mounting condition and wind loading calculation as required by local codes and standards.

- b. Contractor shall fabricate mount using all SS hardware.
- J. IPTV Interface
 - 1. Interface with IPTV payers located in adjacent IDF room from ECS equipment cabinets. Each IDF shall be provided with a relay output to trigger the local video players / controller to mute audio / video signals.
 - 2. Local relay shall be configured to activate when an airport page or emergency message is routed thru a local amplifier
 - K. Room Volume Control
 - 1. Where indicated on drawings provide a priority page override volume control for the local room speaker/s.
 - 2. Where required to support local volume control devices, install additional Logic Relay Module in ECS cabinet to provide trigger output to activate the priority page relay in all local volume controls.
 - 3. Provide power supply in ECS cabinet sized as required to handle local paging relays connected, as recommended by the manufacture.
 - 4. Priority Page relay shall activate when an emergency / fire page is made
 - L. Ambient Sensors
 - 1. Route all sensors to same amplifier as corresponding speaker circuit.
- 3.2 FIELD QUALITY CONTROL
- A. Refer to Specification Section 27 05 00 in addition to the following.
 - B. Provide services of service representative to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.
 - C. Pre-testing: upon completing installation of the system, align, adjust, and balance the system and perform complete pre-testing. Determine, through pre-testing, the conformance of the system to the requirements of the specifications. Correct deficiencies observed in pre-testing. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
 - D. Report of pre-testing: after pre-testing is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of the witnesses to the preliminary tests.
 - E. Final test notice: provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.
 - F. Verify the absence of unwanted voltages between circuit conductors and ground.
 - G. Megger test all conductors other than those intentionally and permanently grounded with electronic components disconnected. Test for resistance to ground. Report readings less than 1-megohm for evaluation.

- H. Test all conductors for short circuits utilizing an insulation-testing device.
- I. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on the record drawings.
- J. Verify the ACS control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
- K. Test the system for all specified functions according to the manufacturer's operating and maintenance manual.
- L. Re-testing: correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the specifications and complies with applicable standards.

3.3 TESTS AND ADJUSTMENTS

- A. Refer to Specification Section 27 05 00 in addition to the following.
- B. The Contractor shall perform all tests and adjustments prior to the system demonstration and acceptance test.
- C. The Contractor will provide the test instrumentation such as, precision sound level meter, real time, audio frequency analyzer, dual trace oscilloscope, random noise generator, Impedance Bridge, etc. And as previously submitted and approved.
- D. Provide permanent staff - trained personnel to perform the tests and to adjust and equalize the systems, there will be no exceptions.
- E. Measure and record the input impedance of any active device used to terminate passive devices and record the total impedance of all such devices. Record the dc resistance of any terminating resistor used.
- F. Measure and record the frequency response of each mixer preamplifier and power amplifier in the system. Adjust as required.
- G. The documentation of tests, measurements and adjustments performed will include a list of personnel and the list of certified test equipment used.
- H. All information recorded from all testing is to be shown on the as-built documents.
- I. Speaker Circuits:
 - 1. Measure and record the impedance of each loudspeaker line before connecting the line to the output of its respective amplifier. Adjust, so that the load impedance will be equal to or greater than the rated impedance. Record the total impedance.
 - 2. Provide ground fault test on all speaker circuits before connecting to amplifier outputs.

3. Perform polarity check on all speaker circuits prior to connection to amplifier outputs.
 4. Contractor to adjust speaker tap values and amplifier settings to achieve a target SPL of 90db and configure ambient sensors to maintain 15db above ambient up to 95db max
- J. Steerable line array aiming requirements:
1. Contractor shall level, balance, and adjust the digitally steerable speakers for optimal levels, speech intelligibility, and overall sound quality.
 2. The Contractor shall coordinate a walk through with the Authority, OAR, and Engineer to demonstrate options for the steerable array software beam patterns.
 3. The Contractor shall validate the horizontal aiming angle on site.
 4. The Contractor shall engage an entity experienced in adjusting public address emergency communications systems in large atrium environments.
- K. Messaging:
1. Test message playback thru out buildings including message request from Mic Stations, NTLS Comm Center, and Automated FIDS messages.
 2. Test interface between FIDS (AIDB) and ECS system controller for purpose of automated flight information messages.
 3. Test curtesy message playback and automated schedule
- L. Contractor shall adjust all speaker tap values, amplifier power setting, DSP (EQ, Limiters, Compressors) as required to provide a NFPA compliant ECS audio system meeting all intelligibility and audibility requirements
- M. Configure all ambient audio sensors for each speaker circuit being controller to allow for a 15db over ambient SPL. Adjustments and demonstration shall be made when building is empty and occupied to simulate daytime and nighttime ambient levels and prove system functionality. Testing shall be with AHJ, Owner, and EOR.
1. Contractor shall include all additional time required to make all requested adjustments after demonstration.
- N. Test function of ALL fire alarm supervision and control relays during fire alarm activation and for system supervision.
- 3.4 SYSTEM DEMONSTRATION AND ACCEPTANCE TEST.
- A. Refer to Specification Section 27 05 00 in addition to the following.
 - B. The demonstration and acceptance test will be performed after the system test and adjustments have been completed.
 - C. The demonstration of the system shall be by the contractor.

- D. All final "as-built" drawings, run sheets, manuals, and other required documents, as detailed herein, shall be on hand. Two complete sets of these documents shall be delivered to the owner at this time. (One complete set shall have been delivered to the consultant prior to the scheduling of acceptance tests).
- E. In the event further adjustment is required, or defective equipment must be repaired or replaced, tests may be suspended or continued at the option of the consultant.

3.5 OWNER PERSONNEL TRAINING

- A. Refer to Specification Section 27 05 00 in addition to the following.
- B. During training Use submitted operation and maintenance manual as reference. Supplement with training materials as required.

END OF SECTION 27 51 13

SECTION 01 45 29 - STRUCTURAL TESTING AND INSPECTIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for quality assurance and quality control to be completed by the Testing Laboratory, Contractor, and/or the Geotechnical Engineer for the following structural items:
 - 1. Concrete Reinforcing.
 - 2. Cast-in-Place Concrete.
 - 3. Precast Architectural Concrete.
 - 4. Masonry.
 - 5. Structural Steel.
 - 6. Steel Joists or Steel Joists and Joist Girders.
 - 7. Steel Decking.
 - 8. Cold-Formed Metal Framing.
 - 9. Rough Carpentry – blocking, nailers, etc.
 - 10. Earthwork.
- B. Related Requirements:
 - 1. Specification 01 45 00 “Quality Control” for other independent testing agency procedures and administrative requirements.
 - 2. Refer to the drawings for the Threshold Inspection Plan for requirements for additional inspections to be completed by the Threshold Inspector.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Unit Prices:
 - 1. Cost Proposal: The Testing Laboratory’s proposal to the OAR shall contain unit price stipulations for specified tests and inspections and on an hourly basis for personnel. A total estimated price shall also be submitted.
- B. Measurement and Payment
 - 1. Payment of the Testing Laboratory: The contractor will pay for the Laboratory services for inspection and testing of materials for compliance with the requirements of the Contract Documents.
 - 2. Payment for Substitution Testing: The Contractor shall arrange for and pay for any additional samples and tests above those required by the Contract Documents as requested by the Contractor for his convenience in performing the work.
 - 3. Payment for Retesting: When initial tests indicate work does not comply with the requirements of the Contract Documents, the Contractor shall be liable for the cost for any additional inspections, sampling, testing, and retesting done by the Testing Laboratory.
 - 4. Payment by Contractor: The Contractor shall furnish and pay for the following items if required:

- a. Soil survey of the location of borrow soil materials, samples of existing soil materials, and delivery to the Contractor's Testing Laboratory.
 - b. Samples of concrete aggregates and delivery to the Contractor's Testing Laboratory.
 - c. Concrete mix designs as prepared by his concrete supplier.
 - d. Site-situated storage boxes for concrete cylinders
 - e. Concrete coring, tests of below strength concrete, and load tests, if ordered by the OAR, Architect, or Engineer.
 - f. Certification of reinforcing steel and prestressing steel mill order.
 - g. Certification of structural steel mill order.
 - h. Certification of portland cement, lime, fly ash.
 - i. Certification of welders and preparation of Welding Procedure Specifications.
 - j. Tests, samples, and mock-ups of substitute material where the substitution is requested by the Contractor and the tests are necessary in the opinion of the OAR, Architect or Engineer to establish equality with specified items.
 - k. The making and testing of concrete cylinders for the purpose of evaluating strength at time of form stripping or for post-tensioning or the time spent evaluating the in-situ strength of concrete using the Maturity Method.
 - l. Any other tests when such costs are required by the Contract Documents to be paid by the Contractor.
5. Payment for Tests of Suspected Deficient Work: If, in the opinion of the Building Official, OAR, Architect, or Engineer, any of the work of the Contractor is not satisfactory, the Contractor shall furnish and pay for all tests that the OAR, Architect, or Engineer deem advisable to determine its proper construction. The OAR shall pay all costs if the tests prove the questioned work to be satisfactory.

1.3 OWNER RESPONSIBILITIES

- A. Threshold Inspection: The OAR shall engage a separate agency to serve as a Threshold Inspector to provide Threshold Inspection services for the items outlined in the Threshold Inspection Plan. The scope of these services is not included in this section and is to be provided separately as outlined in the Threshold Inspection Plan. These inspections are mandatory for conformance to the legal requirements of the Florida Building Code and shall be in addition to the inspections and tests otherwise defined in this specification.
- B. The OAR shall provide a copy of the project plans and specifications to the Testing Laboratory prior to the start of construction and prior to any pre-installation meetings.

1.4 CONTRACTOR RESPONSIBILITIES

- A. NOT USED.

- B. Furnishing Samples and Certificates: The Contractor shall provide to the laboratory certificates and representative samples of materials proposed for use in the work in quantities sufficient for accurate testing as specified.
- C. Furnishing Casual Labor, Equipment and Facilities: The Contractor shall furnish casual labor, equipment, and facilities as required for sampling and testing by the laboratory and otherwise facilitate the required inspections and tests.

1.5 TESTING LABORATORY RESPONSIBILITIES

- A. The Testing Laboratory shall sample and test materials as they are being installed for compliance with specified acceptance criteria. The Testing Laboratory will report and interpret the test results. The Laboratory shall monitor and report on the installation of construction work and shall perform tests on the completed construction as required to indicate Contractor's compliance with the various material specifications governing this work.
- B. The Testing Laboratory shall provide inspections on the following items:
 - 1. Welding of reinforcing steel.
 - 2. Inspection of structural steel, bolting, and welding material.
 - 3. Welding of structural steel.
 - 4. High-strength bolting.
 - 5. Compacted earth fill.
 - 6. Drilled Shaft Foundations at Passenger Boarding Bridge.
- C. Inspections Required by Government Agencies: The Testing Laboratory shall perform inspections and submit reports and certifications as required by government agencies having jurisdiction over the aspects of the project covered by this specification.
- D. Notification of Deficiencies in the Work: The Testing Laboratory shall notify the Architect, Engineer, and Contractor within 24 hours of discovery of observed irregularities and deficiencies of the Work and other conditions not in compliance with the requirements of the Contract Documents. Notification shall be by telephone or e-mail and then in writing.
- E. Accounting: The Testing Laboratory shall submit all billing costs to the Contractor.
- F. Monitoring Product and Material Certifications: The Testing Laboratory shall be responsible for monitoring the submittals of product and material certifications from manufacturers and suppliers as specified in the Specifications and shall report to the OAR, Architect, and Engineer when those submittals are not made in a timely manner.
- G. Limitations of Authority: The Testing Laboratory is not authorized to revoke, alter, relax, enlarge upon, or release any requirements of the Specifications or to approve

or accept any portion of the work or to perform any duties of the Contractor and his Subcontractors.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. The Testing Laboratory shall cooperate with the Architect, Engineer, and Contractor and provide qualified personnel promptly on notice.
2. The Contractor shall cooperate with Testing Laboratory personnel and provide access to the work and to manufacturers' operations.
3. Notification of Source Change: The Contractor shall be responsible for notifying the OAR,
4. Architect, Engineer, and Testing Laboratory when the source of any material is changed after the original tests or inspections have been made.

B. Pre-installation Meetings: The Testing Laboratory shall attend pre-installation meetings with the Architect, Engineer, Contractor, and material suppliers as required to coordinate materials inspection and testing requirements with the planned construction schedule and shall participate in such meetings throughout the course of the project.

C. Scheduling:

1. Advance Notice: The Contractor shall be responsible for notifying the Testing Laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests. Failure to sufficiently notify may result in additional costs incurred by the Testing Laboratory to the Contractor.

1.7 SUBMITTALS

A. Quality Control Reports:

1. Information on Reports: The Testing Laboratory shall submit copies of reports of inspections and tests promptly. The reports shall contain at least the following information:
 - a. Project name.
 - b. Date report issued.
 - c. Testing Laboratory name and address.
 - d. Name and signature of inspector/technician.
 - e. Date of inspection and/or sampling.
 - f. Date of test.
 - g. Identification of product and Specification section.
 - h. Location in the project.
 - i. Identification of inspection or test.
 - j. Record of weather conditions and temperature (if applicable).
 - k. Results of test regarding compliance with Contract Documents.
2. Copies: The Laboratory shall send signed electronic (PDF) copies of test and inspection reports to the following parties:
 - a. OAR or his/her representative.

- b. Contractor.
 - c. Architect.
 - d. Engineer of Record.
 - e. Threshold Inspector.
 3. Discrepancy Log: The Testing Laboratory shall create and maintain a log of all discrepancies throughout the duration of the project.
 4. Information on Log: This log shall include, but is not limited to:
 - a. Discrepancy date.
 - b. Description of discrepancy.
 - c. Drawing and/or detail reference.
 - d. Description of as-built condition.
 - e. Description of any remedial work performed.
 - f. Status of discrepancy.
 5. Submission Schedule: This log shall be submitted to the Architect/Engineer on a periodic basis for review and comment. Upon completion of the Project, this log shall be submitted in its entirety as an attachment to the final signed report described below under Certifications.
- B. Certification: Upon completion of the job, the Laboratory shall furnish to the OAR, Architect, and Engineer of Record, a statement signed by a licensed professional engineer that, to the best of their knowledge, required tests and inspections were made in accordance with the requirements of the Contract Documents.

1.8 QUALITY ASSURANCE

- A. Qualifications of Testing Laboratory:
 1. The Testing Laboratory shall meet the basic requirements of ASTM E 329 and shall submit to the OAR, Architect, and Engineer evidence of current accreditation from the American Association for Laboratory Accreditation, the AASHTO Accreditation Program or the “NIST” National Voluntary Laboratory Accreditation Program.
 2. The Testing Laboratory shall be an Approved Agency by the Building Official to perform Special Inspections and other tests and inspections as outlined in the applicable building code.
 3. Tests and inspections shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American Society for Testing and Materials or other recognized and accepted authorities in the field.
 4. Qualifications of Welding Inspectors
 - a. Inspectors performing visual weld inspection shall meet the requirements of AWS D1.1 Section 6.1.4. Inspectors shall have current certification as an AWS Certified Welding Inspector (CWI). Assistant inspectors, if any, shall be supervised by an Inspector and shall be qualified by training and experience to perform the specific functions to which they are assigned.

- b. Inspectors performing nondestructive examinations of welds other than visual inspection (MT, PT, UT, and RT) shall meet the requirements of AWS D1.1, Section 6.14.6.
- B. The Contractor shall not engage the same testing laboratory for construction services quality assurance testing, unless agreed to by the OAR.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SCOPE OF WORK

- A. The work to be performed by the Testing Laboratory shall be as specified in this Section of the Specification and as determined in meetings with the OAR, Architect, and Engineer.

3.2 CONCRETE REINFORCING

- A. Quality Assurance:
 - 1. Review the Welding Procedure Specification (WPS) submitted by the contractor for any reinforcing steel other than ASTM A 706 that is proposed to be welded for consistency with acceptable welding practices and AWS.
 - 2. Review welder qualifications by certification or verify by retesting. Obtain welder certificates.
- B. Field Testing: The following tests shall be completed by the Testing Laboratory:
 - 1. Mechanical Tension Splices: The Laboratory shall conduct monotonic tension tests in accordance with ASTM A 1034 of mechanical tension splices of the type as specified on the structural drawings. It is not necessary that the specimens to be tested are production splices, however, the specimens to be tested shall have been made by the Contractor's personnel under field conditions. The rate of testing shall be as follows:
 - a. Two specimens for the first 50 splices (or fraction thereof) at the beginning of the job. Splices not meeting tension requirements shall be retested at Contractor's expense until all splices meet the tension requirements.
 - b. One specimen for every 100 (or fraction thereof) additional splices occurring on the job. Any splices not meeting tension requirements shall be retested at Contractors expense until all splices have passed the test.
 - c. A minimum of one test specimen shall also be selected from transition splices (splices of one bar size to another bar size), if any.

3.3 CAST-IN-PLACE CONCRETE

- A. Quality Assurance:

01 45 29 - 6

1. Concrete Mix Designs: The Testing Laboratory shall review the submitted mix designs for conformance to the specifications and for suitability for use in the project.
 2. Preinstallation Meetings: The Testing Laboratory shall attend the preinstallation meetings as noted in Specification 03 3000 "Cast-in-Place Concrete."
- B. Field Testing: The following tests shall be completed by the Testing Laboratory:
1. During Concrete Placement:
 - a. Record the amount of water added and note if it exceeds the amount allowed to be added shown in the approved mix design.
 - b. Mold concrete test cylinders as specified below in Paragraph 3.a.
 - c. Perform tests to determine slump, concrete temperature, unit weight, and air entrainment as specified below.
 - d. Record information for concrete test reports as specified below.
 - e. Pick up and transport to Laboratory cylinders cast the previous day.
 - f. After Concrete Placement:
 - g. In-situ Concrete Strength Verification for Form Stripping: The Testing Laboratory shall perform the tests necessary to determine the concrete strength prior to form stripping:
 - 1) If concrete strength for form stripping is to be determined using field-cured cylinders, the cylinder shall be broken at the time of form removal as directed by the Contractor.
 - 2) If concrete strength for form stripping is to be determined using the Maturity Method, the Testing Laboratory shall verify that the requirements of ASTM C 1074 are being followed and that the proper criteria for determining concrete strength by this method has been established and is being followed.
 - h. Investigation of Low Strength Concrete Test Results:
 - 1) Cost of Investigations for Low Strength Concrete: The Contractor shall be responsible for the costs of investigations of low strength concrete, as defined in Part I above.
 - 2) Scope of Investigations: See Specification Section 03 30 00 "Cast-In-Place Concrete" for the investigations that may be required by the Engineer. The Testing Laboratory will conduct these investigations if required.
 - i. Post-Installed Anchors in Concrete:
 - 1) Verify maximum anchor tightening torque for all applicable post-installed anchors.
 - 2) Provide pull tests on individual anchors as specified in the ICC Evaluation Services Report, on the drawings, or as directed by the Engineer-of-Record.
 - j. Floor Flatness and Levelness Measuring: Perform tests as defined below.
 - k. Testing of Concrete Floor Slabs for Acceptability to Receive an Adhesive-Applied, Low-Permeable Floor Covering: Perform tests as defined below.

- I. Testing of Non-Shrink Grout for Base Plates, Bearing Plates, and Precast Wall Panels:
 - 1) Compressive Strength Tests: Compressive strength of grout shall be determined by testing grout cubes according to the requirements of ASTM C 109 - Modified. Test one set of three cubes at one day, and one set of three cubes at 28 days. Testing Laboratory shall discuss with the contractor the addition of a third set of grout cubes if the contractor anticipates the higher strength grouts might not achieve the 28-day strength. These shall be paid by the contractor.
 - 2) Frequency of Testing: One set of cubes (6 cubes) shall be made for every ten base plates and bearing plates or fraction thereof but not less than one set for each day's operation. One set of cubes shall be made for each day's operation of grouting wall panels.
2. Standards for Concrete Tests:
 - a. Concrete Test Cylinders: Mold and test concrete cylinders as described below:
 - 1) Cylinder Molding and Testing: Cylinders for strength tests shall be molded and Laboratory cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39. Cylinders may be either 6" in diameter by 12" or 4" in diameter by 8", however, the diameter of the cylinder shall be at least three times the nominal maximum size of the coarse aggregate in the mix tested. All of the cylinders for each class of concrete shall be of the same dimension for all sets of that class.
 - 2) Field Samples: Field samples for strength tests shall be taken in accordance with ASTM C 172 at the point of placement.
 - 3) Quantity of Cylinders: Each set of test cylinders shall consist of a minimum of four standard test cylinders. If concrete strength for form stripping is to be determined using field-cured cylinders, one additional cylinder per set will be required for formed slab for the purpose of evaluating the concrete strength at the time of form stripping. This cylinder shall be stored on the floor where form removal is to occur under the same exposure conditions as the floor concrete. The cylinder shall be cured under field conditions in accordance with ASTM C 31. Field-cured test cylinders shall be molded at the same time and from the same samples as laboratory-cured test specimens. The Contractor shall pay for the cost of making and testing these cylinders.
 - 4) Frequency of Testing: A set of test cylinders shall be made according to the following minimum frequency guidelines:
 - a) One set for each class of concrete taken not less than once a day.
 - b) Piles: One set for each 50 cubic yards or fraction thereof.
 - c) Spread Footings: One set for each 50 cubic yards or fraction thereof.

- d) Pile Caps: One set for each 50 cubic yards or fraction thereof.
- e) Floors: One set for each 150 cubic yards or fraction thereof but not less than one set for each 5,000 square foot of floor area.
- f) Columns: One set for each 50 cubic yards or fraction thereof with a minimum of two sets per floor.
- g) Shear Walls: One set for each 50 cubic yards but not less than two sets per floor.
- h) Tilt-Up Panels: One set for every 50 cubic yards or fraction thereof.
- i) All Other Concrete: A minimum of one set for each 150 cubic yards or fraction thereof but not less than one set for each 5,000 square feet of area for walls.
- j) No more than one set of cylinders at a time shall be made from any single truck.
- k) If the total volume of concrete is such that the frequency of testing as specified above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.
- l) The above frequencies assume that one batch plant will be used for each pour. If more than one batch plant is used, the frequencies cited above shall apply for each plant used.
 - The cylinders shall be numbered, dated, and the point of concrete placement in the building recorded.
 - For concrete specified on the drawings to reach the required strength at 28 days, break one cylinder of the set at seven days, two 6" by 12" cylinders or three 4" by 8" cylinders at 28 days, and keep one in reserve for testing at the Engineer's direction.
 - For concrete specified on the drawings to reach the required strength at 56 days, break one cylinder of the set at seven days, one cylinder at 28 days, two 6" by 12" cylinders or three 4" by 8" cylinders at 56 days, and one kept in reserve for testing at the Engineer's direction.
 - Cylinder Storage Box: The Contractor shall be responsible for providing a protected concrete cylinder wooden storage box at a point on the job site mutually agreeable with the Testing Laboratory for the purpose of storing concrete cylinders until they are transported to the Laboratory. The box shall be constructed and equipped to maintain the environment specified for initial curing in ASTM C 31.
 - Transporting Cylinders: The Testing Laboratory shall be responsible for transporting the cylinders to the Laboratory in a protected environment such that no damage or ill effect

- will occur to the concrete cylinders including loss of moisture, freezing temperatures or jarring.
- Information on Concrete Test Reports: The Testing Laboratory shall make and distribute concrete test reports after each job cylinder is broken. Such reports shall contain the following information:
 - m) Truck number and ticket number.
 - n) Concrete Batch Plant.
 - o) Mix design number.
 - p) Accurate location of pour in the structure.
 - q) Strength requirement.
 - r) Date cylinders made and broken.
 - s) Technician making cylinders.
 - t) Concrete temperature at placing.
 - u) Air temperature at point of placement in the structure.
 - v) Amount of water added to the truck at the batch plant and at the site and whether or not it exceeds the amount allowed by the mix design.
 - w) Slump.
 - x) Unit weight.
 - y) Air content.
 - z) Cylinder compressive strengths with type of failure if concrete does not meet Specification requirements. Seven-day breaks are to be flagged if they are less than 60% of the required 28-day strength. 28-day breaks are to be brought to the attention of the Architect and Engineer in writing if either cylinder fails to meet specification requirements.
 - b. Slump Tests: Slump Tests (ASTM C 143) shall be completed at the beginning of concrete placement for each batch plant and for each set of test cylinders made. The slump test shall be made from concrete taken from the end of the concrete truck chute. The concrete shall be considered acceptable if the slump is within the slump tolerance noted on the mix design submittal form for that class of concrete.
 - c. Air Entrainment: Air entrainment tests (ASTM C 231 or C 173, C 173 only for lightweight concrete) shall be made at the same time slump tests are made as cited above. Samples for air entrainment tests shall be taken at the point of placement.
 - d. Concrete Temperature: Concrete temperature at placement shall be measured (ASTM C 1064) at the same time slump tests are made as cited above.
 - e. Unit Weight Test: ASTM C 138.
 - f. Floor Flatness and Levelness Measuring:
 - 1) The Testing Laboratory shall measure the floor for flatness and levelness according to ASTM E 1155.
 - 2) Measurement of the finished concrete surface profile for any test section shall be made when requested by the Representative at

- his option. Notwithstanding, measurements shall be made within 24 hours after completion of finishing operations. For structural elevated floors measurement shall also be made prior to removal of forms and shores. The Contractor shall be notified immediately after the measurements of any section are complete and a written report of the floor measurement results shall be submitted within 72 hours after finishing operations are complete.
- 3) The concrete surface profile shall be measured using equipment manufactured for the purpose such as a Dipstick Floor Profiler as manufactured by the Edward W. Face Company in Norfolk, Virginia, F-Meters manufactured by Allen Face & Company in Norfolk, Virginia, optical, or laser means or other method specified in ASTM E 1155.
 - 4) Each floor test section and the overall floor area shall conform to the two-tiered measurement standard as specified herein.
 - a) Minimum Local Value (MLV). The minimum local FF/FL values represent the absolute minimum surface profile that will be acceptable in any one floor test section.
 - b) Specified Overall Value (SOV). The specified overall FF/FL values represent the minimum values acceptable for all combined floor test sections representing the overall floor.
 - 5) For purposes of this specification a floor test section is defined as the smaller of the following areas:
 - a) The area bounded by column and/or wall lines.
 - b) The area bounded by construction and/or control joint lines.
 - c) Any combination of column lines and/or control joint lines.
 - d) Test sample measurement lines within each test section shall be multidirectional along two orthogonal lines as defined by ASTM E 1155.
 - e) The precise layout of each test section shall be determined by the Testing Laboratory and shall be submitted for Architect/Engineer review and approval.
- g. Testing of Concrete Floor Slabs for Acceptability to Receive an Adhesive-Applied, Low-Permeable Floor Covering:
- 1) The following tests shall be performed by the Testing Laboratory as a part of quality assurance testing to insure that the proper moisture condition and alkalinity of the substrate has been achieved prior to installing adhesive-applied, low-permeability floor coverings such as vinyl composition tile (VCT), linoleum, sheet vinyl, vinyl-backed carpet, rubber, athletic flooring, synthetic turf, wood, acrylic terrazzo, thin-set tile, epoxy overlays and adhesives, waterproofing, et.al.
 - 2) Moisture Vapor Emission Rate: Perform testing according to ASTM F 1869 to determine if the moisture emission rate from the floor is below the flooring manufacturer's maximum recommended

- value but not greater than five pounds per 1,000 square feet per 24 hours.
- 3) Relative Humidity Determination Test: As an alternate to the Moisture Vapor Emission Rate Test, and if agreed to by the Contractor, Architect and OAR, perform testing according to ASTM F 2170 to determine if the relative humidity of the concrete slab is below the flooring manufacturer's maximum recommended value but not greater than 75%.
 - 4) Alkalinity Testing: Perform testing in accordance with ASTM F 710, Paragraph 5.3, to determine if the pH level of the concrete slab surface is below the flooring manufacturer's maximum recommended value but not greater than 10. Perform one test per 1,000 square feet with a minimum of three tests within the total area being tested.
3. Evaluation and Acceptance of Concrete:
- a. Strength Test: A strength test shall be defined as the average strength of two six-inch cylinder breaks or three four-inch cylinder breaks from each set of cylinders tested at the time indicated above.
 - b. Quality Control Charts and Logs: The Testing Laboratory shall keep the following quality control logs and charts for each class of concrete containing more than 2,000 cubic yards. The records shall be kept for each batch plant and submitted on a weekly basis with cylinder test reports:
 - 1) Number of strength tests made to date.
 - 2) Strength test results containing the average of all strength tests to date, the high test result, the low test result, the standard deviation, and the coefficient of variation.
 - 3) Number of tests under specified strength.
 - 4) A histogram plotting the number of strength test cylinders versus compressive strength.
 - 5) Quality control chart plotting compressive strength test results for each test.
 - 6) Quality control chart plotting moving average for strength where each point plotted is the average strength of three previous test results.
 - 7) Quality control chart plotting moving average for range where each point plotted is the average of 10 previous ranges.
 - c. Acceptance Criteria: The strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:
 - 1) The average of all sets of three consecutive strength tests equal or exceed the required $f'c$.
 - 2) No individual strength test falls below the required $f'c$ by more than the greater of 10% of $f'c$ or 500 PSI.
 - d. If either of the above Acceptance Criteria requirements is not met, the Testing Laboratory shall immediately notify the Engineer by telephone.

Steps shall immediately be taken to increase the average of subsequent strength tests.

- C. Causes for Rejection of Concrete: The Contractor shall reject concrete delivered to the site for any of the following reasons:
1. Wrong class of concrete (incorrect mix design number).
 2. Environmental Conditions: Environmental condition limits shall be as follows unless appropriate provisions in concreting practices have been made for cold or hot weather:
 - a. Cold Weather: Air temperature must be 40°F and rising or the average daily temperature cannot have been lower than 40°F for 3 consecutive days unless the temperature rose above 50°F for at least one-half of any of those 24-hour periods.
 - b. Hot Weather: Environmental conditions must be such that cause an evaporation rate from the concrete surface of 0.2 lb./sq. ft./hr. or less as determined by Figure 2.1.5 in ACI 305R-91.
 - c. Concrete may be placed at other environmental condition ranges only with approval of the job inspector for the Testing Laboratory or other duly appointed representative.
 3. Concrete with temperatures exceeding 95°F shall not be placed in the structure.
 4. Air contents outside the limits specified in the mix designs.
 5. Slumps outside the limits specified.
 6. Excessive Age: Refer to Section 03 30 00 "Cast-In-Place Concrete".
- D. Concrete Batch Trip Tickets: Concrete batch trip tickets shall be collected and retained by the Contractor. Compressive strength, slump, air, and temperature tests shall be identified by reference to a particular trip ticket. Tickets shall contain the information specified in ASTM C 94. Each ticket shall also show the amount of water that may be added in the field for the entire batch that will not exceed the specified water cement ratio for the design mix. The Contractor and Testing Laboratory shall immediately notify the Architect/Engineer and each other of tickets not meeting the criteria specified.

3.4 PRECAST ARCHITECTURAL CONCRETE

- A. Field Inspection: The Testing Laboratory shall:
1. Verify proper bolting and/or welding of panel connection to the structure.
 2. Verify proper panel position with specified panel joint thickness.
 3. Verify proper sealant materials and methods at joints.
 4. Report any cracked panels or panels with improper finish to the Architect and Engineer.

3.5 MASONRY

- A. Quality Assurance:

1. Concrete Masonry Unit: For each type of concrete masonry unit indicated, verify compliance with ASTM C 90 and the strength required by design. Verification may be by reviewing certification from unit producer showing compliance.
 2. Review field welder qualifications by certification or verify by retesting. Obtain welder certificates.
- B. Field Testing:
1. Masonry Strength Testing:
 - a. Verification Testing Frequency: Verification of masonry strength (f'm) will be performed at the beginning of masonry construction.
 - b. Mortar:
 - 1) Throughout construction, verify the proportions of the site-prepared mortar mix comply with the requirements of ASTM C 270 for the type specified.
 - 2) Verify the proportions of materials in premixed or preblended mortar comply with the requirements of ASTM C 270 for the type specified as delivered to the site.
 - 3) Mortar Tests: Verify mortar composition with specified requirements according to ASTM C 780, Annex A4; made at following times during Work:
 - a) First day
 - b) 5 percent
 - c) 15 percent
 - d) 30 percent
 - e) 60 percent
 - c. Grout:
 - 1) Prior to grouting, verify the proportions of site-prepared grout mix comply with the requirements of ASTM C 476 for each type of grout used.
 - 2) Verify the proportions of materials in premixed or pre-blended grout comply with the requirements of ASTM C 476 as delivered to the site.
 - 3) For grout pre-mixed at a batch plant or otherwise not prepared on site, grout shall be sampled and tested in accordance with ASTM C 1019. Prepare one set of grout samples for testing at seven days and two sets for testing at 28 days.
 - 4) Test each mix provided, according to ASTM C 1019 for compressive strength. Perform one set of tests for each 5000 sf of wall area or portion thereof unless otherwise indicated.
 - d. Report test results in writing and in form specified under each test method, to Architect and Contractor, on same day tests are made.
 - e. Retests: Where prism tests indicate non-compliance with specified requirements, additional testing shall be performed at the frequency of two additional tests for each unsatisfactory test. The cost of such additional testing shall be the responsibility of the Contractor. Where retesting fails to indicate conformance with specified requirements, any

- masonry construction represented by unsatisfactory tests shall be removed and replaced with acceptable masonry construction.
2. Testing of Non-Shrink Grout for Base Plates and Bearing Plates:
 - a. Compressive Strength Tests: Compressive strength of grout shall be determined by testing grout cubes according to the requirements of ASTM C 109 - Modified. Test one set of three cubes at one day, and one set of three cubes at 28 days.
 - b. Frequency of Testing: One set of cubes (6 cubes) shall be made for every ten base plates and bearing plates or fraction thereof but not less than one set for each day's operation. One set of cubes shall be made for each day's operation of grouting wall panels.
- C. Field Inspection:
1. Anchors:
 - a. Verify maximum anchor tightening torque for all post-installed anchors.
 - b. Provide pull tests on individual anchors as specified on the drawings or as directed by the Engineer-of-Record.
 - c. Welding of Reinforcing Bars: Observe the welding of reinforcing bars.

3.6 STRUCTURAL STEEL

- A. Scope of Work:
1. Contract Obligations:
 - a. Contractor Responsibility: The contractor shall pay for shop and field inspections and tests as required during the fabrication and erection of the structural steel.
 - b. Testing Laboratory Responsibility: The inspection by the Testing Laboratory of the Fabricator's work shall be in sequence, timely, and performed in such a manner so that corrections can be made without delaying the progress of the work. Inspections shall be performed by qualified technicians with a minimum of two years of experience in structural steel testing and inspection. Refer to Paragraph 1.9.4.b for special requirements for welding inspectors. The Testing Laboratory shall provide test reports of inspections. All test reports shall indicate types and locations of defects found during inspection, the measures required and performed to correct such defects, statements of final approval of welding and bolting of shop and field connections, and other fabrication and erection data pertinent to the safe and proper welding and bolting of shop and field connections. Weld inspection reports shall be signed by an inspector with current certification as an AWS Certified Welding Inspector (CWI). In addition to the parties listed in this Specification the Fabricator and Erector shall receive copies of the test reports.
 - c. Rejection of Material or Workmanship: The OAR, Architect, Engineer, and Testing Laboratory reserve the right to reject any material or workmanship not in conformance with the Contract Documents at any time during the progress of the work. However, this provision does not allow waiving the obligation for timely, in sequence inspections.

- B. Quality Assurance:
1. Verify the fabrication shop's certification from AISC.
 2. Verify that the fabricator's fabrication and quality control procedures provide a sound basis for inspection control of workmanship and of the ability to conform to construction documents and industry standards. Review the procedures for completeness and adequacy relative to code requirements for the fabricator's finished product.
 3. Review field welder qualifications by certification or verify by retesting. Obtain welder certificates.
- C. Source Testing: The Testing Laboratory shall provide the following tests at the designated fabrication shops:
1. Test welds completed in the shop according to Paragraph G "Weld Testing" below.
 2. Test bolted connections completed in the shop according to Paragraph I "High-Strength Bolt Testing."
- D. Source Inspection: The Testing Laboratory shall provide the following inspections at the designated fabrication shops:
1. An initial shop inspection prior to the start of any fabricating work shall be made to accomplish the following:
 - a. Perform tasks outlined in Paragraphs G.1, G.2 and G.3 of welding inspection duties described below in Paragraph G "Weld Inspection and Process Monitoring" when shop welding is to be performed.
 - b. Perform tasks outlined in paragraph J.1 of bolt inspection duties described below in Paragraph I "High-Strength Bolt Inspection and Process Monitoring" when shop bolting involves joints that are designated on the plans as Pretensioned or Slip-Critical.
 2. Process Monitoring:
 - a. Provide continuous or periodic monitoring of welding as described below in Paragraph G "Weld Inspection and Process Monitoring."
 - b. Provide continuous or periodic monitoring of bolting as described below in Paragraph J "High-Strength Bolt Inspection and Process Monitoring" of high-strength bolt installation in pre-tensioned or slip-critical joints using turn-of-the-nut without matchmarking or calibrated wrench method of bolt installation.
 - c. Provide periodic verification of specified camber of steel beams.
- E. Field Testing: The Testing Laboratory shall provide the following tests in the field:
1. Test welds completed in the field according to Paragraph H "Weld Testing:" below.
 2. Test bolted connections completed in the field according to Paragraph I "High-Strength Bolt Testing."
 3. Perform bend tests on completed shear connectors attached to beams as required according to procedures outlined in AWS D1.1. In addition, perform

- field bend tests on an additional 2% of completed shear connectors on each beam but not less than one connector per beam.
4. Testing of Non-Shrink Grout for Base Plates, Bearing Plates, and Precast Wall Panels:
 - a. Compressive Strength Tests: Compressive strength of grout shall be determined by testing grout cubes according to the requirements of ASTM C 109 - Modified. Test one set of three cubes at one day, and one set of three cubes at 28 days.
 - b. Frequency of Testing: One set of cubes (6 cubes) shall be made for every ten base plates and bearing plates or fraction thereof but not less than one set for each day's operation. One set of cubes shall be made for each day's operation of grouting wall panels.
- F. Field Inspection: The Testing Laboratory shall provide the following inspections in the field:
1. Inspect galvanized HSS and other cold-worked structural steel members for cracking or other damage resulting from galvanizing process. Endeavor to complete inspections prior to erection of these members. Immediately notify Contractor and Architect/Engineer of any irregularities discovered.
 2. Provide continuous or periodic monitoring of field welding as described below in Paragraph G "Weld Inspection and Process Monitoring."
 3. Provide continuous or periodic monitoring of field bolting as described below in Paragraph I "High-Strength Bolt Inspection and Process Monitoring" of high-strength bolt installation in pre-tensioned or slip-critical joints using turn-of-the-nut without matchmarking or calibrated wrench method of bolt installation.
 4. Inspect welded or bolted connections that were completed, but not inspected, in the shop. Perform inspections according to Paragraph G "Weld Inspection and Process Monitoring" and/or Paragraph I "High-Strength Bolt Inspection and Process Monitoring" as appropriate.
 5. Obtain the planned erection procedure, and review with the Erector's supervisory personnel.
 6. Check the installation of base plates for proper leveling, grout type, and grout application.
 7. Check structural steel as received in the field for possible shipping damage, workmanship, and identification marking to conform to AISC 360 for structural steel and specified ASTM standards for other steel.
 8. Verify that surveys are occurring as specified to check plumbness and frame alignment as erection progresses. Review the submitted survey report.
 9. Periodically inspect the steel frame for such items as bracing and stiffening details, member locations, and joint details at each connection for compliance with approved construction documents.
 10. Inspect 100% of the column compression and base joints for verification that gaps in contact bearing do not exceed 1/16 inch. Gaps greater than 1/16 inch but less than 1/4 inch shall be reported to the OAR and Engineer for assessment. All gaps greater than 1/4 inch shall be shimmed according to Specification 05 12 00 "Structural Steel Framing."

11. Endeavor to guard the OAR against the Contractor cutting, grinding, reaming, or making any other field modification to structural steel without the prior approval of the Engineer. Report any noted unauthorized modifications to the OAR and Engineer.
- G. Weld Inspection and Process Monitoring: The Testing Laboratory shall make the following inspections of the welds and welding processes. Welds performed in the fabricating shop may be inspected in the field unless continuous monitoring of the welding process is herein specified or if access in the field due to other work or shop finishes makes field inspection impractical:
1. Approve Welding Procedure Specifications submitted by the Contractor. Approve any changes submitted by the Contractor to any WPS that has already been approved. Obtain the Welding Procedure Qualification Record (WPQR) for each successful WPS qualification.
 2. Periodically verify welding electrodes to be used and other welding consumables as the job progresses.
 3. Periodically observe joint preparation, assembly practice, welding techniques including preheating and sequence, and the performance of welders with sufficient frequency to assure compliance with code and contract document requirements. Check preheating to assure conformance with AWS D1.1, Section 5.6. Verify procedure for control of distortion and shrinkage stresses.
 4. Continuously observe joint preparation and fit up, backing strips, and runout plates for welded moment connections and column splices.
 5. Periodically provide visual inspection of the root pass of partial and complete joint penetration welds.
 6. Visually inspect 100 % of welds for proper size, length, location, and weld quality in accordance with AWS D1.1 requirements. Unless specifically noted otherwise, all welding shall be considered statically loaded nontubular connections.
 7. Visually inspect 100% of completed shear connectors on each beam.
 8. Visually inspect 100% of the welds of anchors to embedded plates that are to be cast into concrete elements.
 9. In addition to the inspections above, perform the following:
 - a. Continuously monitor and observe joint preparation, assembly practice, welding techniques including preheating and sequence, and the performance of welders for 100% of complete and partial joint penetration welds, plug and slot welds, multiple-pass fillet welds, and single-pass fillet welds greater than 5/16 inch.
 - b. Check preheating to assure conformance with AWS D1.1, Section 5.6. Verify procedure for control of distortion and shrinkage stresses.
 - c. Periodically monitor welding of single-pass fillet welds that are less than or equal to 5/16 inch.
 - d. Periodically monitor the welding of headed studs to floor beams.
 - e. Periodically monitor the welding of anchors to embedded plates that are to be cast into concrete elements.
- H. Weld Testing:

1. Perform nondestructive examination services using a qualified technician with the necessary equipment to perform the following:
 - a. Nondestructive examination conducted in accordance with the specific requirements for the item being examined including radiographic (RT), ultrasonic (UT), magnetic particle (MT), or dye-penetrant inspection (PT). Nondestructive inspection procedures shall conform to AWS D1.1.
 - b. Interpret, record, and report results of the nondestructive tests.
 - c. Mark for repair, any area not meeting Specification requirements. Correction of rejected welds shall be made in accordance with AWS D1.1.
 - d. Re-examine repair areas and interpret, record, and report the results of examinations of repair welds.
 - e. Verify that quality of welds meets the requirements of AWS D1.1.
2. Fillet Welds: Provide the following:
 - a. MT test a minimum of 10% of the length of each fillet weld exceeding 5/16".
 - b. Periodic MT testing of representative fillet welds 5/16" and less but need not exceed 10% of all such welds, except as required for high rejection rates as indicated in the following paragraph.
 - c. Increase MT testing rate for welders having a high rejection rate as required to ensure acceptable welds.
3. Partial Joint Penetration (PJP) Welds, including Flare-Bevel Groove Welds: Provide the following:
 - a. MT test a minimum of 25% of the length of each PJP weld exceeding 5/16" effective throat.
 - b. Periodic MT testing of representative PJP welds 5/16" and less but need not exceed 10% of all such welds, except as required for high rejection rates as indicated in the following paragraph.
 - c. Increase MT testing rate for welders having a high rejection rate as required to ensure acceptable welds.
4. Complete Joint Penetration (CJP) Welds: Provide the following:
 - a. All CJP welds exceeding 5/16" thickness shall be 100% UT tested per AWS D1.1 Clause 6 Part F. The Testing Laboratory shall review the CJP joints to determine where geometry or accessibility precludes the use of standard scanning patterns per AWS D1.1 Clause 6 Part F. At these locations the testing laboratory shall develop and submit for approval a written testing procedure in accordance with AWS D1.1 Annex S.
 - b. Periodic MT testing of representative CJP welds 5/16" and less not to exceed 10% of all such welds, except as required for high rejection rates as indicated in the following paragraph.
 - c. Increase MT testing rate for welders having a high rejection rate as required to ensure acceptable welds.
5. Acceptance Criteria:
 - a. Visual, MT, PT shall be per AWS D1.1 Table 6.1.
 - b. UT testing shall be per AWS D1.1 6.13.1 and Table 6.2.

6. Base metal thicker than 1.5 inches, where subjected to through-thickness weld shrinkage strains, shall be UT tested for discontinuities behind and adjacent to such welds. UT testing shall occur no sooner than 24 hours after the weld has cooled to ambient temperatures. Any material discontinuities shall be recorded on the basis of ASTM A 435 or ASTM A 898 (Level 1 criteria) and reported for Engineer disposition.
7. Field Welds of Anchors to Embedded Plates:
 - a. Headed Studs: Perform field bend tests according to AWS D1.1 on 2% of the studs welded to plates, but not less than one stud per plate.
 - b. Deformed Bar Anchors: Perform MT testing on 10% of deformed bar anchors larger than #5 bar.
8. The costs of repairing defective welds and the costs of retesting by the Testing Laboratory shall be borne by the Contractor. If removal of a backing strip is required by the Testing Laboratory to investigate a suspected weld defect, such cost shall be borne by the Contractor.
 - a. High-Strength Bolt Inspection and Process Monitoring: The Testing Laboratory shall perform the following inspections for connections joined with high-strength bolts. Bolting performed in the shop may be inspected in the field unless continuous monitoring of the bolting operation is specified herein:
9. Observe pre-installation verification testing of the pretensioning method to be used in accordance with the requirements of the "Specification for Structural Joints Using High-Strength Bolts".
10. Check daily the calibration of impact wrenches used in field bolted connections.
11. Inspect bolt installation for 100% of high strength bolted connections according to inspection procedures outlined in the "Specification for Structural Joints Using High-Strength Bolts".
12. Monitoring of Bolting Installation:
 - a. Continuous Monitoring: The Testing Laboratory shall be continuously present and monitor the bolting installation for compliance with the selected procedure for installation as specified in the "Specification for Structural Joints Using High-Strength Bolts" for joints using high-strength bolts that are designated on the plans as Pretensioned (PT) or Slip-Critical (SC) type joints and that are being installed using the calibrated wrench method or the turn-of-nut without match-marking method of installation.
 - b. Periodic Monitoring: All joint types and bolt installation methods shall be monitored on a periodic basis.
 - c. High-Strength Bolt Testing: The Testing Laboratory shall perform the following tests for connections joined with high-strength bolts:
13. Perform Arbitration Testing according to procedures outlined in the "Specification for Structural Joints using High-Strength Bolts" when a disagreement exists between the Testing Laboratory and the Fabricator as to the minimum tension of installed bolts that have been inspected according to paragraph below.

3.7 STEEL JOISTS

- A. Scope of Work: The Testing Laboratory shall perform inspection of steel joists as described herein.
- B. Quality Assurance:
 - 1. Verify that the fabricator maintains detailed quality control procedures that provide a basis for inspection control of workmanship and of the ability to conform to approved construction documents and industry standards. Verify that these procedures are complete and adequate relative to code requirements for fabricator's scope of work.
 - 2. Verify welding procedures, welder qualifications and weld material prior to the start of work.
 - 3. Review field welder qualifications by certification or verify by retesting. Obtain welder certificates.
- C. Source Inspection:
 - 1. Provide periodic inspection of the welding work in progress.
 - 2. Visually inspect 100% of welds prior to shipment of shop welded assemblies.
 - a. Verify camber requirements.
- D. Field Testing:
 - 1. Perform Magnetic Particle testing (MT) on representative field welds not to exceed 10% of such welds unless rejection rates become high, in which case, frequency of inspection shall be increased to ensure acceptable welding.
- E. Field Inspection: The duties of the Testing Laboratory shall be as follows:
 - 1. Inspect joists for damage during shipment.
 - 2. Visually inspect 100% of welded chord splices for compliance with SJI and project specifications.
 - 3. Confirm bolting of joists to supports at column lines as required by OSHA requirements.

3.8 STEEL DECKING

- A. Field Inspection:
 - 1. Check steel deck as received in the field for possible shipping damage, workmanship, and identification marking to conform to specified ASTM standards for steel deck.
 - 2. Periodically monitor the method of attaching the steel floor and roof decking to the structural frame.
 - 3. Visually inspect 100% of the welding or other attachment method of steel deck to the structure and at side laps.

3.9 COLD-FORMED METAL FRAMING

- A. Field Inspection:

1. Periodically inspect welding of main wind-force-resisting systems.
2. Periodically inspect screwing, bolting, anchoring and other fastening techniques used to attach components of the main wind-force-resisting systems, including shear walls, braces, diaphragms, collectors, and hold downs.

3.10 EARTHWORK

A. Quality Assurance:

1. Welder Qualifications: Verify welder qualifications either by certification and/or by retesting. Obtain welder certificates.

B. Field Testing:

1. Compacted Fill:

- a. Verification of Fill Material: Perform classification and testing to verify that the fill material to be used complies with the project specifications.
- b. Field Density Testing: Perform field density testing as described below:
 - 1) Field density tests shall be run according to ASTM D 2937 or ASTM D 6938 as applicable.
 - 2) Acceptance Criteria: The results of field density tests by the Laboratory will be considered satisfactory if the average of any three consecutive tests has a value not less than the required density with no single test falling more than 2 percent below the required density and the moisture content conforms to the requirements of the specification.
 - 3) Test Frequency for Paved Areas and Building Slab Subgrade:
 - a) Make at least one field density test of the natural subgrade for every 2500 square feet of paved area or building slab but in no case less than three tests.
 - b) In each compacted fill layer or lift, make one field density test for every 2500 square feet of building slab or paved area but in no case less than three tests.
 - 4) Test Frequency for Foundation Wall Backfill: Make at least one field density test for each 200 lineal feet of wall with a minimum of 4 tests for the basement walls around the perimeter of each building and a minimum of one test for every other type of foundation wall on the site. Tests shall be performed in random lifts along each wall.
 - 5) Test Frequency for Compacted Fill beneath Column and Wall Footings and Mat Foundations: Make at least one field density test in each compacted fill layer or lift for each column footing, one for each twenty-five lineal feet of wall and one for each 2,500 square feet of mat foundation area or fraction thereof.
- c. Report Copies: Moisture-density curves and results of field density tests shall be submitted to the parties specified earlier in this section.
- d. Additional Testing: If reports by the Laboratory indicate field densities lower than specified, additional tests will be run by the Laboratory with

at least the frequencies scheduled above on recompacted fill and/or natural subgrade. The Testing Laboratory shall notify the Contractor on a timely basis for any required retesting so as not to delay the work. The costs of such tests shall be borne by the Contractor.

2. Spread (Excavated) Footings
 - a. Concrete Cylinders: Make and test concrete cylinders as specified for Cast-in-Place Concrete.
- C. Field Inspection by the Testing Laboratory:
 1. The Testing Laboratory shall provide inspection of materials used in foundation elements as described below.
 2. Compacted Fill:
 - a. Subgrade below Compacted Fill: Observe and verify that the subgrade below compacted fill has been properly prepared before compact fill construction begins.
 - b. During placement and compaction of fill, determine that the material being used and the maximum lift thickness comply with the specifications.

END OF SECTION 01 45 29

SECTION 34 70 00 - FDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE
CONSTRUCTION, DATED 2022

PART 1 - GENERAL

1.1 Purpose

- A. The purpose of this Section is for the adoption by Reference of, The **Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2022 Edition (FDOT Standard Specifications)**, for Technical Criteria and Description of the Division II – Construction Details, and Division III - Materials, which are typically associated with roadway construction and related work.
- B. Adoption of these FDOT Standard Specifications shall not be limited to roadway construction, but may include but not be limited to, Paving, Grading, and Drainage improvements related to Site Work/Civil Projects of the Greater Orlando Aviation Authority, as applicable.
- C. Unless specifically stated otherwise, Division 1 of this Project Manual, take precedence over the applicable sections of the FDOT Standard Specifications, i.e. Division I – General Requirements and Covenants.

1.2 Related Documents

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections including sustainability requirements, apply to this Section.
- B. When the FDOT Standard Index Drawings are referenced on the Drawings or in the Contract Documents, the work or item shall comply with the Florida Department of Transportation Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System, 2022 Edition, except as specifically modified elsewhere in the Contract Documents.

PART 2 – DEFINITIONS

2.1 Definition of Terms

- A. The following paragraphs redefine the FDOT terms (as listed in Division I, Part 1) to be consistent with the Contract Documents.
 - 1. **Contractor** shall mean the entity entering into the Contractual Agreement with the Greater Orlando Aviation Authority for the execution and delivery of the project.
 - 2. **Contractor's Engineer of Record** shall mean an Engineer, Licensed by the State of Florida, hired by the Contractor to perform Professional Engineering Design Services

- related to the project. Submittals made by the Contractor's Engineer of Record to the Owner under the provisions of Division 1, shall carry his/her signature, date and seal. (**Related Definition: Contractor's Surveyor** shall mean a Surveyor hired by the Contractor to perform project related services, such as but not limited to, staking and layout of lines and grades of the work, and recording As-Built (As-Constructed) conditions. Submittals made by the Contractor's Surveyor to the Owner under the provisions of Division 1, shall be prepared from a Florida Licensed Surveyor, and shall carry his/her signature, date and seal.)
3. **Department**, where used to denote an approved plant, material, product, or similar reference, shall mean the Florida Department of Transportation. Where used to denote the Contracting Entity, it shall mean the Greater Orlando Aviation Authority, or the Owner.
 4. **Engineer** shall mean the Greater Orlando Aviation Authority, Department of Engineering and Construction, or their duly authorized representative, (Owner's Authorized Representative, or OAR).
 5. **Engineer of Record** shall mean the Professional Engineer or Engineering Firm that develops the criteria and concept for the project, performs the analysis, and is responsible for the preparation of the Plans (Drawings) and Specifications of the work.
 6. **Inspector** shall mean a duly authorized entity of the Greater Orlando Aviation Authority, the OAR, the Engineer of Record, and/or the City of Orlando, assigned to make official inspections of the materials furnished and of the work performed by the Contractor. Additional Inspection Oversight may be performed by any Authority Having Jurisdiction (AHJ), including but not limited to the Water Management District, Florida Department of Environmental Protection, etc.
 7. **Laboratory** shall mean any official testing laboratory used by the Greater Orlando Aviation Authority, the OAR, the Engineer of Record, and/or the City of Orlando. (**Related Definition: Contractor's Laboratory** shall have a similar definition representing the Contractor for Quality Control purposes, and/or for confirmation/comparison to the Laboratory's testing results.)
 8. **Right of Way** shall not be limited to defined limits of titled land around a roadway. As used in the FDOT Standard Specifications, Right of Way shall encompass all areas where the specified work is depicted in the Contract Documents.
 9. **Secretary** shall mean the Greater Orlando Aviation Authority, Department of Engineering and Construction, or their OAR.
 10. **Specialty Engineer**: See **Contractor's Engineer of Record**, except used for the design and drawing preparation of components, systems, or installation methods and equipment for specific temporary portions of the work, or for special items of the permanent works not fully detailed in the plans and required to be furnished by the

ORLANDO INTERNATIONAL AIRPORT
BP-S195, TERM C, PH 1X
AIRSIDE CONCOURSE

FDOT STANDARD SPECIFICATIONS
FOR ROAD AND BRIDGE
SECTION 34 70 00

Contractor such as but not limited to foundation designs, non-standard expansion joints, MSE wall designs, and other specialty items.

END OF SECTION 347000

34 70 00 - 3

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ADDENDUM NO. 08

(Issued July 22, 2022)

**TO THE BID DOCUMENTS FOR
BP-S00195, TERMINAL C, PHASE 1X AIRSIDE CONCOURSE**

ORLANDO INTERNATIONAL AIRPORT

ADDENDUM NO. 08

TO ALL HOLDERS OF CONTRACT DOCUMENTS

1. Your attention is directed to the following interpretations of, changes in, and/or additions to the contract documents for the above-named project
2. This addendum is part of the Contract Documents
3. Bidders are required to acknowledge receipt of this Addendum in the space provided on the Bid Form Section 00 41 13

BP-S196 Addenda Files are being sent for reference

- BP-S196 – Addendum No. 3 Narrative
- BP-S196 – Addendum No. 4 Narrative
- BP-S196 – Addendum No. 5 Narrative
 - CE7.00.07.pdf
 - CE7.00.08.pdf
 - CE7.00.08A.pdf
 - CE7.00.09.pdf
 - CE7.00.11.pdf
 - E0.01.01.pdf
 - E2.05.13.pdf
 - E7.00.08.pdf
 - E7.00.18.pdf
 - E7.01.14.pdf
 - JFC1.11.19.pdf
 - JFE1.11.08.pdf
 - C9.01.03.pdf
 - C14.01.06.pdf

- C14.01.07.pdf
- C14.01.08.pdf
- C14.01.09.pdf
- C15.01.33.pdf
- C15.01.35.pdf
- C60.01.04.pdf
- CE0.00.01.pdf
- CE3.00.00.pdf
- CE3.00.07.pdf
- CE3.00.08.pdf
- CE3.00.15.pdf
- CE3.00.16.pdf
- P-501 - Cement Concrete Pavement_Add_5.pdf
- P-605 - Joint Sealants for Pavements_Add_5.pdf
- T-904 - Sodding_Add_5.pdf
- 00 01 00 - Table of Contents.pdf
- 22 37 00 - Potable Water Cabinet_Add_5.pdf
- 26 05 00 - Common Work Results for Electrical_Add_5.pdf
- 26 05 12 - OUC Underground Electric_Add_5.pdf
- 26 05 43 - Underground and Raceways for Electrical Systems_Add_5.pdf
- 26 57 01 - South RON Electrical Distribution System_Add_5.pdf
- 33 52 47 - Fuel System Valves and Equipment_Add_5.pdf
- D-751 - Manholes Catch Basins and Inspection Holes_Add_5.pdf
- L-108 - Underground Power Cable for Airports_Add_5.pdf
- L-115 - Electrical Manholes and Junction Structures_Add_5.pdf
- P-152 - Excavation, Subgrade, and Embankment_Add_5.pdf

Misc. Files Added:

- Berg Underground Power Distribution As-Builts for P1X
- South Trailer Complex (Ref. BQ #26)
- STC Temp Construction Equipment Airspace Determinations (Ref. BQ#85,88)
- BP-S195 Bid Schedule (Airfield Civil, Electrical and Fueling Works – dated 7/21/22)

Revised Specifications

The following Specifications have been revised by this Addendum and are included as attachments to this Addendum:

- 08 44 13 – Glazed Curtain Walls and Skylights
- 09 00 01 – Finish Key

Added Specifications

The following Specifications have been added by this Addendum and are included as attachments to this Addendum:

- 00 01 00 – Table of Contents – Vols. 2-5
- 04 22 00 – Concrete Masonry Unit
- 32 18 13 – Synthetic Turf Surfacing

Deleted Specifications

The following Specifications have been deleted by this Addendum:

- 03 47 00 – Tilt Up Concrete
- 05 51 16 – Metal Floor Plate Stairs
- 05 53 13 – Bar Gratings
- 05 53 16 – Plank Gratings
- 05 73 00 – Decorative Metal Railings
- 05 73 10 – Smoke Baffle System
- 06 42 16 – Flush Wood Paneling
- 07 41 10 – Metal Canopy Cladding System
- 07 41 13.16 – Standing-Seam Metal Roof Panels
- 08 14 16 – Flush Wood Doors
- 08 33 10 – Security Grilles
- 08 34 53 – Bullet Resistant Hollow Metal Doors and Frames
- 08 34 63 – Detention Doors and Frames
- 08 35 13.23 – Accordion Folding Fire Doors
- 08 56 67 – Bullet-Resistant Transaction Windows
- 08 71 63 – Detention Door Hardware
- 08 84 00 – Plastic Glazing
- 08 88 00 – Special Function Glazing
- 09 27 13 – Glass-Fiber-Reinforced Gypsum Fabrications
- 09 51 23 – Acoustical Tile Ceilings
- 09 54 33 – Specialty Metal Ceilings
- 09 54 36 – Suspended Decorative Grids
- 09 69 00 – Access Flooring
- 09 78 00 – Interior Wall Paneling
- 09 82 60 – Acoustical Plaster Systems
- 09 83 16 – Spray-Applied Acoustical Finish System
- 09 84 33 – Sound-Absorbing Wall Units
- 09 94 13 – Textured Plaster Finish
- 10 14 10 – Vehicle Direction Signage
- 10 21 14 – Detention Stainless-Steel Modesty Panels
- 10 22 26 – Operable Partitions

- 10 26 41 – Bullet Resistant Panels
- 10 51 13 – Metal Lockers
- 10 71 13 – Exterior Sun Control Devices
- 10 71 53 – Debris Containment Netting
- 10 73 16 – Aluminum Canopies
- 10 81 13 – Bird Control Devices
- 11 13 16 – Loading Dock Seals and Shelters
- 11 14 53 – Pedestrian Security Breach Control System
- 11 30 13 – Residential Appliances
- 12 21 13 – Horizontal Louver Blinds
- 12 24 13 – Roller Window Shades
- 12 36 16 – Metal Countertops
- 12 48 43.23 – Anti-Fatigue Floor Mats
- 12 93 00 – Site Furnishings
- 13 46 00 – Transparent Bullet Resistant Assemblies
- 13 47 13 – Cathodic Protection System
- 14 91 82 – Trash Chutes

Revised Drawings

The following drawings have been revised by this Addendum and are included as attachments to this Addendum:

- A3.12.21 – Revised finish call-out (BQ#70)
- A3.12.22 – Revised finish call-out (BQ#70)
- A4.12.36 – Revised finish call-out (BQ#70)
- A5.11.09 – Revised Reference To 07 24 23 (BQ# 44)
- A6.11.01 – Revised door schedule (BQ#31/32/33 and corrected incorrect addendum reference.)
- A6.12.01 – Revised finish call-out (BQ#70)
- G0.01.01 – Removed Sheet A5.14.15-Trash Chute Details From Index Sheet (BQ# 60)

Responses to Bidders Questions

<i>Bidder Questions</i>	<i>Responses</i>
<i>Question 1: We would like to be listed as an Approved Lightning Protection Manufacturer on this project and future projects.</i>	Response 1: The Manufacturer's product will need to comply with all requirements listed in Section 01 25 00 Substitutions Procedures.
<i>Question 2: In order to be able to meet the requirements of the Terminal C-Phase 1x Request for Proposal, we would like to request a bid date extension to August 9th, 2022 Please confirm this is acceptable.</i>	Response 2: Per Addendum No. 5, sealed bids will be received up to 2:00 p.m. local time, August 2, 2022.

<p><i>Question 3: I do not see the Minimum wages for the Davis Bacon Act. Can you please provide those?</i></p>	<p>Response 3: Davis Bacon Act minimum wages were incorporated by Addendum No. 1 into Volume 1 of the Project Manual. See Special Provisions Section SP-1.</p>
<p><i>Question 4: Are the passenger boarding bridges, PCA, GPU and other ancillary gate equipment procurement and installation a part of this bid? If not, how will they be procured and installed.</i></p>	<p>Response 4: PBBs and GPU's will be procured and installed by the Owner and are not part of this bid. PBB Air Handlers will be procured and installed by the Owner and are not part of this bid. Final connection of Glycol Lines from the building to the PBB Air Handlers will be part of the Contractor's bid. Potable water cabinets will be procured by the owner and are not part of this bid, final connection of potable water line from the building to the potable water cabinet will be part of the Contractor's bid.</p> <p>Other ancillary gate equipment that is beyond the face of the building such as baggage conveyance equipment, supplemental air conditioning, etc., and that is associated with the passenger boarding bridges will be procured and installed by the owner as part of passenger boarding bridge procurement.</p>
<p><i>Question 5: RFI #1, Item #1– 274133 - AV Touchscreen Controller Specification Section 274133 Section 2.3.K specifies a 10" color touch screen is to be provided as part of the IP Master Antenna Television System (IPTV). The IPTV System Block Diagram on drawing TA6.01.01 does not illustrate any touch screen controllers to be part of the IPTV system. Please confirm the touchscreen controller is not required. If it is required, please provide an updated block diagram illustrating all required connectivity and components.</i></p>	<p>Response 5: The Touch Screen Controller is required and will be field located in one of the IDF rooms per GOAA IT as the project progresses.</p>
<p><i>Question 6: RFI #1, Item #2– 274133 – Networked AV Media Player Specification Section 274133 Section 2.3.G specifies a Networked AV Media Player is to be provided as part of the IP Master Antenna Television System (IPTV) but does not provide a model number as the basis of design. The specified manufacturers do not appear to provide models that meet the specified performance requirements. Please confirm a Brightsign XT1144 is an approved Networked AV Media Player and is compatible with the existing GOAA IPTV infrastructure. If not, please provide the manufacturer and model number of the required Media Player.</i></p>	<p>Response 6: The XT114 is acceptable.</p>

<p><i>Question 7: RFI #1, Item #3– 274220 – Fiber Channeling Contractor</i> <i>Specification Section 274220 Section 1.3.B specifies Fiber Channeling as described in Specification Section 271000 to be part of the Scope of Work for the Electronic Dynamic Signage System. Specification Section 271000 Section 1.3.C states that Fiber Channeling is to be provided by hiring the services of a GOAA Continuing Contractor. Specification Section 271000 does not provide any method for contacting the required contractor(s). Please provide the contact details for the required Fiber Channeling Contractor(s).</i></p>	<p>Response 7: Advanced Cable Connection, Inc. (ACCI): Project Manager: Alan Jones Phone (Office): 813-978-0101 EXT 249 Phone (Cell): 401-263-4070</p> <p>Orion Management: Florida Operations Manager: Billy Nobles Phone (Office): 321-453-4668 EXT 238 Phone (Cell): 321-615-2804</p> <p>Orlando Business Telephone Systems (OBTS): Project Manager: Tom Roberts Phone (Office): 813-978-0101 EXT 249 Phone (Cell): 321-239-3831 Project Manager: Bart Baranack Phone (Office): 321-239-4679 Phone (Cell): 321-239-3831</p> <p>Quality Cable Contractors, Inc (QCCI): President: Jorge del Rio Phone (Office): 407-246-0606 Phone (Cell): 407-468-6238</p> <p>Precision Contracting Services (PCS): Dir Ent Networks: Rick Arnold Phone (Office): 561-360-1104 Phone (Cell): 407-578-9607.</p>
<p><i>Question 8: RFI #1, Item #4– 274220 – Spare Materials</i> <i>Specification Section 274220 Section 1.12 specifies spare materials that are to be provided as part of the Electronic Dynamic Signage System. The language appears to mirror the original project specifications and requires spare materials in excess of the spare materials previously provided. Please clarify if additional spare materials are required as part of P1X, or if the specified spare materials can be disregarded. If additional spare materials are required, please clarify the quantities and models that are required.</i></p>	<p>Response 8: Refer to 1.12.D for the minimum requirements. Omit the Outdoor LED.</p>

<p><i>Question 9: RFI #1, Item #5– 275113 – Local Volume Controls</i> <i>Specification Section 275113 specifies the AtlasIED AT##-PA Local Volume Control to be provided where indicated on the drawings. The TA-Series drawings do not appear to illustrate any local volume controls to be part of the Emergency Communication System. Please confirm the specified local volume controls can be disregarded. If not, please provide updated block diagram and floor plan drawings illustrating all required connectivity and locations.</i></p>	<p>Response 9: None are currently shown in plan but may become necessary due to future revisions and/or tenant requests, provide only when shown on plans.</p>
<p><i>Question 10: RFI #1, Item #6– 275113 – Spare Materials</i> <i>Specification Section 275113 Section 1.12 specifies spare materials that are to be provided as part of the Emergency Communication System. The language appears to mirror the original project specifications and requires spare materials in excess of the spare materials previously provided. Please clarify if additional spare materials are required as part of P1X, or if the specified spare materials can be disregarded. If additional spare materials are required, please clarify the quantities and models that are required.</i></p>	<p>Response 10: See Revised Spare Material Schedule below</p> <ol style="list-style-type: none"> 1. (5) of each style AMP Card used 2. (2) AMP Mainframes 3. (2) Multifunction IO 4. (5) Ambient Sensor Collectors 5. (5) of each style Mic stations 6. Ceiling Speakers <ol style="list-style-type: none"> a. (20) Type 00 b. (5) Type 01 7. Wall Speakers <ol style="list-style-type: none"> a. (10) Type 01 b. (2) Type 06
<p><i>Question 11: RFI #1, Item #7– Communication System Terminal Cabinet</i> <i>The TA-series drawings illustrate CSTC terminal cabinets in the MDF/IDF rooms. Specification Section 275113 does not specify a manufacturer or model number for the CSTC cabinets. Please provide the manufacturer and model number for the required cabinets.</i></p>	<p>Response 11: Shall be per DIV 26 and DIV 27 general specification for terminal cabinets and junction boxes for additional requirements, and detail on drawings.</p>
<p><i>Question 12: RFI #1, Item #8– 275113 – Additional Devices</i> <i>Specification Section 275113 Section 1.13 specifies additional devices to be provided as part of the Emergency Communication System. The language appears to mirror the original project specifications and requires additional devices in excess of the additional devices previously provided. Please clarify if additional devices are required as part of P1X, or if the specified additional devices can be disregarded. If additional devices are required, please clarify the quantities and models that are required.</i></p>	<p>Response 12: Devices shall be per specifications.</p>

<p><i>Question 13: RFI #1, Item #9– 275113 – Fire Alarm Interface</i> <i>The Head End Fire Alarm Interface block diagram on drawing TA5.02.24 notes that the contractor is to “PROVIDE THIS DETAIL (x2) IN HEAD END. TOTAL OF (2) OF EACH CONNECTION SHOWN BELOW.” Please confirm a quantity of four (4) AtlasIED IP116 ECS System Controllers are required to accommodate the illustrated and noted connectivity.</i></p>	<p>Response 13: Will remove note requiring detail x2, only (2) total ACS to support additional equipment are required.</p>
<p><i>Question 14: RFI #1, Item #10– 275113 – Logic Relay Module</i> <i>The Head End Fire Alarm Interface block diagram on drawing TA5.02.24, as well as the ECS Block Diagrams on drawing TA6.12.20 and TA6.12.21 illustrate connectivity for a Logic Relay Module. Specification Section 275113 specifies the AtlasIED IED1516LI to be the Logic Relay Module. The IED1516LI does not have Relay Outputs as illustrated on the block diagrams. Please confirm the IED1516LI is the required interface module.</i></p>	<p>Response 14: Specifications will be revised to indicate correct part number IED: 1522LR 2 Input x 2 Relay Output.</p>
<p><i>Question 15: RFI #1, Item #11– Type C41 Displays</i> <i>The Display Schedule on drawing TA7.01.01 notes the Type C41 displays and mounts to be TBD “Pending response to RFI 1135.” Please provide a manufacturer and model for the Type C41 displays and mounts that can be included as a baseline value for the purpose of accurately estimating the project.</i></p>	<p>Response 15: Refer to specification 27 42 20 part 2.3.B.b. Gable Z-Clip LED Cabinet Bracket. Note that the displays and supporting AV equipment for this sign type is also Owner Furnished.</p>
<p><i>Question 16: RFI #1, Item #12– Type C06 FIDS Wall</i> <i>The Display Schedule on drawing TA7.01.01 notes the Type C06 displays to require six (6) displays and to be “14 Phase 1.” The display detail on drawing X8.00.18 illustrates the Type C06 displays to have twenty (20) displays. Please confirm the quantity of displays required for each Type C06 location.</i></p>	<p>Response 16: 20 Displays.</p>
<p><i>Question 17: RFI #1, Item #13– Type C07 Information Tower</i> <i>The Display Schedule on drawing TA7.01.01 notes the Type C07 display to be two sided and require two (2) displays. The display detail on drawing X8.00.19 illustrates the Type C07 displays to have two (2) displays on both front and back. Please confirm the quantity of four (4) displays are required for each Type C07 location.</i></p>	<p>Response 17: 4 Displays.</p>

<p><i>Question 18: RFI #1, Item #14– 275113 – Mic Station Cabling</i> <i>Specification Section 275113 Section 1.3.C states that PAS Signal Cabling falls under the scope of work for the Emergency Communication System contractor. Specification Section 275113 Section 2.13.A refers to the Network Cabling requirements to Specification Section 271000 for the Horizontal Cabling that would be required for the Microphone Paging Stations. Please clarify who is to provide the network cabling for the Microphone Paging Stations.</i></p>	<p>Response 18: To be coordinated with CM / GC.</p>
<p><i>Question 19: RFI #1, Item #15– 275113 – Additional Mic Station Quantity</i> <i>Specification Section 275113 Section 2.8.A specifies the provision of an “additional twenty-five (25) stations and all associated cable, conduit, labor, programing and materials to be located where directed by GOAA.” The language appears to mirror the original project specifications and requires devices in excess of the additional devices previously provided. Please clarify if additional devices are required as part of P1X, or if the specified additional devices can be disregarded.</i></p>	<p>Response 19: Will revise specifications, provide additional (5) Type 1 Station only.</p>
<p><i>Question 20: RFI #1, Item #16– 275113 – Type 4 Wall Speakers</i> <i>Specification Section 275113 Section 2.10.6 specifies the Renkus-Heinz ICL-F-DUAL-RN to be the Type 4 Wall Speaker. The TA-Series drawings do not appear to illustrate any Type 4 Wall Speakers to be part of the Emergency Communication System. Please confirm the specified Type 4 Wall Speakers can be disregarded. If not, please provide updated block diagram and floor plan drawings illustrating all required connectivity and locations.</i></p>	<p>Response 20: Will revise specifications and remove type 4 wall speakers as they are not used in this phase.</p>
<p><i>Question 21: RFI #1, Item #17– 275113 – Type 5 Wall Speakers</i> <i>Specification Section 275113 Section 2.10.6 specifies the AtlasLED ALA5T to be the Type 5 Wall Speaker. The TA-Series drawings do not appear to illustrate any Type 5 Wall Speakers to be part of the Emergency Communication System. Please confirm the specified Type 5 Wall Speakers can be disregarded. If not, please provide updated block diagram and floor plan drawings illustrating all required connectivity and locations.</i></p>	<p>Response 21: Will revise specifications and remove type 5 wall speakers as they are not used in this phase.</p>

<p><i>Question 22: I came across your project mentioning IPTV in the spec. VITEC is a leading manufacturer of IPTV, Signage and Videowall solutions and I wanted to see if it makes sense for us to bid on this project. There weren't any details and I'm reaching out to see if you can refer me to someone to speak with or an area that lists specific for the IPTV requirement and how we can be included in the bid process.</i></p>	<p>Response 22: The IPTV details are in the plans and specifications. Refer to the TA series plans for Dynamic Signage and IPTV locations, quantities, logic diagrams and details. Refer to specification 27 41 33 for IPTV requirements. Refer to 27 42 20 for dynamic signage requirements.</p>
<p><i>Question 23: Please provide current prevailing wages to be used for this project.</i></p>	<p>Response 23: Refer to Response for Question 3.</p>
<p><i>Question 24: Section 30-20 Award of contract, indicates that proposal shall be valid for the duration of the Bid Guarantee period as indicated in section 20. Under section 20-13 - Bid Security, it indicates bid shall not be withdraw for a period of 30 days. Please confirm that bidder's validity of proposal is 30 days as well. If not, then indicate how many days the bidder's proposal shall be valid for.</i></p>	<p>Response 24: This was revised in Addendum No. 1 to 93 days.</p>
<p><i>Question 25: When is the expected start date for the project?</i></p>	<p>Response 25: Expected NTP for this work is 12/6/2022.</p>
<p><i>Question 26: Section 01 50 00 - Temporary Facilities and Control, paragraph 1.2 D, temporary facilities or location are not stated. Please clarify if field offices will be required for Owner and GCs. If new offices are to be provided, indicate minimal criteria and scope so we can price accordingly.</i></p>	<p>Response 26: No field offices will be required for the Owner. See "South Trailer Complex.pdf" for reference. GOAA will provide office trailer space for up to ten (10) employees in the existing GOAA trailer complex highlighted in red. Contractors will be allowed to place temporary field offices / trailers on site in the blue area located along Terminal C Service Road. All office supplies, office operating costs, and any additional fit-out and furniture by Contractor.</p>
<p><i>Question 27: See attached filled out SSI form as provided in section 03 73 93.03 - Special Procedures for Sensitive Security Information. Please provide any additional specifications or drawings associated to Division 28 (physical access control systems, intrusion detection system, video surveillance).</i></p>	<p>Response 27: There are no additional specifications or drawings associated with Division 28 that are under SSI protection required for Bid Documents.</p>
<p><i>Question 28: Please clarify who is responsible to furnish and install the passenger boarding bridges.</i></p>	<p>Response 28: Refer to Response for Question 4.</p>
<p><i>Question 29: Bird Control Devices is included in the specifications but do not find any on the drawings. Please confirm no Bird Control Devices (Bird Netting) for P1X.</i></p>	<p>Response 29: Confirmed; there are no bird control devices for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 30: Roller Window Shades is included in the specifications but do not find any on the drawings. Please confirm no Roller Window Shades for P1X.</i></p>	<p>Response 30: Confirmed; there is no roller shade requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>

<i>Question 31: The 2nd level door schedule is duplicated on sheet A6.11.01</i>	Response 31: Duplicated schedule has been removed.
<i>Question 32: Sheet A1.12.34 openings are not in the 2nd level Door Schedule. Please provide</i>	Response 32: Door Schedule updated in Addendum No. 08 to include missing doors.
<i>Question 33: Sheet A1.12.39 openings are not on the Door Schedule. Please provide</i>	Response 33: Door Schedule updated in Addendum No. 08 to include missing doors.
<i>Question 34: Exit Stair doors on Intl level (ex. 04.6087C) have a passage set lock spec'd. We do not believe that will not work at those locations. Please confirm or clarify.</i>	Response to be provided in a future addendum
<i>Question 35: STC Landside had a temp power transformer adjacent to P1x that the electrician used to permit HP's temp power plan (see sketch attached). Please answer the following questions taking this information into consideration: 1) Is this transformer still onsite? 2) Conduit, pathways & cabling, DB still intact?, 3) If everything has been removed from its current location, is the transformer onsite for use?, 3) If the transformer and pathways are not available, we are we to get temporary power from?</i>	Response 35: The existing service is a 1,200 amp 480V 3-phase service at the SE corner of the ASC Phase 1 building. There is a 4" conduit from this to a 48"x60" pullbox which continues into the P1-X construction area at column Y15/D12. The plan is to leave the transformer and DP in place for the P1X construction.
<i>Question 36: Drawing A5.14.15 indicate Trash Chute Details but cannot find any trash chute on the floor plans. Please confirm there are no trash chutes required for P1X. If none required, please remove drawing A5.14.15 from contract documents.</i>	Response 36: There are no trash chutes for this project. Sheet A5.14.15 and specification section 14 91 82 are deleted. Index sheet and Table of Contents are updated to reflect this change.
<i>Question 37: Tilt Up is included in the specifications but none was found within the drawings. Please confirm Tilt-Up does not apply for P1X.</i>	Response 37: Confirmed; there is no tilt up requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 38: Metal Floor Plate Stairs is included in the specifications, but none was found within the drawings. Please confirm Metal Floor Plate Stairs do not apply for P1X</i>	Response 38: Confirmed; there is no Metal Floor Plate Stair requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 39: Smoke Baffle System is included in the specifications, but none was found within the drawings for P1X areas. Please confirm Smoke Baffle System does not apply for P1X</i>	Response 39: Confirmed; there is no Smoke Baffle System requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 40: Please provide locations and details for passenger boarding bridge foundations</i>	Response 40: See Addendum No. 07 for foundation information.
<i>Question 41: Please provide miles stone dates for Owner provided Baggage Handling System (installation, commissioning, etc.)</i>	Response 41: Owner, BHS DBOM Contractor and the GC will prepare an integrated project schedule with the goal of completing the job together.
<i>Question 42: Please confirm that the bid schedule provided in Addendum #3 - BPS195 Bid Schedule for civil work should db e included in the proposal as part of the base bid amount</i>	Response 42: Confirmed.

<p><i>Question 43: Bid schedule, item C-106-4.2 provided in addendum 3 has a line item for temporary fence with Jersey Barrier. Please indicate if the Jersey barrier has to meet AOA requirements or it can be a regular jersey barrier.</i></p>	<p>Response 43: All temporary fence with or without jersey barrier shall be AOA requirements. All costs associated to this shall be incidental to the fencing pay items. There shall be no gaps larger than 2-inches.</p>
<p><i>Question 44: Detail A1 on A5.11.09 references specification 09 25 13.13. This specification is not included in the Project Manual. Please clarify if the Acrylic Plaster Finish indicated at this location is to follow 09 24 00 Cement Plastering, 07 24 23 Direct-Applied Finish System, or another specification for this application.</i></p>	<p>Response 44: This is revised to show 07 24 23; see revised sheet A5.11.09 included in Addendum No. 08.</p>
<p><i>Question 45: Will temporary parking be provide for subcontractor employees? Please clarify.</i></p>	<p>Response 45: Subcontractor employees may park in the Site Logistics Craft Parking Lot along Terminal C Service Road. See "South Trailer Complex.pdf" area highlighted in blue.</p>
<p><i>Question 46: Please clarify if insulated concrete masonry units are to be used on this project. If so, please indicate location or wall type.</i></p>	<p>Response 46: Insulated concrete masonry units are not being used for this project. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>

<p><i>Question 47: Please review and advise as relates to Division 08 Specifications for Airside Concourse P1X:</i></p> <p><i>1) 08 14 16 – Flush Wood Doors – There are currently no doors listed on Door Schedule to be Wood. Please confirm no Wood Doors, and if not, remove Specification</i></p> <p><i>2) 08 33 10 – Security Grilles - There are currently no Security Grilles listed on Door Schedule. Please confirm no Security Grilles, and if not, remove Specification</i></p> <p><i>3) 08 34 53 – Bullet Resistant Hollow Metal Doors and Frames - There are currently no doors or frames listed on Door Schedule to be Bullet Resistant (BRBP). Please confirm no BRBP Doors or Frames, and if not, remove Specification.</i></p> <p><i>4) 08 34 63 – Detention Doors and Frames - There are currently no doors or frames listed on Door Schedule to be Detention Doors and Frames. Please confirm no Detention Doors and Frames, and if not, remove Specification</i></p> <p><i>5) 08 35 13.23 – Accordion Folding Fire Doors - There are currently no doors listed on Door Schedule to be Accordion Folding Fire Doors. Please confirm no Accordion Folding Fire Doors and if not, remove Specification</i></p> <p><i>6) 08 56 67 – Bullet Resistant Transaction Windows - There are currently no openings listed on Door Schedule to be Bullet Resistant Transaction Windows. Please confirm no Bullet Resistant Transaction Windows and if not, remove Specification</i></p> <p><i>7) 08 71 63 – Detention Doors Hardware - There are currently no doors or frames listed on Door Schedule to be Detention Doors. Please confirm no Detention Doors, and if not, remove Specification</i></p> <p><i>8) There are six (6) Doors and Frames listed on the Door Schedule to be Stainless Steel (SS) but there is no Specification provided. Please confirm doors and frames to be SS and if so, please provide Specification.</i></p>	<p>Response 47: 1) There are no Flush Wood Doors 2) There are no Security Grilles 3) There are no Bullet Resistant Metal Doors 4) There are no Detention Doors and Frames 5) There are no Accordion Folding Fire Doors 6) There are no Bullet Resistant Transaction Windows 7) There are no Detention Doors</p> <p>See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 48: Detention Stainless Steel Modesty Panels are included in the specifications but do not find any on the drawings. Please confirm no Detention Stainless Steel Modesty Panels for P1X.</i></p>	<p>Response 48: Confirmed; there is no Detention Stainless Steel Modesty Panel requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 49: Operable Panel Partitions is included in the specifications but do not find any on the drawings. Please confirm no Operable Panel Partitions for P1X.</i></p>	<p>Response 49: Confirmed; there is no Operable Panel Partitions requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>

<i>Question 50: Bullet Resistant Panels are included in the specifications but do not find any on the drawings. Please confirm no Bullet Resistant Panels for P1X.</i>	Response 50: Confirmed; there is no Bullet Resistant Panels requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 51: Metal Lockers are included in the specifications but do not find any on the drawings. Please confirm no Metal Lockers for P1X.</i>	Response 51: Confirmed; there is no Metal Lockers requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 52: Exterior Sun Control Devices are included in the specifications but do not find any on the drawings. Please confirm no Exterior Sun Control Devices for P1X.</i>	Response 52: Confirmed; there is no Exterior Sun Control Device requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 53: Debris Containment Netting is included in the specifications but do not find any on the drawings. Please confirm no Debris Containment Netting for P1X.</i>	Response 53: Confirmed; there is no Debris Containment Netting requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 54: Aluminum Canopies are included in the specifications but do not find any on the drawings. Please confirm no Aluminum Canopies for P1X.</i>	Response 54: Confirmed; there is no Aluminum Canopy requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 55: Horizontal Louver Blinds are included in the specifications but do not find any on the drawings. Please confirm no Horizontal Louver Blinds for P1X.</i>	Response 55: Confirmed; there is no Horizontal Louver Blind requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 56: Anti-Fatigue Floor Mats are included in the specifications but do not find any on the drawings. Please confirm no Anti-Fatigue Floor Mats for P1X.</i>	Response 56: Confirmed; there is no Anti-Fatigue Floor Mat requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 57: Site Furnishings are included in the specifications but do not find any on the drawings. Please confirm no Site Furnishings for P1X.</i>	Response 57: Confirmed; there is no Site Furnishings requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 58: Transparent Bullet Resistance Assemblies are included in the specifications but do not find any on the drawings. Please confirm no Metal Lockers for P1X.</i>	Response 58: Confirmed; there is no Transparent Bullet Resistance Assemblies requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 59: Cathodic Protection System is included in the specifications but do not find any on the drawings. Please confirm no Cathodic Protection System for P1X.</i>	Response 59: Confirmed; there is no Cathodic Protection System requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 60: Trash Chutes are included in the specifications but do not find any on the drawings. Please confirm no Trash Chutes for P1X.</i>	Response 60: Confirmed; there is no Trash Chute requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 61: Drawing X8.00.05 Note 5 and Drawing X8.00.25 Note 4 states "Additional Info: refer to common detail sheet X9.00.04 – for connection</i>	Response 61: For the drawing X8.00.05 Note 5, please refer to the detail on X8.00.06 instead. For X8.00.25, please refer to the updated sheet in

<p><i>details” but there is no sheet X9.00.04. Please provide</i></p>	<p>Addendum No. 06 that refers to structural for details.</p>
<p><i>Question 62: The architectural lighting fixture schedule in section 26 50 10, pages 18-21 do not match the fixtures designations on the drawings. Please update either the drawings or the fixture schedule in section 26 50 10. Clarify.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 63: The following drawings are either missing or have incorrect information, Please provide or clarify:.</i></p> <ul style="list-style-type: none"> <i>• E6.10.01, Emergency Feeder Schedule - Plotted Incorrectly, does not show the feeder sizes.</i> <i>• E6.10.02, Normal Feeder Schedule - Plotted Incorrectly, does not show the feeder sizes.</i> <i>• E8.00.01, Lightning Protection - Missing</i> <i>• E8.11.00, Lightning Protection - Missing</i> <i>• E8.11.01, Lightning Protection - Missing</i> <i>• E8.16.00, Lightning Protection - Missing</i> <i>• E8.20.01, Lightning Protection - Missing</i> <i>• E8.20.02, Lightning Protection - Missing</i> <i>• E8.20.03, Lightning Protection - Missing</i> <i>• E8.50.02, Lightning Protection - Missing</i> <i>• E8.50.03, Lightning Protection - Missing</i> <i>• E8.50.04, Lightning Protection - Missing</i> <i>• E8.50.05, Lightning Protection - Missing</i> <i>• E8.50.06, Lightning Protection - Missing</i> <i>• E8.50.07, Lightning Protection - Missing</i> 	<p>Response to be provided in a future addendum</p>
<p><i>Question 64: Section 10 14 10 – Vehicle Directional Signage (Non-Electrified) – Parking Garage is included in specifications. Please confirm there is no scope as relates to this specification or work to be performed in the Parking Garage. If not, please remove this Section.</i></p>	<p>Response 64: Confirmed; there is no Vehicle Directional Signage (Non-Electrified) requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 65: AM#06 EC4.01.04 – The (4) new panels in the IDF closets (7LRCRCW3A, 7EXLRCRCW3A, 7LRCRSW3B, 7EXLRCRCW3B) do not show up on the riser diagram or feeder schedules. Please provide information on what is feeding these panels and what the feeder sizes are.</i></p>	<p>Response to be provided in a future addendum</p>

<p><i>Question 66: AM#06 E6.10.01 – Emergency Feeder Schedule</i></p> <p><i>a. 7EQHRCSW1B – Does not show up on riser diagram.</i></p> <p><i>b. 7EQLRCSW1B – Does not show up on riser diagram.</i></p> <p><i>c. XFMR-7EQLRCSW1B – Does not show up on riser diagram.</i></p> <p><i>d. 7EHRCSW1B – Does not show up on riser diagram.</i></p> <p><i>e. 7ELRCSW1B – Does not show up on riser diagram.</i></p> <p><i>f. XFMR-7ELCSW1B – Does not show up on riser diagram.</i></p> <p><i>g. 7EUPSG236 – Does not show up on riser diagram.</i></p> <p><i>h. XFMR-7EQLRCSW2A Disc – Does not show up on riser diagram, please confirm if a disconnect is required.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 67: AM#06 E6.10.02 – Normal Feeder Schedule</i></p> <p><i>a. 7HRCSW1B – Does not show up on riser diagram.</i></p> <p><i>b. 7LRCSW1B – Does not show up on riser diagram.</i></p> <p><i>c. XFMR-7LRCSW1B – Does not show up on riser diagram.</i></p> <p><i>d. XFMR-7LRCSW2 Disc – Does not show up on riser diagram, please confirm if a disconnect is required.</i></p> <p><i>e. XFMR-7LRCSW2A Disc – Does not show up on riser diagram, please confirm if a disconnect is required.</i></p> <p><i>f. XFMR-7LRDPCSW2 Disc – Does not show up on riser diagram, please confirm if a disconnect is required.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 68: E3.00.01 – Electrical Riser Diagram</i></p> <p><i>a. Feeder from 7LRDPG250 to 7LRCRCSW3 does not have a feeder size in the provided schedules, please provide required feeder size.</i></p> <p><i>b. Feeder from 7LRDPG250 to 7LRCRCSW4 does not have a feeder size in the provided schedules, please provide required feeder size.</i></p> <p><i>c. Feeder from 7HRDPCSW2 to 7HADIMG252 does not have a feeder size in the provided schedules, please provide required feeder size.</i></p> <p><i>d. Feeder from 7HRDPCSW2 to 7HADIMG253 does not have a feeder size in the provided schedules, please provide required feeder size.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 69: MWC9 and MWC11 are used at Boarding Piers as indicated per A6.12.01. MWC9 and MWC11 aren't described per finish key 09 00 01. Please advise materials for MWC9 and MWC11.</i></p>	<p>Response 69: MWC9 and MWC11 are not in the project. All areas noted MWC9 & MWC11 shall receive interior paint P1</p>

<p><i>Question 70: MWC9 and MWC11 are indicated at Boarding Piers per Finish Schedule A6.12.01. The extents of MWC9 and MWC11 are difficult to understand. For example, MWC9 is shown by callout on enlarged plan A4.12.36 but elevations aren't provided to show the start, stop, and height of paneling. Similarly, MWC11 is indicated via Boarding Pier section cuts per A3.12.21 and A3.12.22 but an elevation showing a paneled wall is missing. Please provide clear elevations that show the entire extent of MWC9 and MWC11 at boarding piers.</i></p>	<p>Response 70: MWC9 and MWC11 are not in the project. All areas noted MWC9 & MWC11 shall receive interior paint P1. Sheets have been updated for Addendum No. 08.</p>
<p><i>Question 71: Reference Specification 27 05 00 1.2.C and confirm the intent of this project is NOT to award as a CMAR and the TPM will be the responsibility of the Owner/GOAA.</i></p>	<p>Response 71: Refer to Addendum No. 03 for revisions to Specification Section 27 05 00 1.2.C. The intent of this project is to award, as a sub-contractor to the General Contractor, a TPM for the oversight and coordination of all related scopes of work described herein who will be a single point of contact to the Authority and the OAR. Refer to Addendum No. 07 for revisions to Specification Section 27 05 00 1.1.E.11 which states that the TPM shall serve for the entire project through closeout.</p>
<p><i>Question 72: All panel schedule drawings in E6 series have panel IDs designations that do not match panel IDs shown on the floor plan, feeder schedule & riser diagram. The P1X E6 series panel schedule shows the old gate numbering system (i.e. 233 thru 236) for Panels, UPSs, Dimming racks .. etc. while the floor plans & the feeder schedule show those panels with the new gate numbering system (i.e. 250 thru 253) Panel schedule needs to be revised.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 73: All panel schedule drawings in E6 series utilize the old rooms numbering system that does not match with the floor plans new GOAA numbering system, Panel schedule needs to be revised.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 74: DWG E4.04.01 Dimming panels 7EQHADIMG235 & 7HADIMG235 were deleted from floor plan ER 04.6162 without deleting the Control Rack DMX512, also the panel schedule for those deleted panels still exists in DWG E6.60.04, need confirmation and revised drawings.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 75: DWG E3.00.04 need to add the OUC transformer TX-PCA-U14 that feeds the PCA room to the drawing and to the feeder schedule.</i></p>	<p>Response to be provided in a future addendum</p>

<p><i>Question 76: DWG EX7.12.35 thru 39 shows newly added Exterior Gate Identity (EGI) power EGI JB + circuitry at each PBB. Circuits for EGI do not match with the panel schedule, a revised panel schedule is required.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 77: DWG EX7.12.35 thru 39 VDGS circuits do not match the panel schedule, a revised panel schedule is required.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 78: Reference drawing X8.00.25 and specification section 27 05 00. Please confirm who will furnish and install the Peerless SmartMount Back-to-Back Ceiling Mounts and Adjustable Drop Columns for the C25 displays per details A2 (Qty 1), A5 (Qty 12) & D4 (Qty 4) / X8.00.25.</i></p>	<p>Response 78: Mounts are F/I by the contractor.</p>
<p><i>Question 79: Sheet A0.31.00 shows 2" spray insulation and intumescent seal coating for EWS-02a. Various wall sections for EWS-02a (A6, A3, and A1/A3.13.01, A1 and A3/A3.13.02, A2/A3.13.07, A4/A3.13.09) show 1-½" polyisocyanurate insulation on 3-5/8" metal studs, with no intumescent coating indicated or listed in the finish scheduled for these locations. Please clarify if: a.) Spray insulation or polyisocyanurate insulation is to be used. Please include the desired thickness and/or R-value for the desired product. b.) Intumescent coatings are required at exterior wall system EWS-02a.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 80: Please clarify if the mockup requirements listed in various specification sections (03 30 00, 03 45 00, 04 22 00, 07 24 23, etc.) apply to this phase of work or if the adjacent existing construction can serve as the mockup for each scope.</i></p>	<p>Response 80: Mockup Requirements still apply for this phase. Owner reserves the right to eliminate any mockup requirements. Intent is to match the existing structure as much as possible.</p>
<p><i>Question 81: Are the PACs door schedule and VSS camera schedule for new devices to be installed or any of these device existing already?</i></p>	<p>Response 81: PACS and VSS scheduled elements are new to be installed.</p>
<p><i>Question 82: Sheet A0.31.00 indicates a custom form-liner and sand-blasted finish for the 6" architectural precast panels. Please clarify if the new precast panels for this project are to match the existing panels used on Phase 1, where no custom form-liner was required.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 83: Performance mock ups indicated under section 08 44 13 part 1.17 seem to be for STC Phase 1. Please confirm that performance mock-ups and testing of mock-ups will not be required for STC Phase 1X. If they are required for STC Phase 1X, please clarify requirements.</i></p>	<p>Response 83: See revised specification in Addendum No. 08.</p>

<p><i>Question 84: Provide quantity and locations of field testing for Phase 1X. The ones provided in section 08 44 13 part 3.4 appeared to be for STC Phase 1.</i></p>	<p>Response 84: See revised specification in Addendum No. 08.</p>
<p><i>Question 85: Airside concourse Phase 1 provided FAA approved 7460 Crane heights plan (see attached). Please provide approved crane heights for Phase 1X concourse scope of work.</i></p>	<p>Response 85: See STC Temp Construction Equipment Airspace Determinations drawing. The plan is to extend the same determinations through the P1X construction duration.</p>
<p><i>Question 86: Reference Specification Section 09 00 01-13 – Key Item STS1 – Synthetic Turf Surface – SARA references Spec. Section 32 18 13.A but 32 18 13.A is not provided. Please provide required specification for complete scope requirement.</i></p>	<p>Response 86: See added specification in Addendum No. 08</p>
<p><i>Question 87: Refer to E3.00.01 revised in addendum #6. This drawing added a new electrical room but is missing the panel schedule. Please provide.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 88: Can we utilize part of the employee parking as a staging area for the sand blasting and prep of the steel? If so what is the maximum height of the crane we can utilize?</i></p>	<p>Response 88: Site Logistics Craft Parking Lot and Laydown Area located along Terminal C Service Road may be utilized. See STC Temp Construction Equipment Airspace Determinations to answer any questions on crane heights.</p>
<p><i>Question 89: Reference details A3, C3 & E3/A5.12.33. Please confirm that only four (4) of these are required as indicated on drawing A5.12.33</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 90: Refer to BP-S195 BID SCHEDULE provided in addendum 3. Item P-501-8.4: Raise Existing Structures to Grade, 10 EA. Please clarify what constitutes a structure? In other words, where are the Fire Hydrant, Water Valve and Storm and Sanitary Cleanout adjustments to be paid for?</i></p>	<p>Response 90: Item P-501-8.4: Raise Existing Structures to Grade quantity has been increase to 48 EA to include sanitary, storm and electrical manholes, cleanouts, valves, fire hydrants, etc. that extend through the P-501 PCC pavement (i.e. not sidewalks). Small handholes and pull boxes located in sidewalk pavement are incidental to the respective electrical/communication pay item.</p>
<p><i>Question 91: Exterior wall system SS-02 on sheet A0.31.00 indicates a layer of 07 41 50 Self-Adhering, High Temperature Underlayment between the glass-mat sheathing and stucco finish. Please clarify if this layer is to be the underlayment material specified in specification 07 41 50 (Aluminum Rain-Screen Wall and Soffit Panels) with SBS-modified asphalt, or if the air barrier product listed in specification 07 27 29 Air-Barrier Coatings is appropriate for this location where there are no metal panels.</i></p>	<p>Response to be provided in a future addendum</p>

<p><i>Question 92: Reference Drawings A0.14.01, A5.12.90 and Electrical and Fire Alarm Drawings for International Level.</i></p> <p><i>There are eight (8) stand-alone pylons scheduled for the International Level.</i></p> <p><i>One (1) contains FEC & AED & F/A Pull Station</i></p> <p><i>One (1) contains FEC & AED</i></p> <p><i>Four (4) contain FEC & F/A Pull Station</i></p> <p><i>One (1) contains FEC only</i></p> <p><i>One (1) contains AED only</i></p> <p><i>Currently there is no power/outlets shown at these pylon locations and no Fire Alarm for the AED's</i></p> <p><i>Please confirm Power and Fire Alarm requirements for each condition</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 93: Elevator Emergency power transfer signaling. Emergency power transfer to Generator feed signaling shall be coordinated from the emergency switchboards to each elevator control panel to indicate that the elevators are on emergency power and also to receive a pre-transfer signal. Please update the riser diagram to indicate the above-mentioned signals from the emergency switchboards by adding a hex note or a as a single line.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 94: EXIT signs for BHS areas. No EXIT signs are shown along the baggage row and the baggage sortation. Please provide a revised ramp level drawing showing the necessary EXIT signs along the baggage area with all necessary power supply circuiting.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 95: ACR-CP Magnetic Starter. Please confirm that the water-cooled DX coil CIRCULATION PUMP ACR-CP requires a magnetic starter with HOA to operate either through the BMS and on manual mode please provide updated mechanical schedule sheet #2 M6.01.02.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 96: Poke thru locations at passenger seating areas. Please confirm that the poke thru exact location at the transfer level hold rooms shall be coordinated with respect to FFE type and orientation, constructability due to building steel and equipment at ramp level ceiling.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 97: Weather Alert System WAS. DWG TA1.01.22 does not show the two WAS HPSA-PS in area 34 & area 37 please provide an updated drawing in accordance with RFI 2656 response issued back in July 14 2020 for P1X.</i></p>	<p>Response to be provided in a future addendum</p>

<p><i>Question 98: Virtual Ramp Control VRC. Please confirm whether P1X requires an additional RU sled to be installed at the south wing roof, or RU-19 will cover the whole west wing and the south wing Ramp.</i></p>	<p>Response 98: Per SAAB: There are no additional cameras planned for the south extension, the camera array F4-6 is intended to provide coverage there.</p>
<p><i>Question 99: Please confirm that in order to maintain GOAA standards, an on-site dedicated Quality Control/Safety Manager with no other duties shall be included to assist in the quality control and safety requirements per the Contract Documents. Also, confirm that this Quality Control/Safety Manager shall be an employee of the Subcontractor.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 100: Enlarged plan A1 on sheet A4.22.11 shows a G1 wall behind the toilets in the restrooms. Per A0.21.00, G1 walls only have gypsum board one side. The enlarged RCP A4 on sheet A4.22.11 shows a gypsum ceiling in the chase behind the G1 wall. Please clarify if the wall drawn as G1 is to be a G2 wall or if the ceiling in the restroom chase is to be removed.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 101: The G1 walls that make up the (3) mechanical chases in front of each boarding pier (reference rooms 02.6051 and 02.6080 on sheet A1.12.35, 04.6048, 04.6075, and 04.6080 on sheet A1.14.35, typical for all boarding pier areas on transfer and IA level) are shown as non-rated walls. We believe these should be fire rated. Please confirm these should be G1. If not, please clarify. Also, if they are rated walls, confirm that the wall expansion joints that pass through the southernmost mechanical chase at each pier are or are to be fire rated.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 102: Textured plaster finish DF1 is not listed in the finish key and there is no product listed in specification 09 94 13. Please provide information for the materials to be used at the locations where 09 94 13 – Texture Plaster Finish is indicated on the drawings, or provide an alternate finish.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 103: Specification 09 83 16 Spray-Applied Acoustical Finish System is listed in the project manual but is not indicated on the drawings. Please confirm that this specification section is not applicable to this bid.</i></p>	<p>Response 103: Confirmed; there is no requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 104: Specification 07 14 18 Fluid-Applied Waterproofing Deck is listed in the project manual but is not indicated on the drawings. Please confirm that this specification section is not applicable to this bid.</i></p>	<p>Response to be provided in a future addendum</p>

<p><i>Question 105: Please see M0.00.00 Note 22. For liquid filled pipe supported by hangers bellow the concrete deck. Please confirm the minimum size of pipe that will require additional structural steel be added to the deck.</i></p>	<p>Response to be provided in a future addendum</p>
<p><i>Question 106: 1) Will the glass required be as specified or to match existing? If existing , what was the coating used? 2) Laminated glass warranty available is 5 years not 10 specified 074413.1.19.D.4. Will this be acceptable? 3) Will the Kynar finish paint be selected to match existing? If yes what was the previous color code selected</i></p>	<p>Response to be provided in a future addendum</p>



ADDENDUM NO. 03

(Issued July 14, 2022)

**TO THE BID DOCUMENTS FOR
BP-S196, TERM C, PH 1X – AIRFIELD CIVIL, APRON & TAXIWAY PAVING**

ORLANDO INTERNATIONAL AIRPORT

July 14, 2022

ADDENDUM NO. 3

TO ALL HOLDERS OF CONTRACT DOCUMENTS

1. Your attention is directed to the following interpretations of, changes in, and/or additions to the contract documents for the above-named project
2. This addendum is part of the Contract Documents
3. Bidders are required to acknowledge receipt of this Addendum in the space provided on the Bid Form Section 00 41 13

Revised Specifications

The following Specifications have been modified by this Addendum:

- None

Revised Drawings

The following drawings have been revised by this Addendum and are included as attachments to this Addendum:

- None

Responses to Bidder's Questions:

Question 1: Is this a Lump Sum or Unit Priced contract?

Response 1: Unit Price

Question 2: If this is a Lump Sum project, please clarify the purpose of unit prices on the bid form. How will these be used by GOAA?

Response 2: This is a unit price contract.

Question 3: Can the owner provide CAD files?

Response 3: CAD files are not being provided to bidders. CAD files will be provided to the successful bidder after the contract is awarded.

Question 4: There appear to be several missing bid items from the list provided in the bid form. Please add pay items for the following scopes of work:

Mob/Demob

Site Safety/Security

MOT

Erosion Control

Fabric-formed concrete (if required)

Type B Stabilization & 8" Limerock Base Course (temp service roads)

2.5" Asphalt Surface Paving (temporary)

Response 4: 1) Mobilization, Safety, Security and Maintenance of Traffic and Erosion Control are included in the Airfield Civil, Electrical, and Fueling Works Bid Schedule in pay items C-105-6.1, C-106-4.1 through C-106-4.4 and C-102-5.1, respectively.

2) Fabric-formed concrete is not required.

3) Type B Stabilization, 8" Limerock Base Course, and 2.5" Asphalt Surface Paving (for temporary roads) are incidental to the Miscellaneous Maintenance of Traffic and Safety under pay item C-106.4.4.

Question 5: Please provide geotechnical information including borings

Response 5: Geotechnical information was included in Addendum #1.

Question 6: *Will the owner provide quantity calculations used to generate the bid item quantities?*

Response 6: Quantities are included on the bid schedule.

Question 7: *Is a Batch Plant Required for the Apron Paving Concrete? If yes, where is it allowed to be located and does GOAA have a generic permit in place for temporary batch plants that will be extended to BP-196?*

Response 7: A batch plant is not required as discussed in the pre-bid.

Question 8: *Please confirm there is no PLA (Project Labor Agreement) requirement on this project.*

Response 8: Confirmed.

Question 9: *Our vendors have notified us of aggregate and concrete shortages throughout the industry that will affect the pricing and ability to complete this project in the stipulated timeframe. All quarries are on a rationing program and don't see any significant quantities that could be shipped in 2022 for stockpiling purposes nor any relief for 2023. This creates a major issue for aggregate deliveries to meet the already compressed schedule for most of the work being completed in 2023. Please consider eliminating or reducing the \$7,100 per day liquidated damages or extending the completion date.*

Response 9: Supply chain disruptions to the US can be negotiated via the change order process.

Question 10: *Will any work be restricted by the Owner for Holidays or other Special Events?*

Response 10: No- the work area is unrestricted unless overridden by Federal agencies in rare circumstances.

Question 11: *With the compressed schedule, will unrestricted nighttime work be allowed?*

Response 11: No restrictions on work hours are contemplated.

Question 12: *Project documents mandate a \$5,000,000 Automobile Liability policy. Is this requirement applicable to vendors making deliveries as well as on-site vehicles?*

Response 12: The \$5M is intended for vehicles operating on the AOA.

Question 13: *Project documents mandate a \$5,000,000 Automobile Liability policy. Is this requirement applicable to activities outside the AOA?*

Response 13: No

- Question 14: *If the plan dimensions change once the building is finalized and a set of drawings is reissued, will the contractor be afforded price adjustments or will the unit prices at bid time be used?*
- Response 14: (Response will be provided in a future addendum)
- Question 15: *Is the ASC contractor responsible for completion of the joint construction along the demarcation line?*
- Response 15: The AFC Contractor shall complete placement of the pavement to the Demarcation line. The ASC Contractor is to install dowels, place adjacent PCC, and saw/seal the joint.
- Question 16: *Can the owner specify the use/location of the 24" Lime Rock Base item?*
- Response 16: The 24" limerock is to be installed beneath sidewalk pavement adjacent to ASC building as shown on detail sheet C9.01.03.
- Question 17: *Are the asphalt quantities for the temp VSR's included in the asphalt pay item?*
- Response 17: The temporary asphalt road construction and demolition are incidental to the Maintenance of Traffic pay item C-106.4.4.
- Question 18: *Will the owner please clarify where the removal of the existing asphalt is to be paid for? Quantities reflect all pavement removal to be paid for under item P-101-5.1. In addition to this, can the owner please clarify the depth of asphalt being removed? The existing typical shows +/- 2" of asphalt and 10" of limerock base. The pay item shows 8".*
- Response 18: Existing asphalt pavement section removal is incidental to P-151-4.1 Clearing and Grubbing (lump sum) and P-151-4.2 BP-S196 Landside Civil Demolition (lump sum).
- Question 19: *Please confirm if there is Fabri-Form concrete to be installed under the S-196 contract.*
- Response 19: There is no Fabri-Form concrete included in this project at this time.
- Question 20: *There is a structure table for the 23 Inlets but there is not a structure table for the 10 Manholes, will this be provided in an upcoming agenda?*
- Response 20: The structure table includes all proposed Manholes (12) and all proposed inlets (7). A revised bid schedule will be issued in a future addendum.

- Question 21: The bid item for the manholes indicates there are 10 each. I can only locate 9 manholes by adding the 4 within the oil/separator and the adjusted manhole #'s A-43, 105, 243, 244 & 245. Is this correct?*
- Response 21: There are 12 proposed manholes - A-109, A-200, A-206, A-207, A-208, A-209, A-210, A-211, A-212, A-213, A-247, A-248. Within the AFC work area, all manholes to be adjusted to grade shall be incidental to pay item P-501-8.1. A revised bid schedule will be issued in a future Addendum.
- Question 22: Is the ASF Contractor responsible for the 2" PVC water installation, the 1" Copper installation and the Potable Water Cabinets? If so, please add utility bid items with quantities.*
- Response 22: The 2" PVC and 1" Type K Copper piping are part of the AFC work scope and paid under bid items 33 11 00-5.1 and 33 11 00 5.2 (Note: the bid schedule currently lists bid item 34 11 00-5.2 for the 1" Type K Copper Pipe; this will be updated in the bid schedule to be issued in a future addendum)
- Question 23: Is the RCP below the Trench Drain existing or new? If new, please confirm the RCP diameter and inverts from North toward structure A-273 and South from Structure A-272.*
- Response 23: The proposed RCP below the Trench Drain is new. RCP does not extend north of A-272 and does not extend south of A-273. Invert for all structures are provided on Sheet C15.01.35.
- Question 24: What is the timeline and duration for the Airside Concourse project? How much overlap will there be with BP-196?*
- Response 24: The intent is simultaneous work for both AFC and ASC work. The anticipated schedule for BP-S195 SC is Q4 2025. BP-S196 anticipated schedule is start Q4 2022 and SC Q4 2023.
- Question 25: Will the materials that are currently on site be available to the contractor for use on this project? And/or will the contractor be responsible for disposal of these items off site?*
- Response 25: Materials currently on site and included in inventory log will be available to contractor for use on this project. Any materials not used on this project will require relocation and/or disposal off site at the direction of the OAR.
- Question 26: I do not see the Minimum wages for the Davis Bacon Act. Can you please provide those?*
- Response 26: See Special Provisions Section SP-1.

- Question 27: Please refer to P-306 specification section 5.14, can we use curing compound in lieu of Choke Stone as bond breaker? The Dowel baskets may not be secure sitting on top of choke stone.*
- Response 27: Alternative materials are not being considered during the procurement process.
- Question 28: The Joint Layout Sheet C14.01.09 does not show the 12" trench drain on the east side of the apron. The 18" Trench Drain is laid out on the joint layout drawings, but the 12" Trench Drain is missing.*
- Response 28: Additional reinforcement is not required for slabs adjacent to the trench drain on Sheet C14.01.09 except as shown on the plans. Joint callouts to reference a Trench Drain Type "X" Joint will be added to plan sheets C14.01.08 and C14.01.09 in place of the Type "A" thickened edge expansion joints currently called out to be issued with a future addendum.
- Question 29: Please refer to sheet C60.01.04, The East Side AOA Security fence to be installed in Phase 3 uses a legend of Fence mounted on K barrier. Please confirm this.*
- Response 29: The East Side AOA Security fence shall be installed on jersey barrier, Sheet C60.01.04 will be updated and re-issued in a future addendum.
- Question 30: C35.01.08; In order to protect the existing existing fuel line during proposed work, Contractor would like to request copy of the as-builts for currently installed Jet Fuel line at the STC*
- Response 30: As-builts will be provided to apparent low bidder. This is SSI info.
- Question 31: NA; With GOAA requesting qualifications and a goal (requirement) of 20% for DBE , what is the basis of award?*
- Response 31: Most responsive low bid.
- Question 32: 20-02 - 00 45 13; It appears bidders are required to have successfully completed within the last five years, similar work as specified in the Bidder's Qualification Specifications Section 00 45 13. Please clarify in detail how this information will be used in the basis of award?*
- Response 32: Most responsive low bid. Bidders are to have the requisite experience with airfield work.
- Question 33: N/A; Are there "Electronic" Grading Files available, if so please supply.*
- Response 33: CAD files are not being provided to bidders. CAD files will be provided to the successful bidder after the contract is awarded.

Question 34: *C8.01.07; Please clarify following questions associated with the AFC's scope limits around the demarcation line between AFC and ASC Paving.*

1) *For AFC scope, Is there a requirement for overbuild of 6" lean concrete between the AFC & ASC Paving?*

2) *Are dowel bars to be drilled and left exposed along the D-Joints by AFC contractor?*

3) *Who will be responsible for sealing of the joints?*

4) *Who stripes ASC pavement?*

5) *Lightning protection along building is ASC's responsibility?*

Response 34: 1) Yes - see Detail 3/C9.01.02 as reference for overbuild of Lean Concrete and Lime Rock Base Courses.

2) Dowel bars are not to be placed along the D-Joint at the AFC/ASC Demarcation Line only.

3) The ASC contractor is responsible for sealing joints within their designated work area and along demarcation line.

4) The ASC contractor.

5) Yes

Question 35: *C8.01.07; Please advise what the scope the line of demarcation is supposed to include. Only Subgrade to Paving? What about EFSO Fuel, waterline, and Drainage which crosses the line?*

Response 35: The AFC Contractor is responsible for all underground work and completion of the all work to the top of the subgrade. The ASC Contractor is to raise structures to grade, repair any disturbed subgrade and place the Base Courses and PCC Pavement.

Question 36: *C35.01.08; As the installed fuel lines are active and charged with jet fuel? What are the specific steps that needed to be taken by Contractor to protect the existing jet fuel line / Pits ?*

Response 36: Existing fuel lines to be connected to are active and charged with fuel. Protecting the existing fuel lines, fuel vaults and pits have paramount importance as stated in General Notes and Scope of Work on drawing JFG0.11.01, Specifications Section 33 52 43, Specifications Section 33 52 45 Paragraphs 3.6, 3.7, and in other Contract Documents. Provide protection around the existing fuel structures with concrete barricades, warning lights and orange safety fence as required.

- Question 37: *P-306; For lean concrete (P-306) ,please advise if the compressive strength > 800 lbs./sq.inch will be acceptable at seven day compressive strength test results*
- Response 37: For lean concrete base that exceeds a compressive strength of 800 psi as defined in Specification P-306, joints shall be cut to match the PCC pavement joints.
- Question 38: *00 11 13 - 2 - DBE Participation; Please confirm if DBE Good Faith efforts will be accepted?*
- Response 38: 20% with GFE is the requirement.
- Question 39: *00 11 13 - 2 - DBE Participation; Please confirm that the DBE goal of 20% is limited to vendors who are certified by the Florida UCP? And if following weblink can be used for verification of eligibility of a DBE firm:*
- <https://fdotxwp02.dot.state.fl.us/EqualOpportunityOfficeBusinessDirectory/>*
- Response 39: 20% with GFE is the requirement. GOAA small business to be consulted as-needed.
- Question 40: *00 11 13 - 2 - DBE Participation; Please advise if the DBE's from all district's and industries will be acceptable?*
- Response 40: 20% with GFE is the requirement. GOAA small business to be consulted as-needed.
- Question 41: *00 11 13 - 2 - DBE Participation; Will second tier DBE Subcontractors and/or Material Suppliers be accepted on this project? For example, 1st tier Subcontractor is not DBE but the material supplier they use is a DBE. Will that supplier , as a 2nd tier, be acceptable? or another example would be a DBE trucking company hauling for a non-DBE Subcontractor*
- Response 41: 20% with GFE is the requirement. GOAA small business to be consulted as-needed.
- Question 42: *Sheet ISO.00.03; Note F. 7. Site conditions states Contractor shall have a water truck and vacuum sweeper with trained Operator on site at all times. Metal Bristles are prohibited on sweeper equipment. Is there a size requirement on the water truck or vacuum sweeper truck?*
- Response 42: The Contractor shall determine the size of water truck and vacuum sweeper truck required to maintain the project site and provided appropriate environmental controls (dust control, etc.).

- Question 43: C9.01.02; Please clarify sheet C9.01.02, detail 3 Taxiway typical section and detail 5 apron typical section only call out P-306 and P-211 however detail 1 subgrade compaction schedule calls out P-304 or P-306 and P-209 or P-211. Are P-304 and P-209 allowed as an alternate? If so please provide the specifications for P-304 and P-209.*
- Response 43: Alternative materials are not being considered during the procurement process.
- Question 44: C9.01.02; Can an alternate material be proposed to the required bond breaker - choke stone between P-501 and P-306?*
- Response 44: See response to question 27.
- Question 45: N/A; What sites are available for on-site batch plant? What utilities exist near potential sites (electrical & water)*
- Response 45: Bidder to propose if desired. Owner will assist with logistics and owner approval; however, contractor responsible for means and methods and costs if desired.
- Question 46: C60.01.02; Who covers cost for security/gate guards during construction in/out of AOA? Who provides gate shack/light plant/toilet/temp power?*
- Response 46: GOAA will provide SAMs with guard shack and misc. facilities needed.
- Question 47: IS0.00.03; Required to "coordinate with other contractors"? Will ASC contract be working concurrently with AFC contractor? Will ASC need laydown space West of pavement demarcation line? If AFC is impacted by ASC due to schedule delays, will AFC be compensated?*
- Response 47: See response to item 24 above. If work impacts the change order process will be followed by contract.
- Question 48: CD3.01.25; No sawcut detail provided for "full depth sawcut" along perimeter of P-501 as noted on drawings (CD3.01.10). Why is full depth sawcut required to remove 4" concrete sidewalk?*
- Response 48: Saw cutting shall be required for the full depth of pavements to be removed to protect adjacent pavement to remain in place.
- Question 49: CD3.01.11; Plan shows to demo existing E/W portion of roadway, and not N/S portion. Please confirm existing asphalt road going N/S stays in-place.*
- Response 49: Sheet CD3.01.11 identifies removal of the Asphalt Road per P-151 on the east and west side of Taxiway B.

- Question 50: CD3.01.12; Appears old batch plant concrete pad not shown on plan sheets, requires demolition and disposal. Please confirm.*
- Response 50: All pavements within the areas identified for demolition are to be removed unless otherwise noted.
- Question 51: C9.01.04; Are locations for PBB anchors within AFC or ASC pavement limits? No location/map provided.*
- Response 51: A bid item for the PBB anchors is included in both the airfield civil and airside concourse packages as final locations have not been established at this time.
- Question 52: C15.01.12; Erosion and Sediment control plan only designed for current field conditions. Please provide E&S plans for after interim phase before pavement and after embankment and drainage installation.*
- Response 52: Erosion and sediment control measures were defined based on information available at the time of the design. Ongoing construction is occurring on the site that may change the existing conditions, requiring modification to the erosion and sediment control measures. Final sediment and erosion control measures will be coordinated in the field with the OAR and all costs shall be incidental to pay item C-102-5.1.
- Question 53: C15.01.14; Silt fence is shown outside AOA fence. Recommend relocating to inside AOA side of fence, or upstream of watershed. Siltation risk of contaminating #57 stone along limits of secure fence.*
- Response 53: The final location of the erosion and sediment control measures are to be coordinated with the OAR during construction. Consideration of relocating the silt fence inside the AOA fence will be considered at that time.
- Question 54: C60.01.05; What happens with barrier mounted fence on East side of AOA apron that is left in-place for ASC construction? Is barrier and fence become property of GOAA? AFC any action after installation?*
- Response 54: (Response will be provided in a future addendum)
- Question 55: CE0.00.01; Please confirm OUC will not install any cable into new ductbank system until after AFC substantial completion. No support or coordination for new install with OUC by AFC during construction? No dewatering of manholes for OUC.*
- Response 55: Utility coordination is routine for any construction project. Schedules will be coordinated and enforced with all relevant parties.

- Question 56: CE7.00.09; Confirm 48" radius conduit sweeps needed at transformer pads*
- Response 56: 60-inch radius is required at transformer pads. Reference Specification 26 05 12 - 18. The dimensions shown in the detail are for conduit/duct minimum burial depth. Primary conduit/duct radii are 60-inch per specification.
- Question 57: CE3.00.06, C35.01.09; Water booster pump noted in CE drawings, but no information provided on utility plans. Please provide information on booster pump requirements.*
- Response 57: See Specification SECTION 22 37 00 – POTABLE WATER CABINET
- Question 58: CE; Where is info on ground rod requirements for primary power ductbank?*
- Response 58: Reference sheet CE7.00.08A and Specification 26 05 12 for ground rod requirements for primary power system.
- Question 59: NA; In the GOAA provided trailer for the contractor, will the contractor be responsible for power, water and internet?*
- Response 59: No.
- Question 60: 90-06; Please provide details/cross sections for Structures and RCP to verify depth*
- Response 60: Details, top elevations and inverts for drainage structures are included in the Series C15 sheets.
- Question 61: P-403; Please confirm if OAR will be performing the air voids, mat and joint density tests for the asphalt pavement surface. Sec. 6.2 asks for documentation and delivery of results to the OAR when the contractor is not stated as responsible for them.*
- Response 61: Contractor is responsible for QC testing and owner will perform QA testing.
- Question 62: CD3.01.12; The existing Project Office Complex is full of existing materials, are these to be disposed of or relocated by the contractor as an incidental to the Demo item? If GOAA chooses to relocate where would the materials need to be delivered and offloaded?*
- Response 62: The existing team will need to deal with those items on the current contract. Anything beyond that needs to be discussed under those contract terms and conditions.

Question 63: JFC5.11.01; The Detail A, Section A and Section B on sheet JFC5.11.01 all show the concrete apron cast around the fuel valve pit and hydrants. The existing hydrants not currently in pavement have concrete pads poured around them. Please provide a detail of how the existing concrete should be incorporated into the concrete apron pavement or whether it is intended to be demolished.

Response 63: The existing concrete pads around the CVV, BV, LPD and HPV pits are 6" thick x 4' wide non-reinforced concrete (3,000 psi) collars. The collars are to be chipped away and removed with care without damaging the existing pits and new pavement to be installed around the pits as per the Contract Documents.

Question 64: E2.05.11; Please clarify if the High mast pole concrete base protection should be included in the AFC scope or ASC. The base protection is shown on top of concrete pavement demarked for the ASC contract.

Response 64: The Highmast light pole is to be included in the AFC work scope. If the highmast light pole resides in the ASC paving limits, the PCC surrounding the high mast light pole is to be constructed by the ASC Contractor.

Question 65: Can you let us know, which company has the CEI contract for this project.

Response 65: This is not FDOT for CEI. We use OARs with QA test companies.

Question 66: Please refer to sheet 2 of add 5 addendum 1, the 6th bullet from the top states "Revise quantity of Bid Item P-501-8.3 to quantity of 3,880 SY (ASC Only)". This has not been updated in the addendum 1 bid form. Please confirm that this change is correct & the quantity is to be revised from 210 SY to 3,880 SY.

Response 66: The Addendum No. 1 correctly identifies the AFC bid item P-501-8.3 quantity as 210 sy and the ASC bid item P-501-8.3 quantity as 3,880 sy.

Question 67: Please refer to sheet 2 of add 5 addendum 1, the 1st bullet from the top states "Revise Item Description of Bid Item: 26 05 12-5.7 to read: 4 W 6" Schedule 40 PVC OUC Concrete Encased Duct". But on page 13 of 18, Bid schedule addendum 1 the bid item description still reads "12 W 6" Schedule 40 PVC OUC Concrete Encased Duct".

Response 67: The updated bid schedule will be issued in a future addendum.

Question 68: Please refer to sheet 2 of add 5 addendum 1, The quantity for Bid item -115-5.2 has been revised to 10EA, But on the Addendum 1 bid form sheet 9 of 18 its still 9 EA. Please confirm the quantity.

Response 68: The updated bid schedule will be issued in a future addendum.

- Question 69: *In lieu of #4 bars @ 12" O.C. (EW), will a welded wire fabric equivalent be acceptable for use in all PCC Panels which require reinforcement per detail 15 sheet C9.01.01?*
- Response 69: Welded wire fabric shall not be used in lieu of #4 bars spaced @ 12" OCEW.
- Question 70: *Will an equivalent form of reinforcement support be acceptable to in lieu of the support shown on detail 8, sheet C9.01.01, ie ZigZag or Continuous High Chairs?*
- Response 70: Alternative materials are not being considered during the procurement process.
- Question 71: *During the Prebid meeting & the site visit 7/7/22, It was mentioned that there is a potential batch plant site South of the project location. Does GOAA have any layout drawings for the batch plant? Also what condition would we receive the site in? It was mentioned that Tree clearing would be completed. But will there be roots and stumps left in.*
- Response 71: If the contractor opts for a batch plant see response per item 45 above. There are no plans developed.
- Question 72: *Please refer to P-501 4-12. Is the intent here to have a transverse broom finish across the slab?*
- Response 72: Yes, the slabs shall have a transverse broom finish.
- Question 73: *Plan sheet C35.01.09. Please provide pay item for: "Adjust Existing Sanitary Manhole to Proposed Grade", "Adjust Existing Water Main Valve to Proposed Finished Grade", and "Adjust Existing Fire Hydrant to Proposed Finished Grade.*
- Response 73: All structures to be adjusted to grade within the AFC project limits shall be incidental to pay item P-501-8.1.
- Question 74: *Please include pay item for Security Area Monitors (SAMS) and provide specification.*
- Response 74: Not applicable as GOAA will provide SAMs.
- Question 75: *There is no bid item for the oil/grit separator. Please provide a bid item.*
- Response 75: The updated bid schedule will be issued in a future addendum.

Question 76: Please verify that structures A-201, A-216, and A-246 are existing and to remain. Are the structure tops to be adjusted to final elevations? If so, what bid item should be used for this work?

Response 76: A-201, A-216, A-246 are existing and are to remain. Required adjustments for A-246 shall be incidental to P-501. No adjustments are anticipated for structures A-201 and A-216.

Question 77: Drainage structures a104, a43, a105, a243, a244, and a245 are shown to be adjusted. What bid item should be used for this work?

Response 77: All structures to be adjusted to grade within the AFC project limits shall be incidental to pay item P-501-8.1.

Question 78: The available inventory list shows that drainage structures A205, A247, and A109 have been purchased and are stockpiled on-site. Please verify that the structures have been built to the current plan and that no modifications will be required.

Response 78: Structures have been built to the current plan and may require adjustments to grade.

Question 79: The available inventory list shows a variety of concrete pipe. Please verify that all of this pipe is available for use on this project; that it is all Class 5 concrete pipe; and that all gaskets are included and in good condition.

Response 79: The inventory of stored materials, available to the Contractor, was included in Addendum No. 1. The Contractor shall inspect the materials and make their own determination of the material suitability for use in the project.

Question 80: Plan sheet C15.01.32 shows 3 existing cleanout covers that need to be adjusted to final grade. There are 5 total for the project. Under what pay item should this work be included?

Response 80: All structures, including cleanouts, to be adjusted to grade within the AFC project limits shall be incidental to pay item P-501-8.1.

Question 81: Plan sheet CD3.01.12 shows 4 runs of existing drainage pipe to be removed. Please provide the sizes of these pipes.

Response 81: The northern 2 runs of existing drainage pipe running east-west are 60" culverts. The southern 2 runs of existing drainage pipe running north-south are 66" culverts.

Question 82: Plan sheet C15.01.33 shows an outfall pipe from the underdrain to structure A-216. Please provide a size for this outfall pipe.

Response 82: The outfall pipe is underdrain pipe. It shall be Type 1 6" Smooth Perforated HDPE per Note 6 on sheet C15.01.33.

- Question 83: *For the underdrain pipe shown on sheet C15.01.33, please specify how many cleanouts will be required and where? Will terminal cleanouts be required? Will intermediate cleanouts be required (what spacing)? Will the outfall pipe into A-216 require a cleanout?*
- Response 83: Underdrain cleanouts are required at the beginning of each segment of pipe. There will be six (6) total in the infield area between TWY B12 and TWY B13.
- Question 84: *There are trench drain callouts that do not reference a profile section. Is it the intent to use the same profile if trench drain lengths are equal?*
- Response 84: Yes - profiles are typical for trench drains of equal lengths.
- Question 85: *Profiles 1, 2, 3, 6 and 9 do not appear to be used. Please clarify if these are not applicable to this project.*
- Response 85: Correct - only profiles 4, 5, 7 and 10 are applicable to this portion of the Terminal C project.
- Question 86: *The bid item quantity for inlets is 23. 7 new inlets are shown in the plan. There are 16 junctions between the trench drains and 18 inch pipe. Are these junctions to be paid for in the inlet bid item?*
- Response 86: Junctions shall not be paid for under the inlet bid item. The bid schedule will be updated and issued in a future addendum.
- Question 87: *The bid item quantity for 48 inch RCP is 120 LF. Based on our takeoff, there are 263 LF (A247 = 46, A109 = 107, A273 = 110). Please verify and consider revising the bid item quantity.*
- Response 87: The updated bid schedule will be issued in a future addendum.
- Question 88: *The bid item quantity for 72 inch RCP is 230 LF. Based on our takeoff, there are 147 LF (A230 = 147 LF). Please verify and consider revising the bid item quantity.*
- Response 88: The updated bid schedule will be issued in a future addendum.
- Question 89: *The bid item quantity for manholes is 10 EA. Based on our takeoff, there are 12 EA (A109, A200, A206, A207, A208, A209, A210, A211, A212, A213, A247, A248). Please verify and consider revising the bid item quantity.*
- Response 89: The updated bid schedule will be issued in a future addendum.

Question 90: *The following drainage bid items quantities differ from our takeoff quantities by <8%. To avoid unbalanced bidding, please verify the quantities and consider revising the pay item quantities:*

a. 18" RCP = 391; 24" RCP = 120; 30" RCP= 742; 42" RCP = 370 LF; 54" RCP = 572 LF; 60" RCP = 451 LF; 6" PVC = 302 LF; 10" PVC = 226 LF; 6" Smooth HDPE = 1560 LF; 12" trench drain = 976 LF; 18" trench drain = 526 LF.

Response 90: The updated bid schedule will be issued in a future addendum.

Question 91: *Addendum No. 1 revised BS-196 Permit and Bid Documents-Specs Vol 2. Section 152-3.1 "Measurement for payment for embankment, specified by the cubic yard (cubic meter) shall be computed from the comparison of surveyed original and final surface approved by the OAR. The volume computed by a DTM model of the original and final surfaces established by the contractor surveys and approved by the OAR shall be the basis of measurement".*

a- Will measurement for payment for embankment include the cut areas?

b- If the excavation in cut areas will not be measure for payment under the embankment item, please provide quantity of incidental excavation to be included under the embankment item.

c- As per Section 152-2.1 "Before beginning excavation, grading, and embankment operations in existing pervious areas, the area shall have topsoil stripped to a minimum depth of 6 inches". Please confirm pay item for strip topsoil.

Response 91: Pay items P-152-4.1 Embankment and P-152-4.3 Subgrade Preparation represent payment for all costs associated with excavation, transport, placement and compaction of materials required to establish the subgrade surface.

Pay item P-152-4.2 Unsuitable Excavation represents payment for all costs associated with excavation and disposal of materials that are unusable for embankments.

Removal and stockpiling of topsoil shall be incidental to item P-152-4.1. The stockpiled topsoil used in areas to be seeded or sodded shall be paid under item P-905-5.1 Topsoil (Obtained on Site or Removed from Stockpile).

Question 92: Concrete to be Remove as per plans CD3.01.10 to CD3.01.12 will be measured and paid under Pay Item No. P-101-5.1 "Concrete Pavement Removal (Var. depth)" ?

Response 92: Pay item P-101-5.1 represents payment for removal of the concrete pavement around the perimeter of the existing pavement to remain, shown on sheets CD3.01.10, CD3.01.11 and CD3.01.12 only. All other pavement removals are covered by pay items P-151-4.1 and P-151-4.2.

Question 93: Our vendors have notified us of aggregate and cement shortages throughout the industry that will affect the pricing and ability to complete this project in the stipulated timeframe. All quarries are on a rationing program and do not see any significant quantities that could be shipped in 2022 for stockpiling purposes nor any relief for 2023. This creates a major issue for aggregate deliveries to meet the already compressed schedule for most of the work being completed in 2023. Please consider eliminating or reducing the \$7,130 per day liquidated damages or extending the completion date.

Response 93: See response to Question 9

Question 94: Please confirm this is a unit price contract.

Response 94: See response to Question 1

Question 95: Can the owner specify the use of the 24" Lime Rock Base item within this contract?

Response 95: See response to Question 16

Question 96: Will diamond grinding of new PCCP be required as it does not appear it was required for the adjacent project? Is it for smoothness corrections only?

Response 96: Please refer to P-501 specification.

Question 97: Will all RCP be required to be class V? This could require extensive design and cost increases.

Response 97: Reference note 5 on C15 drainage plan series. All storm pipes shall be Class V unless otherwise noted.

Question 98: For the Temporary Security Fence, are the "No Trespassing" signs only attached to the Security Gates?

Response 98: "No Trespassing" signs are to be placed on all gates and at a maximum intervals of 300 feet on the AOA fence. The OAR may request installation of additional signs to maintain security of the project site. Signs are incidental to the cost of fencing.

Question 99: On sheet C60.01.06, are gate number signs to be attached to the Temporary Gates? If so, what are the Gate Numbers and dimensions of the signs?

Response 99: (Response will be provided in a future addendum)

Question 100: On sheet C15.01.35, there is a Drainage Structure Table listing the estimated bid item quantity of 23 inlets and no Manholes. However, on sheet S13.01.08 there is a Table of Variables which lists 14 Manholes and 6 inlets. Can the Owner clarify which table is correct and identify which of the A-Titled structures numbers are Inlets and which are Manholes?

Response 100: See responses to questions 20 and 21.

Question 101: Can the owner provide invert elevations for structure A-201?

Response 101: The south invert of A-201 is 73.21.

Question 102: Are there additional options for the bond breaker between the lean concrete and the 18" Airfield Pavement other than #89 stone?

Response 102: See response to question 27.

Question 103: The quantity for bid item L-110-5.4 was reduced to zero in a prior addendum. The best practice would be to delete this bid item. Please remove this bid item from the bid form.

Response 103: The updated bid schedule will be issued in a future addendum.

Question 104: Are the pavement markings on the ASC side included in this contract?

Response 104: See response to question 34.

Question 105: Per the statement made in P-501-7.3 regarding storm and utility adjustments, does the AFC own any adjustments for utilities or storm in the ASC area?

Response 105: Adjustments for utilities in the ASC area will be the responsibility of the ASC contractor.

Question 106: Are there cleanouts associated with the 6" underdrain? If so, can the owner clarify the quantity and location?

Response 106: See response to question 83.

Question 107: Will there be a pay item for the cleanouts added per the note on Sheet C19.01.02?

Response 107: Cleanouts are incidental to the underdrain installation and/or storm pipe installation.

Question 108: According to the water cabinet supplier, code requires a backflow preventer and a power disconnect. Please review and clarify if these items are required and add appropriate bid items or a specification change to make them incidental to the water cabinet.

Response 108: Water cabinet installation shall meet all applicable standards as referenced in Section 1.2 of Specification 22 37 00. Section 2.5 Item F of Specification 22 37 00 references the the integrated backflow preventer in the water cabinet requirements. All applicable items required to meet codes shall be incidental to the price for the water cabinets.

Question 109: Are there any stockpiled materials on site available for use other than the attic inventory?

Response 109: Assume nothing.

Question 110: What is the existing depth of asphalt and limerock in the staging parking areas?

Response 110: You can field measure.

Question 111: At the pre-bid meeting it was stated that GOAA would provide an office complex for the contractor. Will the contractor need to carry rent, utilities, insurance etc.? If so, can a schedule of these values be provided?

Response 111: See response to item 59 above. Insurance is standard for a contractor to work on owner property. No additional insurance will be required for owner-provided office space.

Question 112: Will the AFC contractor be required to dispose of any of the attic stock upon completion of the project?

Response 112: See response to Question 25.

Question 113: Can the owner clarify the ownership of the security fence upon completion of the AFC project if this material is owned by the AFC contractor?

Response 113: For temporary fencing to separate the AOA from construction activities, we do not intend to own the materials when the project is complete.



ADDENDUM NO. 04

(Issued July 19, 2022)

**TO THE BID DOCUMENTS FOR
BP-S196, TERM C, PH 1X – AIRFIELD CIVIL, APRON & TAXIWAY PAVING**

ORLANDO INTERNATIONAL AIRPORT

ADDENDUM NO. 04

TO ALL HOLDERS OF CONTRACT DOCUMENTS

1. Your attention is directed to the following interpretations of, changes in, and/or additions to the contract documents for the above-named project
2. This addendum is part of the Contract Documents
3. Bidders are required to acknowledge receipt of this Addendum in the space provided on the Bid Form Section 00 41 13

The Bid Due date has been extended to August 2, 2022 @ 2:00 p.m. Please revise Volume 1 of the Project Manual, Page 7 of 461, 3rd paragraph, (Section 00 11 14 – Advertisement for Bids) with the following:

“Sealed bids will be received in the Project Controls Office, Greater Orlando Aviation Authority, 11312 Terminal C Service Road, Bldg. 16, Orlando, FL 32824, up to 2:00 p.m., local time, August 2, 2022, at which time all bids received will be publicly opened, the contents noted and read aloud.”

Revised Drawings

The following drawings have been revised by this Addendum and are included as attachments to this Addendum:

- None



ADDENDUM NO. 05

(Issued July 21, 2022)

TO THE BID DOCUMENTS FOR
BP-S196, TERM C, PH 1X – AIRFIELD CIVIL, APRON & TAXIWAY PAVING

ORLANDO INTERNATIONAL AIRPORT

July 21, 2022

ADDENDUM NO. 5

TO ALL HOLDERS OF CONTRACT DOCUMENTS

1. Your attention is directed to the following interpretations of, changes in, and/or additions to the contract documents for the above-named project
2. This addendum is part of the Contract Documents
3. Bidders are required to acknowledge receipt of this Addendum in the space provided on the Bid Form Section 00 41 13

Revised Specifications

The following Specifications have been modified by this Addendum:

- D-751 ADDED OIL GRIT SEPARATOR TO SPECIFICATION AND PAYMENT ITEMS.
- P-152 ADDED UNCLASSIFIED EXCAVATION LANGUAGE AND BID ITEM P-152-4.4.
- P-501 ADDED LANGUAGE REGARDING SLAB PENETRATIONS AND CLARIFIED PAYMENT FOR RAISING STRUCTURES TO GRADE IS ONLY ASSOCIATED WITH THE AIRSIDE CONCOURSE (ASC) WORK AREA.
- P-605 SPECIFY SILICONE SEALANT IN ACCORDANCE WITH ASTM D5893.
- L-108 PAY ITEMS L-108-5.4 AND L-108-5.5 ADDED
- L-115 DELETE PAY ITEM L-115-5.4, MANHOLE EXTENSION/SLAB PENETRATION THAT IS BEING PAID UNDER SPECIFICATION P-501.
- T-904 ADDED TYPE 3 PLASTIC EROSION CONTROL MAT THE

SPECIFICATION AND PAYMENT ITEMS.

- 22 37 00 CORRECT REFERENCE TO NFPA AND ADD TWO REFERENCE DOCUMENTS, REVISED PARAGRAPH 1.2 ITEMS 1, 6, AND 7.
- 26 05 00 STANDARDIZE ON P-610 REFERENCES, REVISED PARAGRAPH 1.11A.
- 26 05 12 REVISED PARAGRAPHS 3.3A AND 3.5K, FROM 10X20X8 MH ELEVATION ADJUSTMENT TO 24" X 36" X 24"D OUC PULL BOX - COMPLETE. MANHOLE ELEVATION ADJUSTMENT IS PAID FOR IN P-501, PARAGRAPH 3.5.K REVISED TO CLARIFY BEND RADII FOR DUCT, AND REVISED TO STANDARDIZE ON P-610 REFERENCES.
- 26 05 43 STANDARDIZE ON P-610 REFERENCES, REVISED PARAGRAPH 2.3A.
- 26 57 01 STANDARDIZE ON 3" THICK CONCRETE EQUIPMENT PAD AND STANDARDIZE P-610 REFERENCES, REVISED PARAGRAPH 1.10A.
- 33 52 47 REVISED TO INCLUDE RELOCATION OF BV-10 AND REVISE PAY ITEM.

Revised Drawings

The following drawings have been revised by this Addendum and are included as attachments to this Addendum:

- C9.01.03 REMOVED REFERENCE TO JOINT TYPE ON DETAIL 13.
- C14.01.06 EDITED NOTE 7.
- C14.01.07 EDITED NOTE 7.
- C14.01.08 EDITED NOTE 7 AND CORRECTED JOINT SYMBOLS ON TRENCH DRAIN TO TYPE X JOINTS.
- C14.01.09 EDITED NOTE 7 AND CORRECTED JOINT SYMBOLS ON TRENCH DRAIN TO TYPE X JOINTS.
- C15.01.33 ADDED CALLOUTS INDICATING THE LOCATION OF PROPOSED UNDERDRAIN CLEANOUTS. REVISED TRENCH DRAIN CALLOUT TO REFERENCE CORRECTED PROFILE AND LENGTH OF PIPE.
- C15.01.35 REVISED TOP/RIM ELEVATIONS TO MATCH PROPOSED SURFACE.
- C60.01.04 CHANGED CALLOUT TO CLARIFY CONSTRUCTION OF FENCE ON THE EAST SIDE OF THE WORK AREA AND THE NEED TO MAINTAIN SECURE AOA.
- CE0.00.01 REVISED "COORDINATION WITH OTHER UTILITIES AND TRADES" NOTE 4. RENUMBERED "OUC MANHOLE & DUCTBANK DISTRIBUTION NOTES."
- CE3.00.00 REVISED NOTE 36.
- CE3.00.07 REVISED NOTES 5 AND 12, AND CIRCUIT BREAKERS 13 AND 14 FOR WATER CABINET CLARIFICATION.
- CE3.00.08 REVISED NOTES 5 AND 12, AND CIRCUIT BREAKERS 13 AND 14 FOR WATER CABINET CLARIFICATION.
- CE3.00.15 ADDED NOTE 3 AND CALLOUT FOR MANHOLE.
- CE3.00.16 ADDED NOTE 1 AND CALLOUT FOR MANHOLE.

- CE7.00.07 REVISED CONCRETE CALLOUTS AND NOTE 14.
- CE7.00.08 REVISED CONCRETE CALLOUTS.
- CE7.00.08A REVISED CONCRETE CALLOUTS.
- CE7.00.09 ADDED NEW REDESIGN OF THE TRANSFORMER PAD FOR THE 3000KVA TRANSFORMER PAD. APPROVED BY OUC.
- CE7.00.11 REVISED CONCRETE NOTE 2.
- E0.01.01 REVISED NOTE 35 TO CLARIFY CONCRETE REQUIREMENTS.
- E2.05.13 REVISED CONCRETE CALLOUTS.
- E7.00.08 REVISED NOTE 14 TO CLARIFY CONCRETE REQUIREMENTS.
- E7.00.18 REVISED CALLOUT TO CLARIFY CONCRETE REQUIREMENTS.
- E7.01.14 REVISED POLE HEIGHT CALLOUT.
- JFC1.11.19 REVISE SHEET TO SHOW RELOCATION OF BV-10.
- JFE1.11.08 REVISE SHEET TO SHOW LOCATION OF ELECTRICAL ROOMS

Revised Bid Schedule

- ADD BID ITEM D-751-5.3 OIL GRIT SEPARATOR PER EACH WITH A QUANTITY OF 1 EA
- ADD BID ITEM P-152-4.4 UNCLASSIFIED EXCAVATION PER CUBIC YARD WITH A QUANTITY OF 20,000 CY
- ADD BID ITEM L-108-5.4 4/0 AWG BSD COPPER COUNTERPOISE GROUND GRID WIRE - PER LINEAL FOOT WITH A QUANTITY OF 4,410 LF
- ADD BID ITEM L-108-5.5 GROUND ROD INSPECTION PIT - PER EACH WITH A QUANTITY OF 11 EA
- ADD BID ITEM T-904-5.2 TYPE 3 PLASTIC EROSION CONTROL MAT - PER SQUARE YARD WITH A QUANTITY OF 5,380 SY
- REMOVE BID ITEM L-110-5.4 4 WAY 4" SCHEDULE 40 PVC CONCRETE ENCASED DUCT - PER LINEAL FOOT (LF)
- REMOVE BID ITEM L-115-5.4 EXISTING AIRCRAFT RATED ELECTRICAL MANHOLE/HANDHOLE/JUNCTION STRUCTURE ELEVATION ADJUSTMENT UP TO AND INCLUDING 5'X5' INSIDE DIMENSION
- REVISE ITEM DESCRIPTION OF BID ITEM C-106-4.6 TO READ "BOLLARD"
- REVISE BID ITEM D-701-5.5 42-INCH REINFORCED CONCRETE PIPE TO A QUANTITY OF 390 LF
- REVISE BID ITEM D-701-5.6 48-INCH REINFORCED CONCRETE PIPE TO A QUANTITY OF 280 LF
- REVISE BID ITEM D-701-5.9 72-INCH REINFORCED CONCRETE PIPE TO A QUANTITY OF 160 LF
- REVISE BID ITEM D-751-5.1 MANHOLES TO A QUANTITY OF 12 EA
- REVISE BID ITEM D-751.5.3 INLETS TO A QUANTITY OF 7 EA
- REVISE BID ITEM D-756-6.2 18" TRENCH DRAIN TO A VALUE OF 600 LF
- REVISE ITEM DESCRIPTION OF PAY ITEM 26 05 12-5.9 TO READ "24" X 36" X 24"D OUC PULL BOX - COMPLETE"
- REVISE ITEM DESCRIPTION OF BID ITEM 33 52 47-5.5 TO READ

- "MODIFICATIONS AND RELOCATION OF EXISITNG BLOCK VALVE PIT BV-10"
- REVISE ITEM DESCRIPTION OF BID ITEM TO READ "1-INCH TYPE K COPPER PIPE"
- REVISE ITEM DESCRIPTION OF BID ITEM C-106-4.6 TO READ "BOLLARD"
- REVISE BID ITEM P-501-8.4 RAISE EXISTING STRUCTURES TO GRADE TO A QUANTITY OF 48 EA

Responses to Bidder's Questions:

Note: Responses to the following Questions have been revised: 14, 20, 21, 22, 28, 29, 31, 32, 38, 39, 40, 41, 46, 56, 67, 68, 85, 87, 88, 89, 90, 91, 103, 115, 147, 154

<i>Question 1: Is this a Lump Sum or Unit Priced contract?</i>	Response 1: Unit Price
<i>Question 2: If this is a Lump Sum project, please clarify the purpose of unit prices on the bid form. How will these be used by GOAA?</i>	Response 2: This is a unit price contract.
<i>Question 3: Can the owner provide CAD files?</i>	Response 3: CAD files are not being provided to bidders. CAD files will be provided to the successful bidder after the contract is awarded.
<i>Question 4: There appear to be several missing bid items from the list provided in the bid form. Please add pay items for the following scopes of work: Mob/Demob Site Safety/Security MOT Erosion Control Fabric-formed concrete (if required) Type B Stabilization & 8" Limerock Base Course (temp service roads) 2.5" Asphalt Surface Paving (temporary)</i>	Response 4: 1) Mobilization, Safety, Security and Maintenance of Traffic and Erosion Control are included in the Airfield Civil, Electrical, and Fueling Works Bid Schedule in pay items C-105-6.1, C-106-4.1 through C-106-4.4 and C-102-5.1, respectively. 2) Fabric-formed concrete is not required. 3) Type B Stabilization, 8" Limerock Base Course, and 2.5" Asphalt Surface Paving (for temporary roads) are incidental to the Miscellaneous Maintenance of Traffic and Safety under pay item C-106.4.4.
<i>Question 5: Please provide geotechnical information including borings</i>	Response 5: Geotechnical information was included in Addendum #1.
<i>Question 6: Will the owner provide quantity calculations used to generate the bid item quantities?</i>	Response 6: Quantities are included on the bid schedule.

<p><i>Question 7: Is a Batch Plant Required for the Apron Paving Concrete? If yes, where is it allowed to be located and does GOAA have a generic permit in place for temporary batch plants that will be extended to BP-196?</i></p>	<p>Response 7: A batch plant is not required as discussed in the pre-bid.</p>
<p><i>Question 8: Please confirm there is no PLA (Project Labor Agreement) requirement on this project.</i></p>	<p>Response 8: Confirmed</p>
<p><i>Question 9: Our vendors have notified us of aggregate and concrete shortages throughout the industry that will affect the pricing and ability to complete this project in the stipulated timeframe. All quarries are on a rationing program and don't see any significant quantities that could be shipped in 2022 for stockpiling purposes nor any relief for 2023. This creates a major issue for aggregate deliveries to meet the already compressed schedule for most of the work being completed in 2023. Please consider eliminating or reducing the \$7,100 per day liquidated damages or extending the completion date.</i></p>	<p>Response 9: Supply chain disruptions to the US can be negotiated via the change order process.</p>
<p><i>Question 10: Will any work be restricted by the Owner for Holidays or other Special Events?</i></p>	<p>Response 10: No- the work area is unrestricted unless overridden by Federal agencies in rare circumstances.</p>
<p><i>Question 11: With the compressed schedule, will unrestricted nighttime work be allowed?</i></p>	<p>Response 11: No restrictions on work hours are contemplated.</p>
<p><i>Question 12: Project documents mandate a \$5,000,000 Automobile Liability policy. Is this requirement applicable to vendors making deliveries as well as on-site vehicles?</i></p>	<p>Response 12: The \$5M is intended for vehicles operating on the AOA.</p>
<p><i>Question 13: Project documents mandate a \$5,000,000 Automobile Liability policy. Is this requirement applicable to activities outside the AOA?</i></p>	<p>Response 13: No</p>
<p><i>Question 14: If the plan dimensions change once the building is finalized and a set of drawings is reissued, will the contractor be afforded price adjustments or will the unit prices at bid time be used?</i></p>	<p>Response 14: The ASC building foundation is already constructed and the building design is final, so no changes to the plan dimensions are anticipated. Any changes to the drawings would be dealt with in accordance with the contract. (see Section GP-40).</p>

<p><i>Question 15: Is the ASC contractor responsible for completion of the joint construction along the demarcation line?</i></p>	<p>Response 15: The AFC Contractor shall complete placement of the pavement to the Demarcation line. The ASC Contractor is to install dowels, place adjacent PCC, and saw/seal the joint.</p>
<p><i>Question 16: Can the owner specify the use/location of the 24" Lime Rock Base item?</i></p>	<p>Response 16: The 24" limerock is to be installed beneath sidewalk pavement adjacent to ASC building as shown on detail sheet C9.01.03.</p>
<p><i>Question 17: Are the asphalt quantities for the temp VSR's included in the asphalt pay item?</i></p>	<p>Response 17: The temporary asphalt road construction and demolition are incidental to the Maintenance of Traffic pay item C-106.4.4.</p>
<p><i>Question 18: Will the owner please clarify where the removal of the existing asphalt is to be paid for? Quantities reflect all pavement removal to be paid for under item P-101-5.1. In addition to this, can the owner please clarify the depth of asphalt being removed? The existing typical shows +/- 2" of asphalt and 10" of limerock base. The pay item shows 8".</i></p>	<p>Response 18: Existing asphalt pavement section removal is incidental to P-151-4.1 Clearing and Grubbing (lump sum) and P-151-4.2 BP-S196 Landside Civil Demoliton (lump sum).</p>
<p><i>Question 19: Please confirm if there is Fabri-Form concrete to be installed under the S-196 contract.</i></p>	<p>Response 19: There is no Fabri-Form concrete included in this project at this time.</p>
<p><i>Question 20: There is a structure table for the 23 Inlets but there is not a structure table for the 10 Manholes, will this be provided in an upcoming agenda?</i></p>	<p>Response 20: The structure table includes all proposed Manholes (12) and all proposed inlets (7). The bid schedule has been updated and provided in Addendum 5.</p>
<p><i>Question 21: The bid item for the manholes indicates there are 10 each. I can only locate 9 manholes by adding the 4 within the oil/separator and the adjusted manhole #'s A-43, 105, 243, 244 & 245. Is this correct?</i></p>	<p>Response 21: There are 12 proposed manholes - A-109, A-200, A-206, A-207, A-208, A-209, A-210, A-211, A-212, A-213, A-247, A-248. Within the AFC work area, all manholes to be adjusted to grade shall be incidental to pay item P-501-8.1. The bid schedule has been updated and provided in Addendum 5.</p>
<p><i>Question 22: Is the ASF Contractor responsible for the 2" PVC water installation, the 1" Copper installation and the Potable Water Cabinets? If so, please add utility bid items with quantities.</i></p>	<p>Response 22: The 2" PVC and 1" Type K Copper piping are part of the AFC work scope and paid under bid items 33 11 00-5.1 and 33 11 00 5.2 (Note: the bid shedule currently lists bid item 34 11 00-5.2 for the 1" Type K Copper Pipe) The bid schedule has been updated and provided in Addendum 5</p>

<p><i>Question 23: Is the RCP below the Trench Drain existing or new? If new, please confirm the RCP diameter and inverts from North toward structure A-273 and South from Structure A-272.</i></p>	<p>Response 23: The proposed RCP below the Trench Drain is new. RCP does not extend north of A-272 and does not extend south of A-273. Invert for all structures are provided on Sheet C15.01.35.</p>
<p><i>Question 24: What is the timeline and duration for the Airside Concourse project? How much overlap will there be with BP-196?</i></p>	<p>Response 24: The intent is simultaneous work for both AFC and ASC work. The anticipated schedule for BP-S195 SC is Q4 2025. BP-S196 anticipated schedule is start Q4 2022 and SC Q4 2023.</p>
<p><i>Question 25: Will the materials that are currently on site be available to the contractor for use on this project? And/or will the contractor be responsible for disposal of these items off site?</i></p>	<p>Response 25: Materials currently on site and included in inventory log will be available to contractor for use on this project. Any materials not used on this project will require relocation and/or disposal off site at the direction of the OAR.</p>
<p><i>Question 26: I do not see the Minimum wages for the Davis Bacon Act. Can you please provide those?</i></p>	<p>Response 26: See Special Provisions Section SP-1.</p>
<p><i>Question 27: Please refer to P-306 specification section 5.14, can we use curing compound in lieu of Choke Stone as bond breaker? The Dowel baskets may not be secure sitting on top of choke stone.</i></p>	<p>Response 27: Alternative materials are not being considered during the procurement process.</p>
<p><i>Question 28: The Joint Layout Sheet C14.01.09 does not show the 12" trench drain on the east side of the apron. The 18" Trench Drain is laid out on the joint layout drawings, but the 12" Trench Drain is missing.</i></p>	<p>Response 28: Additional reinforcement is not required for slabs adjacent to the trench drain on Sheet C14.01.09 except as shown on the plans. Joint callouts to reference a Trench Drain Type "X" Joint have been added to plan sheets C14.01.08 and C14.01.09 in place of the Type "A" thickened edge expansion joints currently called out. The have sheets have been issued with Addendum #5.</p>
<p><i>Question 29: Please refer to sheet C60.01.04, The East Side AOA Security fence to be installed in Phase 3 uses a legend of Fence mounted on K barrier. Please confirm this.</i></p>	<p>Response 29: The East Side AOA Security fence shall be installed on jersey barrier, Sheet C60.01.04 has been updated and issued with Addendum #5.</p>
<p><i>Question 30: C35.01.08; In order to protect the existing existing fuel line during proposed work, Contractor would like to request copy of the as-builts for currently installed Jet Fuel line at the STC</i></p>	<p>Response 30: As-builts will be provided to apparent low bidder. This is SSI info.</p>

<p><i>Question 31: NA; With GOAA requesting qualifications and a goal (requirement) of 20% for DBE , what is the basis of award?</i></p>	<p>Response 31: Lowest, responsive bidder. To be responsive, bid must meet the 20% goal or provide acceptable evidence of good faith efforts (GFE) as defined in GOAA Policy and the federal regulations. GOAA determines whether evidence of GFE is acceptable, and it will be evaluated very closely.</p>
<p><i>Question 32: 20-02 - 00 45 13; It appears bidders are required to have successfully completed within the last five years, similar work as specified in the Bidder's Qualification Specifications Section 00 45 13. Please clarify in detail how this information will be used in the basis of award?</i></p>	<p>Response 32: Lowest, responsive bidder. To be responsive, Bidder must have the requisite experience with airfield work.</p>
<p><i>Question 33: N/A; Are there "Electronic" Grading Files available, if so please supply.</i></p>	<p>Response 33: CAD files are not being provided to bidders. CAD files will be provided to the successful bidder after the contract is awarded.</p>
<p><i>Question 34: C8.01.07; Please clarify following questions associated with the AFC's scope limits around the demarcation line between AFC and ASC Paving.</i></p> <p><i>1) For AFC scope, Is there a requirement for overbuild of 6" lean concrete between the AFC & ASC Paving?</i></p> <p><i>2) Are dowel bars to be drilled and left exposed along the D-Joints by AFC contractor?</i></p> <p><i>3) Who will be responsible for sealing of the joints?</i></p> <p><i>4) Who stripes ASC pavement?</i></p> <p><i>5) Lightning protection along building is ASC's responsibility?</i></p>	<p>Response 34: 1) Yes - see Detail 3/C9.01.02 as reference for overbuild of Lean Concrete and Lime Rock Base Courses.</p> <p>2) Dowel bars are not to be placed along the D-Joint at the AFC/ASC Demarcation Line only.</p> <p>3) The ASC contractor is responsible for sealing joints within their designated work area and along demarcation line.</p> <p>4) The ASC contractor.</p> <p>5) Yes</p>
<p><i>Question 35: C8.01.07; Please advise what the scope the line of demarcation is supposed to include. Only Subgrade to Paving? What about EFSO Fuel, waterline, and Drainage which crosses the line?</i></p>	<p>Response 35: The AFC Contractor is responsible for all underground work and completion of the all work to the top of the subgrade. The ASC Contractor is to raise structures to grade, repair any disturbed subgrade and place the Base Courses and PCC Pavement.</p>

<p><i>Question 36: C35.01.08; As the installed fuel lines are active and charged with jet fuel? What are the specific steps that needed to be taken by Contractor to protect the existing jet fuel line / Pits ?</i></p>	<p>Response 36: Existing fuel lines to be connected to are active and charged with fuel. Protecting the existing fuel lines, fuel vaults and pits have paramount importance as stated in General Notes and Scope of Work on drawing JFG0.11.01, Specifications Section 33 52 43, Specifications Section 33 52 45 Paragraphs 3.6, 3.7, and in other Contract Documents. Provide protection around the existing fuel structures with concrete barricades, warning lights and orange safety fence as required.</p>
<p><i>Question 37: P-306; For lean concrete (P-306) ,please advise if the compressive strength > 800 lbs./sq.inch will be acceptable at seven day compressive strength test results</i></p>	<p>Response 37: For lean concrete base that exceeds a compressive strength of 800 psi as defined in Specification P-306, joints shall be cut to match the PCC pavement joints.</p>
<p><i>Question 38: 00 11 13 - 2 - DBE Participation; Please confirm if DBE Good Faith efforts will be accepted?</i></p>	<p>Response 38: GOAA determines whether evidence of GFE is acceptable, following federal regulations.</p>
<p><i>Question 39: 00 11 13 - 2 - DBE Participation; Please confirm that the DBE goal of 20% is limited to vendors who are certified by the Florida UCP? And if following weblink can be used for verification of eligibility of a DBE firm: https://fdotxwp02.dot.state.fl.us/EqualOpportunityOfficeBusinessDirectory/</i></p>	<p>Response 39: 20% or GFE is the requirement. GOAA small business to be consulted as-needed.</p>
<p><i>Question 40: 00 11 13 - 2 - DBE Participation; Please advise if the DBE's from all district's and industries will be acceptable?</i></p>	<p>Response 40: 20% or GFE is the requirement. GOAA small business to be consulted as-needed.</p>
<p><i>Question 41: 00 11 13 - 2 - DBE Participation; Will second tier DBE Subcontractors and/or Material Suppliers be accepted on this project? For example, 1st tier Subcontractor is not DBE but the material supplier they use is a DBE. Will that supplier , as a 2nd tier, be acceptable? or another example would be a DBE trucking company hauling for a non-DBE Subcontractor</i></p>	<p>Response 41: 20% or GFE is the requirement. GOAA small business to be consulted as-needed.</p>

<p><i>Question 42: Sheet ISO.00.03; Note F. 7. Site conditions states Contractor shall have a water truck and vacuum sweeper with trained Operator on site at all times. Metal Bristles are prohibited on sweeper equipment. Is there a size requirement on the water truck or vacuum sweeper truck?</i></p>	<p>Response 42: The Contractor shall determine the size of water truck and vacuum sweeper truck required to maintain the project site and provided appropriate environmental controls (dust control, etc.).</p>
<p><i>Question 43: C9.01.02; Please clarify sheet C9.01.02, detail 3 Taxiway typical section and detail 5 apron typical section only call out P-306 and P-211 however detail 1 subgrade compaction schedule calls out P-304 or P-306 and P-209 or P-211. Are P-304 and P-209 allowed as an alternate? If so please provide the specifications for P-304 and P-209.</i></p>	<p>Response 43: Alternative materials are not being considered during the procurement process.</p>
<p><i>Question 44: C9.01.02; Can an alternate material be proposed to the required bond breaker - choke stone between P-501 and P-306?</i></p>	<p>Response 44: See response to question 27.</p>
<p><i>Question 45: N/A; What sites are available for on-site batch plant? What utilities exist near potential sites (electrical & water)</i></p>	<p>Response 45: Bidder to propose if desired. Owner will assist with logistics and owner approval; however, contractor responsible for means and methods and costs if desired.</p>
<p><i>Question 46: C60.01.02; Who covers cost for security/gate guards during construction in/out of AOA? Who provides gate shack/light plant/toilet/temp power?</i></p>	<p>Response 46: Guardshack/lighting/temp toilet by contractor</p>

<p><i>Question 47: ISO.00.03; Required to "coordinate with other contractors"? Will ASC contract be working concurrently with AFC contractor? Will ASC need laydown space West of pavement demarcation line? If AFC is impacted by ASC due to schedule delays, will AFC be compensated?</i></p>	<p>Response 47: See response to item 24 above. If work impacts the change order process will be followed by contract.</p>
<p><i>Question 48: CD3.01.25; No sawcut detail provided for "full depth sawcut" along perimeter of P-501 as noted on drawings (CD3.01.10). Why is full depth sawcut required to remove 4" concrete sidewalk?</i></p>	<p>Response 48: Saw cutting shall be required for the full depth of pavements to be removed to protect adjacent pavement to remain in place.</p>
<p><i>Question 49: CD3.01.11; Plan shows to demo existing E/W portion of roadway, and not N/S portion. Please confirm existing asphalt road going N/S stays in-place.</i></p>	<p>Response 49: Sheet CD3.01.11 identifies removal of the Asphalt Road per P-151 on the east and west side of Taxiway B.</p>
<p><i>Question 50: CD3.01.12; Appears old batch plant concrete pad not shown on plan sheets, requires demolition and disposal. Please confirm.</i></p>	<p>Response 50: All pavements within the areas identified for demolition are to be removed unless otherwise noted.</p>
<p><i>Question 51: C9.01.04; Are locations for PBB anchors within AFC or ASC pavement limits? No location/map provided.</i></p>	<p>Response 51: A bid item for the PBB anchors is included in both the airfield civil and airside concourse packages as final locations have not been established at this time.</p>
<p><i>Question 52: C15.01.12; Erosion and Sediment control plan only designed for current field conditions. Please provide E&S plans for after interim phase before pavement and after embankment and drainage installation.</i></p>	<p>Response 52: Erosion and sediment control measures were defined based on information available at the time of the design. Ongoing construction is occurring on the site that may change the existing conditions, requiring modification to the erosion and sediment control measures. Final sediment and erosion control measures will be coordinated in the field with the OAR and all costs shall be incidental to pay item C-102-5.1.</p>
<p><i>Question 53: C15.01.14; Silt fence is shown outside AOA fence. Recommend relocating to inside AOA side of fence, or upstream of watershed. Siltation risk of contaminating #57 stone along limits of secure fence.</i></p>	<p>Response 53: The final location of the erosion and sediment control measures are to be coordinated with the OAR during construction. Consideration of relocating the silt fence inside the AOA fence will be considered at that time.</p>

<p><i>Question 54: C60.01.05; What happens with barrier mounted fence on East side of AOA apron that is left in-place for ASC construction? Is barrier and fence become property of GOAA? AFC any action after installation?</i></p>	<p>Response 54: (Response will be provided in a future addendum)</p>
<p><i>Question 55: CE0.00.01; Please confirm OUC will not install any cable into new ductbank system until after AFC substantial completion. No support or coordination for new install with OUC by AFC during construction? No dewatering of manholes for OUC.</i></p>	<p>Response 55: Utility coordination is routine for any construction project. Schedules will be coordinated and enforced with all relevant parties.</p>
<p><i>Question 56: CE7.00.09; Confirm 48" radius conduit sweeps needed at transformer pads</i></p>	<p>Response 56: 60-inch radius is required at transformer pads. Reference Specification 26 05 12 - 18. The dimensions shown in the detail are for conduit/duct minimum burial depth. The minimum primary conduit/duct bend radius for all bends is 60-inches per specification.</p>
<p><i>Question 57: CE3.00.06, C35.01.09; Water booster pump noted in CE drawings, but no information provided on utility plans. Please provide information on booster pump requirements.</i></p>	<p>Response 57: See Specification SECTION 22 37 00 – POTABLE WATER CABINET</p>
<p><i>Question 58: CE; Where is info on ground rod requirements for primary power ductbank?</i></p>	<p>Response 58: Reference sheet CE7.00.08A and Specification 26 05 12 for ground rod requirements for primary power system.</p>
<p><i>Question 59: NA; In the GOAA provided trailer for the contractor, will the contractor be responsible for power, water and internet?</i></p>	<p>Response 59: No.</p>
<p><i>Question 60: 90-06; Please provide details/cross sections for Structures and RCP to verify depth</i></p>	<p>Response 60: Details, top elevations and inverts for drainage structures are included in the Series C15 sheets.</p>
<p><i>Question 61: P-403; Please confirm if OAR will be performing the air voids, mat and joint density tests for the asphalt pavement surface. Sec. 6.2 asks for documentation and delivery of results to the OAR when the contractor is not stated as responsible for them.</i></p>	<p>Response 61: Contractor is responsible for QC testing and owner will perform QA testing.</p>

<p><i>Question 62: CD3.01.12; The existing Project Office Complex is full of existing materials, are these to be disposed of or relocated by the contractor as an incidental to the Demo item? If GOAA chooses to relocate where would the materials need to be delivered and offloaded?</i></p>	<p>Response 62: The existing team will need to deal with those items on the current contract. Anything beyond that needs to be discussed under those contract terms and conditions.</p>
<p><i>Question 63: JFC5.11.01; The Detail A, Section A and Section B on sheet JFC5.11.01 all show the concrete apron cast around the fuel valve pit and hydrants. The existing hydrants not currently in pavement have concrete pads poured around them. Please provide a detail of how the existing concrete should be incorporated into the concrete apron pavement or whether it is intended to be demolished.</i></p>	<p>Response 63: The existing concrete pads around the CVV, BV, LPD and HPV pits are 6" thick x 4' wide non-reinforced concrete (3,000 psi) collars. The collars are to be chipped away and removed with care without damaging the existing pits and new pavement to be installed around the pits as per the Contract Documents.</p>
<p><i>Question 64: E2.05.11; Please clarify if the High mast pole concrete base protection should be included in the AFC scope or ASC. The base protection is shown on top of concrete pavement demarked for the ASC contract.</i></p>	<p>Response 64: The Highmast light pole is to be included in the AFC work scope. If the highmast light pole resides in the ASC paving limits, the PCC surrounding the high mast light pole is to be constructed by the ASC Contractor.</p>
<p><i>Question 65: Can you let us know, which company has the CEI contract for this project.</i></p>	<p>Response 65: This is not FDOT for CEI. We use OARs with QA test companies.</p>
<p><i>Question 66: Please refer to sheet 2 of add 5 addendum 1, the 6th bullet from the top states "Revise quantity of Bid Item P-501-8.3 to quantity of 3,880 SY (ASC Only)". This has not been updated in the addendum 1 bid form. Please confirm that this change is correct & the quantity is to be revised from 210 SY to 3,880 SY.</i></p>	<p>Response 66: The Addendum No. 1 correctly identifies the AFC bid item P-501-8.3 quantity as 210 sy and the ASC bid item P-501-8.3 quantity as 3,880 sy.</p>
<p><i>Question 67: Please refer to sheet 2 of add 5 addendum 1, the 1st bullet from the top states "Revise Item Description of Bid Item: 26 05 12-5.7 to read: 4 W 6" Schedule 40 PVC OUC Concrete Encased Duct". But on page 13 of 18 , Bid schedule addendum 1 the bid item description still reads "12 W 6" Schedule 40 PVC OUC Concrete Encased Duct".</i></p>	<p>Response 67: The updated bid schedule will be issued in a future addendum. The pay items as listed in Specification 26 05 12 are correct. Please revise all other forms to match 26 05 12.</p>

<p><i>Question 68: Please refer to sheet 2 of add 5 addendum 1, The quantity for Bid item -115-5.2 has been revised to 10EA, But on the Addendum 1 bid form sheet 9 of 18 its still 9 EA. Please confirm the quantity.</i></p>	<p>Response 68: The bid schedule has been updated and provided in Addendum 5.</p>
<p><i>Question 69: In lieu of #4 bars @ 12" O.C. (EW), will a welded wire fabric equivalent be acceptable for use in all PCC Panels which require reinforcement per detail 15 sheet C9.01.01?</i></p>	<p>Response 69: Welded wire fabric shall not be used in lieu of #4 bars spaced @ 12" OCEW.</p>
<p><i>Question 70: Will an equivalent form of reinforcement support be acceptable to in lieu of the support shown on detail 8, sheet C9.01.01, ie ZigZag or Continuous High Chairs?</i></p>	<p>Response 70: Alternative materials are not being considered during the procurement process.</p>
<p><i>Question 71: During the Prebid meeting & the site visit 7/7/22, It was mentioned that there is a potential batch plant site South of the project location. Does GOAA have any layout drawings for the batch plant? Also what condition would we receive the site in? It was mentioned that Tree clearing would be completed. But will there be roots and stumps left in.</i></p>	<p>Response 71: If the contractor opts for a batch plant see response per item 45 above. There are no plans developed.</p>
<p><i>Question 72: Please refer to P-501 4-12. Is the intent here to have a transverse broom finish across the slab?</i></p>	<p>Response 72: Yes, the slabs shall have a transverse broom finish.</p>
<p><i>Question 73: Plan sheet C35.01.09. Please provide pay item for: "Adjust Existing Sanitary Manhole to Proposed Grade", "Adjust Existing Water Main Valve to Proposed Finished Grade", and "Adjust Existing Fire Hydrant to Proposed Finished Grade.</i></p>	<p>Response 73: All structures to be adjusted to grade within the AFC project limits shall be incidental to pay item P-501-8.1.</p>
<p><i>Question 74: Please include pay item for Security Area Monitors (SAMS) and provide specification.</i></p>	<p>Response 74: Not applicable as GOAA will provide SAMS.</p>
<p><i>Question 75: There is no bid item for the oil/grit separator. Please provide a bid item.</i></p>	<p>Response 75: The Bid Schedule has been updated to include the Oil Grit Separator as Bid Item D-751-5.3.</p>
<p><i>Question 76: Please verify that structures A-201, A-216, and A-246 are existing and to remain. Are the structure tops to be adjusted to final elevations? If so, what bid item should be used for this work?</i></p>	<p>Response 76: A-201, A-216, A-246 are existing and are to remain. Required adjustments for A-246 shall be incidental to P-501. No adjustments are anticipated for structures A-201 and A-216.</p>

<p><i>Question 77: Drainage structures a104, a43, a105, a243, a244, and a245 are shown to be adjusted. What bid item should be used for this work?</i></p>	<p>Response 77: All structures to be adjusted to grade within the AFC project limits shall be incidental to pay item P-501-8.1.</p>
<p><i>Question 78: The available inventory list shows that drainage structures A205, A247, and A109 have been purchased and are stockpiled on-site. Please verify that the structures have been built to the current plan and that no modifications will be required.</i></p>	<p>Response 78: Structures have been built to the current plan and may require adjustments to grade.</p>
<p><i>Question 79: The available inventory list shows a variety of concrete pipe. Please verify that all of this pipe is available for use on this project; that it is all Class 5 concrete pipe; and that all gaskets are included and in good condition.</i></p>	<p>Response 79: The inventory of stored materials, available to the Contractor, was included in Addendum No. 1. The Contractor shall inspect the materials and make their own determination of the material suitability for use in the project.</p>
<p><i>Question 80: Plan sheet C15.01.32 shows 3 existing cleanout covers that need to be adjusted to final grade. There are 5 total for the project. Under what pay item should this work be included?</i></p>	<p>Response 80: All structures, including cleanouts, to be adjusted to grade within the AFC project limits shall be incidental to pay item P-501-8.1.</p>
<p><i>Question 81: Plan sheet CD3.01.12 shows 4 runs of existing drainage pipe to be removed. Please provide the sizes of these pipes.</i></p>	<p>Response 81: The northern 2 runs of existing drainage pipe running east-west are 60" culverts. The southern 2 runs of existing drainage pipe running north-south are 66" culverts.</p>
<p><i>Question 82: Plan sheet C15.01.33 shows an outfall pipe from the underdrain to structure A-216. Please provide a size for this outfall pipe.</i></p>	<p>Response 82: The outfall pipe is underdrain pipe. It shall be Type 1 6" Smooth Perforated HDPE per Note 6 on sheet C15.01.33.</p>
<p><i>Question 83: For the underdrain pipe shown on sheet C15.01.33, please specify how many cleanouts will be required and where? Will terminal cleanouts be required? Will intermediate cleanouts be required (what spacing)? Will the outfall pipe into A-216 require a cleanout?</i></p>	<p>Response 83: Underdrain cleanouts are required at the beginning of each segment of pipe. There will be six (6) total in the infield area between TWY B12 and TWY B13.</p>
<p><i>Question 84: There are trench drain callouts that do not reference a profile section. Is it the intent to use the same profile if trench drain lengths are equal?</i></p>	<p>Response 84: Yes - profiles are typical for trench drains of equal lengths.</p>
<p><i>Question 85: Profiles 1, 2, 3, 6 and 9 do not appear to be used. Please clarify if these are not applicable to this project.</i></p>	<p>Response 85: Correct - only profiles 4, 5, 7, 9 and 10 are applicable to this portion of the Terminal C project.</p>

<p><i>Question 86: The bid item quantity for inlets is 23. 7 new inlets are shown in the plan. There are 16 junctions between the trench drains and 18 inch pipe. Are these junctions to be paid for in the inlet bid item?</i></p>	<p>Response 86: Junctions shall not be paid for under the inlet bid item. The bid schedule has been updated and provided in Addendum 5.</p>
<p><i>Question 87: The bid item quantity for 48 inch RCP is 120 LF. Based on our takeoff, there are 263 LF (A247 = 46, A109 = 107, A273 = 110). Please verify and consider revising the bid item quantity.</i></p>	<p>Response 87: The bid schedule has been updated and provided in Addendum 5.</p>
<p><i>Question 88: The bid item quantity for 72 inch RCP is 230 LF. Based on our takeoff, there are 147 LF (A230 = 147 LF). Please verify and consider revising the bid item quantity.</i></p>	<p>Response 88: The bid schedule has been updated and provided in Addendum 5.</p>
<p><i>Question 89: The bid item quantity for manholes is 10 EA. Based on our takeoff, there are 12 EA (A109, A200, A206, A207, A208, A209, A210, A211, A212, A213, A247, A248). Please verify and consider revising the bid item quantity.</i></p>	<p>Response 89: The bid schedule has been updated and provided in Addendum 5.</p>
<p><i>Question 90: The following drainage bid items quantities differ from our takeoff quantities by <8%. To avoid unbalanced bidding, please verify the quantities and consider revising the pay item quantities: a. 18" RCP = 391; 24" RCP = 120; 30" RCP= 742; 42" RCP = 370 LF; 54" RCP = 572 LF; 60" RCP = 451 LF; 6" PVC = 302 LF; 10" PVC = 226 LF; 6" Smooth HDPE = 1560 LF; 12" trench drain = 976 LF; 18" trench drain = 526 LF.</i></p>	<p>Response 90: The bid schedule has been updated and provided in Addendum 5.</p>

<p><i>Question 91: Addendum No. 1 revised BS-196 Permit and Bid Documents-Specs Vol 2. Section 152-3.1 "Measurement for payment for embankment, specified by the cubic yard (cubic meter) shall be computed from the comparison of surveyed original and final surface approved by the OAR. The volume computed by a DTM model of the original and final surfaces established by the contractor surveys and approved by the OAR shall be the basis of measurement".</i></p> <p><i>a- Will measurement for payment for embankment include the cut areas?</i></p> <p><i>b- If the excavation in cut areas will not be measured for payment under the embankment item, please provide quantity of incidental excavation to be included under the embankment item.</i></p> <p><i>c- As per Section 152-2.1 "Before beginning excavation, grading, and embankment operations in existing pervious areas, the area shall have topsoil stripped to a minimum depth of 6 inches". Please confirm pay item for strip topsoil.</i></p>	<p>Response 91: Pay items P-152-4.1 Embankment and P-152-4.3 Subgrade Preparation represent payment for all costs associated with excavation, transport, placement and compaction of materials required to establish the subgrade surface.</p> <p>Pay item P-152-4.2 Unsuitable Excavation represents payment for all costs associated with excavation and disposal of materials that are unusable for embankments.</p> <p>Removal and stockpiling of topsoil shall be incidental to item P-152-4.1.</p> <p>Pay item P-152-4.4 Unclassified Excavation has been added to the bid schedule.</p> <p>The stockpiled topsoil used in areas to be seeded or sodded shall be paid under item P-905-5.1 Topsoil (Obtained on Site or Removed from Stockpile).</p>
<p><i>Question 92: Concrete to be Remove as per plans CD3.01.10 to CD3.01.12 will be measured and paid under Pay Item No. P-101-5.1 "Concrete Pavement Removal (Var. depth)" ?</i></p>	<p>Response 92: Pay item P-101-5.1 represents payment for removal of the concrete pavement around the perimeter of the existing pavement to remain, shown on sheets CD3.01.10, CD3.01.11 and CD3.01.12 only. All other pavement removals are covered by pay items P-151-4.1 and P-151-4.2.</p>

<p><i>Question 93: Our vendors have notified us of aggregate and cement shortages throughout the industry that will affect the pricing and ability to complete this project in the stipulated timeframe. All quarries are on a rationing program and do not see any significant quantities that could be shipped in 2022 for stockpiling purposes nor any relief for 2023. This creates a major issue for aggregate deliveries to meet the already compressed schedule for most of the work being completed in 2023. Please consider eliminating or reducing the \$7,130 per day liquidated damages or extending the completion date.</i></p>	<p>Response 93: See response to Question 9</p>
<p><i>Question 94: Please confirm this is a unit price contract.</i></p>	<p>Response 94: See response to Question 1</p>
<p><i>Question 95: Can the owner specify the use of the 24" Lime Rock Base item within this contract?</i></p>	<p>Response 95: See response to Question 16</p>
<p><i>Question 96: Will diamond grinding of new PCCP be required as it does not appear it was required for the adjacent project? Is it for smoothness corrections only?</i></p>	<p>Response 96: Please refer to P-501 specification.</p>
<p><i>Question 97: Will all RCP be required to be class V? This could require extensive design and cost increases.</i></p>	<p>Response 97: Reference note 5 on C15 drainage plan series. All storm pipes shall be Class V unless otherwise noted.</p>
<p><i>Question 98: For the Temporary Security Fence, are the "No Trespassing" signs only attached to the Security Gates?</i></p>	<p>Response 98: "No Trespassing" signs are to be placed on all gates and at a maximum intervals of 300 feet on the AOA fence. The OAR may request installation of additional signs to maintain security of the project site. Signs are incidental to the cost of fencing.</p>
<p><i>Question 99: On sheet C60.01.06, are gate number signs to be attached to the Temporary Gates? If so, what are the Gate Numbers and dimensions of the signs?</i></p>	<p>Response 99: (Response will be provided in a future addendum)</p>

<p><i>Question 100: On sheet C15.01.35, there is a Drainage Structure Table listing the estimated bid item quantity of 23 inlets and no Manholes. However, on sheet S13.01.08 there is a Table of Variables which lists 14 Manholes and 6 inlets. Can the Owner clarify which table is correct and identify which of the A-Titled structures numbers are Inlets and which are Manholes?</i></p>	<p>Response 100: See responses to questions 20 and 21.</p>
<p><i>Question 101: Can the owner provide invert elevations for structure A-201?</i></p>	<p>Response 101: The south invert of A-201 is 73.21.</p>
<p><i>Question 102: Are there additional options for the bond breaker between the lean concrete and the 18" Airfield Pavement other than #89 stone?</i></p>	<p>Response 102: See response to question 27.</p>
<p><i>Question 103: The quantity for bid item L-110-5.4 was reduced to zero in a prior addendum. The best practice would be to delete this bid item. Please remove this bid item from the bid form.</i></p>	<p>Response 103: The updated bid schedule will be issued in a future addendum. The bid schedule has been updated to remove the zero item.</p>
<p><i>Question 104: Are the pavement markings on the ASC side included in this contract?</i></p>	<p>Response 104: See response to question 34.</p>
<p><i>Question 105: Per the statement made in P-501-7.3 regarding storm and utility adjustments, does the AFC own any adjustments for utilities or storm in the ASC area?</i></p>	<p>Response 105: Adjustments for utilities in the ASC area will be the responsibility of the ASC contractor.</p>
<p><i>Question 106: Are there cleanouts associated with the 6" underdrain? If so, can the owner clarify the quantity and location?</i></p>	<p>Response 106: See response to question 83.</p>
<p><i>Question 107: Will there be a pay item for the cleanouts added per the note on Sheet C19.01.02?</i></p>	<p>Response 107: Cleanouts are incidental to the underdrain installation and/or storm pipe installation.</p>
<p><i>Question 108: According to the water cabinet supplier, code requires a backflow preventer and a power disconnect. Please review and clarify if these items are required and add appropriate bid items or a specification change to make them incidental to the water cabinet.</i></p>	<p>Response 108: Water cabinet installation shall meet all applicable standards as referenced in Section 1.2 of Specification 22 37 00. Section 2.5 Item F of Specification 22 37 00 references the integrated backflow preventer in the water cabinet requirements. All applicable items required to meet codes shall be incidental to the price for the water cabinets.</p>

<p><i>Question 109: Are there any stockpiled materials on site available for use other than the attic inventory?</i></p>	<p>Response 109: Assume nothing.</p>
<p><i>Question 110: What is the existing depth of asphalt and limerock in the staging parking areas?</i></p>	<p>Response 110: You can field measure.</p>
<p><i>Question 111: At the pre-bid meeting it was stated that GOAA would provide an office complex for the contractor. Will the contractor need to carry rent, utilities, insurance etc.? If so, can a schedule of these values be provided?</i></p>	<p>Response 111: See response to item 59 above. Insurance is standard for a contractor to work on owner property. No additional insurance will be required for owner-provided office space.</p>
<p><i>Question 112: Will the AFC contractor be required to dispose of any of the attic stock upon completion of the project?</i></p>	<p>Response 112: See response to Question 25.</p>
<p><i>Question 113: Can the owner clarify the ownership of the security fence upon completion of the AFC project if this material is owned by the AFC contractor?</i></p>	<p>Response 113: For temporary fencing to separate the AOA from construction activities, we do not intend to own the materials when the project is complete.</p>
<p><i>Question 114: Most of the removals included in Addendum No. 2, WS110 LSC Demo Plans (Dated 11/21/2018) seems to be completed. Please identify removals (Water /Sanitary/Conc Pavement/Asphalt Pavement/Light Poles/Elec Duct banks... to be included under lump sum pay items P-151-4.1 Clearing and Grubbing and P-151-4.2 BP-S196 Landside Civil Demolition.</i></p>	<p>Response 114: (Response will be provided in a future addendum)</p>
<p><i>Question 115: Will temporary lighting be required for the temporary Service Road?</i></p>	<p>Response 115: No; temporary roads are not required to be lighted.</p>
<p><i>Question 116: Please confirm pay item for proposed Type 3 Plastic Erosion Mat (Refer to Plan sheet C15.01.33).</i></p>	<p>Response 116: The Erosion Control Mat will be paid under pay item T-904-5.2 Type 3 Erosion Control Mat per square yard (SY). An updated Specification T-904 and bid schedule has been updated and issued with Addendum #5.</p>
<p><i>Question 117: Plan sheet C60.01.04 (Phase 3), please confirm pay item for +/- 980' of temporary security fence with jersey barrier.</i></p>	<p>Response 117: Temporary security fence with jersey barrier is defined in Specification C-106 and paid under pay item C-106-4.2.</p>

<p><i>Question 118: It seems to be a discrepancy between the Grading Plans and the bid quantity for embankment. Based on our AGTEK take off the quantity for embankment should be four (4) times the bid quantity (19,200 CY) not including the excavation of approx. 50,000 CY. As per section 152-3.1 Measurement for payment for embankment shall be computed from the comparison of surveyed original and final surface approved by the OAR. Please confirm the bid quantity for the embankment item.</i></p>	<p>Response 118: (Response will be provided in a future addendum)</p>
<p><i>Question 119: Can an electronic bid schedule be provided?</i></p>	<p>Response 119: Bid schedules provided as PDFs.</p>
<p><i>Question 120: C61.01.07; Drawings call out the use of barricades and references sheet C61.01.07. But there is no sheet C61.01.07.</i></p>	<p>Response 120: Sheet IS0.00.03, Note C8, shall be revised to delete "AS SHOWN ON DETAIL SHEET C61.01.07."</p>
<p><i>Question 121: 40-04 & C9.01.02; Please confirm the intent of detail 1 on C9.01.02 is for the contractor to perform test pits per P152-2.10 to verify insitu soils meet the compaction requirement. In the event the insitu soil does not meet the compaction requirement, will the contractor be compensated via a Field Change Order to remediate the failed area to within specified values, or will this be paid under unsuitable excavation by the Cubic Yard? Work would include excavation, compaction, removal or replacement of the 1,000 Square Yard failed lot.</i></p>	<p>Response 121: A pay item for unclassified excavation has been added to accommodate lots with a failed test pit.</p>
<p><i>Question 122: P-152, C12.01.01-12.01.12; Based upon surveys performed on the Airfield Site, the contours shown on the Contract Drawings are incorrect, the actual contours are higher than represented. We are requesting that an "Unclassified Excavation" bid item be added to the Schedule of Values to compensate the cost needed for excavation.</i></p>	<p>Response 122: (Response will be provided in a future addendum)</p>

<p><i>Question 123: Appendix A - Available Inventory List; Please confirm if all the material listed in the Appendix A - Available Inventory List is in good condition for the Contractor to use for the BP-S196 scope.</i></p> <p><i>In the event if some of the material is identified as damaged or unrepairable, how the Owner intends to compensate?</i></p>	<p>Response 123: (Response will be provided in a future addendum)</p>
<p><i>Question 124: 26 56 30-5.2; Bid Item 26 56 30-5.2 lists 5 Ea 70' High Masts while drawing shows 2 Ea. Please confirm the correct quantity</i></p>	<p>Response 124: There are four 100 foot poles bid Item 26 56 30-5.1 and two 70 foot tall poles bid item 26 56 30-5.2.</p>
<p><i>Question 125: C15.01.33; What is the pay item for the 6" Underdrain?</i></p>	<p>Response 125: Pay Item D-705-5.1 represents the procurement and installation of underdrain.</p>
<p><i>Question 126: C12.01.09; Please provide elevation for the 2" WM on drawing C12.01.09</i></p>	<p>Response 126: The 2-inch watermain connection inverts are provided in the C35 Utilities series plan sheets. The installation of the watermain shall be in accordance with the depths identified in the specifications and should be coordinated to obstructing all other existing and proposed infrastructure.</p>
<p><i>Question 127: C15.01.34; Please confirm that each 114' Trench drain are correlated with typical trench drain profile 4, shown on sheet C15.09.39.</i></p>	<p>Response 127: Confirmed, as it is noted on the plan sheet as typical (north most run).</p>
<p><i>Question 128: C15.01.33; Please confirm that each 110' Trench drain are correlated with typical trench drain profile 10, shown on sheet C15.09.39.</i></p>	<p>Response 128: The referenced 18-inch wide trench drain is identified as 100' long and the typical profile of these segments are shown in Profile 10 on Sheet C15.09.39.</p>
<p><i>Question 129: S13.01.05; Please confirm that the details listed for trech drain in asphalt is not applicable to the current scope of work. Refer dwg# S13.01.05</i></p>	<p>Response 129: Yes - details indicating trench drain in asphalt are not applicable to this portion of the Terminal C project.</p>
<p><i>Question 130: C15.01.34; What is the Pay Item for the Oil Grit Separator on sheet C15.01.34</i></p>	<p>Response 130: See response to Question 75.</p>
<p><i>Question 131: C14.07-09; Please confirm all hatched panel throughout the dwg# C14.07-09 , that do not show a structure symbol, only require the P-501 required #4 single matting reinforcement.</i></p>	<p>Response 131: Slabs that are shown to be additionally reinforced that do not have structures or penetrations only require the single #4 bar mat. Where a hatched panel is next to a Type R joint, additional steel is required in accordance with the Type R joint detail.</p>

<p><i>Question 132: C14.01.08; Please clarify the Northeast trench drain panel on dwg# C14.01.08 required Type F and Type D joint, considering all other joints are Type A.</i></p>	<p>Response 132: Type D and F joints called out at northeast end of trench drain have been revised. All joints adjacent to trench drain have been corrected to identify the Type X detail. Sheet C14.01.08 reissued in Addendum 5.</p>
<p><i>Question 133: C14.01.08; Please provide detail on the reinforcement required for the hatched panels on east & west side of 18" Trench drain on dwg# C14.01.08</i></p>	<p>Response 133: The reinforcement of irregular shaped slabs shall require #4 bars on 12" OCEW.</p>
<p><i>Question 134: C14.01.08/C9.01.01; Please clarify if the lane east and west of the trench drain, adjacent to type A joint, requires a thickened edge?</i></p>	<p>Response 134: All joints adjacent to trench drain have been corrected to identify the Type X detail which requires a thickened edge of variable depth in order to match the bottom of the trench drain. Sheets C14.01.08/09 reissued in Addendum 5.</p>
<p><i>Question 135: Due to the complexity of the fuel system and the numerous items addressed in Addendum 3, we are requesting the bid date be extended. Preferably (2) two weeks.</i></p>	<p>Response 135: (Response will be provided in a future addendum)</p>
<p><i>Question 136: Have the runway lights and signs on the inventory list already been subtracted from the quantities shown on the bid schedule?</i></p>	<p>Response 136: No. Due to warranty issues of using existing products, new items are required for this project. Contractor shall not rely on existing materials. Materials in the inventory shall be given first right of refusal to GOAA maintenance staff.</p>
<p><i>Question 137: Sheet CE3.00.02 shows Existing MH-VRC-11 to be removed and existing MH-COMM-11 to be used in this project. Note 5 on the same sheet says the existing MH-VRC-11 is to be reassigned to GOAA manhole MH-COMM-11. Please clarify.</i></p>	<p>Response 137: The existing manhole MH-VRC-11 is being renamed MH-COMM-11 and will be used in this project. The manhole will need an elevation adjustment to match apron paving.</p>
<p><i>Question 138: What bid item is covering the aircraft service pedestals?</i></p>	<p>Response 138: The service pedestals are incidental to the RON pay item 26 57 01-5.1.</p>
<p><i>Question 139: There are different sized transformer pad details shown in the drawings, but only one bid item. The plans are not clear as to how many of each size are needed. Please clarify.</i></p>	<p>Response 139: GOAA Primary transformers are 3,000 kVA. OUC Primary transformers are 2,500 kVA. A concrete transformer pad for the 3,000 kVA transformer has been added to drawing CE7.00.09. Refer to E5 Series detail sheets in the BP-S195 Phase 1X Airside Concourse Package for additional work requirements.</p>

<i>Question 140: Will the existing electrical manholes need to be raised or lowered to meet the new apron?</i>	Response 140: All structures to be adjusted to grade.
<i>Question 141: Should there be a bid line item for the L-867B telescoping base cans?</i>	Response 141: No. Base cans are considered incidental to the specific fixture installation.
<i>Question 142: Are precast 10'x20'x8' electrical manholes acceptable in lieu of cast in place?</i>	Response 142: Yes, at the Contractor's option.
<i>Question 143: Are precast concrete bases required for the OUC streetlights, or is the anchor base shown on sheet 26 05 12-23 of the specifications required?</i>	Response 143: Provide pyramidal base and anchor bolts as detailed on sheet E7.0.14.
<i>Question 144: Is the project site for this bid considered part of the Aircraft Operations Area with the increased insurance requirements?</i>	Response 144: (Response will be provided in a future addendum)
<i>Question 145: Where is the OUC street service point referenced in bid item 26 05 12-5.11 located? Is this a new service for the street lighting required by OUC? It does not appear to be on the plans.</i>	Response 145: The service points are existing. The contractor is responsible for all conduit, poles, luminaires, pull boxes, and TC cable in poles. OUC will provide secondary cables and terminate in each pole's handhole. Note the existing OUC lighting contactor is located adjacent to Lift Station No. 1. There is additional existing contactor on the west side of the perimeter road.
<i>Question 146: Who is the owner of the disassembled concrete batch plant currently on site?</i>	Response 146: (Response will be provided in a future addendum)
<i>Question 147: Will Hiperpav (or a similar prediction software) be required to determine concrete pours for this contract?</i>	Response 147: Contractor shall satisfy requirements for P-501 Section 4.7 (C.)

<p><i>Question 148: Can the owner confirm when the information regarding note #10 in the demolition plans will be provided by the Construction Manager for bidding purposes?</i></p> <p><i>"10. THIS DEMOLITION PLAN DOES NOT REFLECT ANY EARLY WORKS PACKAGES THAT MAY HAVE BEEN COMPLETED PRIOR TO FINAL LANDSIDE CIVIL BID PACKAGE DEVELOPMENT. SOME OF THE WORK SHOWN ON THIS PLAN MAY HAVE ALREADY BEEN COMPLETED. SITE CONDITIONS CONTINUE TO CHANGE THROUGHOUT THE PROJECT AREA. IT IS THE RESPONSIBILITY OF THE CONSTRUCTION MANAGER TO PROVIDE THESE DETAILS AND ANY AVAILABLE AS-BUILT DATA TO THE CONTRACTOR AT TIME OF BIDDING AND COORDINATE THROUGHOUT PROJECT."</i></p>	<p>Response 148: (Response will be provided in a future addendum)</p>
<p><i>Question 149: Can the owner clarify the location of the topsoil stockpile for the material that is to be obtained on site?</i></p>	<p>Response 149: (Response will be provided in a future addendum)</p>
<p><i>Question 150: The majority of the Inventory RCP Pipe listed was manufactured by Forterra, who is no longer manufacturing RCP. Therefore, will concrete collars be allowed below the taxiway as a method of connecting the different manufacturers RCP? If concrete collars are allowed, will the Owner create a pay item for "Concrete Collars?"</i></p>	<p>Response 150: Concrete collars on RCP pipe will not be permitted.</p>
<p><i>Question 151: As per plan sheet C19.01.01 - Detail #1, the note states to follow FAA Specification D-701 regarding the bedding material for RCP. D-701 allows the use of State Specifications, therefore, can the contractor use FDOT Specification 125-8.3.2 for bedding materials, providing the compaction meets the density requirements for P-152?</i></p>	<p>Response 151: This is acceptable provided there is no additional cost to the owner and the compaction meets the requirements of P-152.</p>

<p><i>Question 152: What are the Grate and Invert Elevations for the 18" Trench Drain?</i></p>	<p>Response 152: The grate elevations can extrapolated from the grading and/or joint elevation sheets. The typical trench drain profiles on C15.01.39 identify the depth of the trench from finish grade. The successful bidder will also be provided a 3D model of the finish grade surface.</p>
<p><i>Question 153: Will an executed contract come before the NTP? Material procurement will be a challenge.</i></p>	<p>Response 153: (Response will be provided in a future addendum)</p>
<p><i>Question 154: At the pre-bid it was mentioned that the submittal process could begin prior to NTP. Will the owner please confirm this will be the case?</i></p>	<p>Response 154: Confirmed in Addendum 2.</p>
<p><i>Question 155: High mast lighting sheet 2 of 3 appears to be missing. Please provide if applicable.</i></p>	<p>Response 155: Addendum 1 renumbered the sheets as 1 of 2 and 2 of 2. The previous sheet 2 was constructed in the previous project and is therefore not needed.</p>
<p><i>Question 156: P-152-4.1 Embankment – Is it the Owner's intent to have the contractor import the 19,000 CY of embankment or can one of the existing on-site stockpiles be utilized?</i></p>	<p>Response 156: (Response will be provided in a future addendum)</p>
<p><i>Question 157: Is there a .KMZ file available for the project?</i></p>	<p>Response 157: A KMZ file will not be provided at this time. The successful bidder is welcome to develop one from the CAD files upon award.</p>
<p><i>Question 158: Sheet C15.01.33, pipe run from JB-3 to A-230. The note states that the first +/- 64 LF of pipe is already installed, should the contractor subtract 64 LF from the 147 LF shown on the drawings or is there 147 LF remaining?</i></p>	<p>Response 158: As the note states, the first ±64-feet of 72-inch RCP is installed. This run of pipe will require an approximate 147-feet of additional 72-inch RCP to connect to structure A-230.</p>
<p><i>Question 159: Sheet C15.01.34, roof drain clean-outs call for 2-way clean-outs. Please provide a detail for how the 2-way clean-out should be constructed, there is no detail on sheet C19.01.02.</i></p>	<p>Response 159: The 2-way cleanout tee shall be constructed similarly to the details shown on C19.01.02. Alternatively, reference the City of Orlando Standard Engineering Details sanitary sewer structures sheet 15 for typical lateral installation with cleanouts. (http://www.cityoforlando.net/wp-content/uploads/sites/38/2014/03/WD.pdf) The 2-way cleanout tee will allow for cleaning of up and downstream of roof drain lateral.</p>

<p><i>Question 160: Pay item C-106-4.6 Shallow Foundation Bollard. The pay item quantity calls for 31 EA, however, only 28 EA can be located on the drawings. Please clarify.</i></p>	<p>Response 160: Pay Item C-106-4.6 will be revised to "Bollard" and the quantity reduced to 28 EA. For clarification, the Shallow Foundation Bollards (Detail 6, Sheet C9.01.04) shall be constructed adjacent to the Terminal in the ASC scope. Bollards (Detail 3, Sheet C9.01.04) shall be constructed in the RON area in the AFC scope.</p>
<p><i>Question 161: As per section 152-3.1 measurement for payment for embankment shall be computed from the comparison of surveyed original and final surface approved by the OAR. Please confirm if the measurement for payment include excavation (cut areas) plus embankment (fill areas) to calculate the total pay quantity (19,200 CY)?</i></p>	<p>Response 161: (Response will be provided in a future addendum)</p>
<p><i>Question 162: In the event Unclassified excavation is incidental, please provide the estimated quantity.</i></p>	<p>Response 162: (Response will be provided in a future addendum)</p>
<p><i>Question 163: LSC Civil Demo Plans; In reference to LSC Civil demo plans, please provide CD3.0.03X, CD3.0.06X and CD3.0.05. It appears existing utilities continue to these pages, please clarify.</i></p>	<p>Response 163: The provided LSC plan sheets include the AFC project limits. No additional sheets will be issued at this time.</p>
<p><i>Question 164: CE0.00.01; Reference drawing CE0.00.01, Coordination with other utilities and trades, note 4 states "ADDITIONAL DUCT, DIRECTIONAL BORE, AND ADDITIONAL MANHOLES REQUIRED TO COMPLETE THIS WORK BUT NOT SHOWN ON THESE PLANS SHALL BE INCIDENTAL TO THE PROJECT." Per addendum 3, confirmation that this is unit price project, if any additional duct, directional bore, or manholes are required not shown on the plans they will be paid by the owner.</i></p>	<p>Response 164: Note 4 revised to state "ALL BENDS, POSITION ADJUSTMENTS, ADDITIONAL EXCAVATION, ETC REQUIRED TO MAINTAIN MINIMUM SPACING OR TO RESOLVE A POSITION CONFLICT IS INCIDENTAL TO THE WORK INCLUDED IN THE SCOPE. ROUTING OF CONDUIT/DUCT AROUND OBSTRUCTIONS IS NORMAL ELECTRICAL CONSTRUCTION ACTIVITY AND WILL NOT BE AN ADDITIONAL COST TO THE OWNER."</p>
<p><i>Question 165: D-756 Trench Drain; Please provide the Concrete PSI necessary for trench drain shown on sheets C15.01.33-C15.01.34.</i></p>	<p>Response 165: Reference note 5.2 on Sheet S13.01.01 for trench drain PCC compressive strength.</p>

<p><i>Question 166: 26 05 12; Reference Specification 26 05 12 item 3.3.B. requiring red dye added to the concrete for duct bank encasement. Please provide information on product specification and requirements.</i></p>	<p>Response 166: Red concrete dye shall be ChemSystems, Inc. CSI #120 conduit red or accepted equivalent. Please see revised Detail on CE7.00.08. Red dye is required for all underground electrical and communication duct/conduit systems. All duct details have been revised to reflect update.</p>
<p><i>Question 167: As per Section 152-2.1 "Before beginning excavation, grading, and embankment operations in existing pervious areas, the area shall have topsoil stripped to a minimum depth of 6 inches". Since most of the pervious areas seems to be previously stripped, will the contractor be required to strip 6" only the existing topsoil (grass) areas?</i></p>	<p>Response 167: All organic soil/material will need to be stripped from the site before beginning excavation, grading and embankment operations. At the time of construction, the OAR may permit a shallower depth of stripping provided the objective of removing all organic soil is achieved prior to further earthwork operations.</p>
<p><i>Question 168: C9.01.03 Detail 13 is a sidewalk contraction joint and the note says to seal with Dow Corning Silicone Sealant. This same detail references Detail 4/C9.01.01 which is an Isolation Joint sealed with compression seal. Is Detail 13 an isolation joint or a contraction joint as the notation states? Is it sealed with silicone or compression seal? Furthermore is the note on Detail 13 correct that you are only sealing one contraction joint every 30'?</i></p>	<p>Response 168: Detail 13 is intended to be a contraction joint and the reference to detail 4 on Sheet C9.01.01 has been deleted. The joint shall be sealed with silicone sealant in accordance with reissued specification P-605. Contractor shall sawcut, clean and seal contraction joint every 30 feet. All other joints on the sidewalk shall be tooled and unsealed.</p>
<p><i>Question 169: C9.01.01 Detail 7 edge seal references P-605 which prescribes the use of hot pour sealant. Please confirm that you want hot pour sealant, not silicone sealant for the HMA/PCC edge seal.</i></p>	<p>Response 169: P-605 Specification, Section 2.1 shall be revised to require all joint sealant materials to meet the requirements of ASTM D5893. P-605 reissued with Addendum 5.</p>

<p><i>Question 170: We received Appendix A-Available Inventory List which lists several double wall spool pieces that have already been fabricated and is stored on the project site.</i></p> <p><i>In order to determine if this is a complete bill of material or what additional material may be needed for a complete system, we need the following:</i></p> <p><i>A. A drawing indicating where each spool piece is located, by tag number, in relation to the layout on the plan & profile fuel drawings.</i></p> <p><i>B. The actual fabrication drawings of each spool piece so we can determine the welding requirements for each spool piece and any additional components required for each assembly.</i></p> <p><i>C. The manufacturer of the materials currently on site. We will need to secure any additional materials from the same supplier to ensure conformance with the existing materials.</i></p>	<p>Response 170: (Response will be provided in a future addendum)</p>
<p><i>Question 171: Do any of the hydrant pits, low point drain pits or high point vent pits include any of the internal components such as the valves or piping or are they provided as empty pits only?</i></p>	<p>Response 171: (Response will be provided in a future addendum)</p>
<p><i>Question 172: The Bid Form indicates 2" HDR-17 for the water piping to the water cabinets. However, Spec 33 11 00-2.4 calls for SDR-11 HDPE pipe. Please confirm which is correct spec.</i></p>	<p>Response 172: The 2-inch PVC SDR17 is acceptable.</p>
<p><i>Question 173: DWG CE2.00.02 – Please provide dimensions for manholes MH-AP-222, MH-AD-222 and MH-AC-222 that are to be adjusted to match the proposed elevations: Internal/External Dimensions, Height of collar to be adjusted to.</i></p>	<p>Response 173: The nominal dimensions are provided on CE7.00.11 and CE7.00.12. The final paving elevation of the apron pavement will determine the necessary adjustment.</p>
<p><i>Question 174: DWG CE3.00.02 – Please provide dimensions (Length x Width x Depth) for manholes MH-VRC-11 and MH-VRC-12 (Power and Communications) that are going to be demolished.</i></p>	<p>Response 174: These are nominal 4' X 4' inside dimension aircraft rated manholes very similar to the manholes shown on CE3.0015.</p>

<p><i>Question 175: Dwg CE7.00.07 – Note 14 calls for red dyed concrete. Please clarify if this requirement is across the board for all underground P-610 ready mixes on this project.</i></p>	<p>Response 175: Please see response to Question 166.</p>
<p><i>Question 176: Dwg CE7.00.08 – Details for proposed duct banks call for backfill using sand. Please clarify if the proposed duct bank trenches on this project can be backfilled with the excavated materials in lieu of sand.</i></p>	<p>Response 176: Per Specification P-152, Section 152-2.1, the suitability of material to be placed in embankments shall be subject to approval by the OAR. Unsuitable materials per section 152-1.3 shall be disposed of and shall not be used in embankments or fill.</p>
<p><i>Question 177: Please clarify the ready mix concrete compressive strength to be used on this project. Throughout the plan sheets, there are references to 3000 PSI, 3400 PSI and 4000 PSI. However, specification P-610 calls for 4000 PSI compressive strength.</i></p>	<p>Response 177: All concrete (except P-501 concrete) shall meet the requirements of specification P-610. Revised plan sheets to reflect update.</p>
<p><i>Question 178: DWG E2.04.05 – Please provide electrical room 01.6180 layout.</i></p>	<p>Response 178: Please coordinate with the BP-S195 Phase 1X Airside Concourse Package. Room 01.6180 layout is a part of the BP-S195 Phase 1X Airside Concourse project.</p>
<p><i>Question 179: DWG E2.04.05 – Please clarify if there are conduit stub outs to feed High Mast Lights 10 through 13. From site pictures, the floor slab is already in place.</i></p>	<p>Response 179: Please coordinate with the BP-S195 Phase 1X Airside Concourse Package. Conduit stub outs is to be installed during the BP-S195 Phase 1X Airside Concourse project.</p>
<p><i>Question 180: DWG E2.04.05 – Please confirm that panel 7EQHRHMLCSW1 is existing.</i></p>	<p>Response 180: Please coordinate with the BP-S195 Phase 1X Airside Concourse Package. Panel 7EQHRHMLCSW1 is to be installed during the BP-S195 Phase 1X Airside Concourse project.</p>
<p><i>Question 181: DWG E2.05.12 – There is a reference to drawing EX7.00.02. However, it is not part of the bid set. Please clarify.</i></p>	<p>Response 181: Drawing EX7.00.02 is a sheet from the BP-S195 Phase 1X Airside Concourse Package and is issued with that project. The reference is to extend the new high mast circuits to the load side of the lighting contactor. The lighting contactor and accessories are part of the Airside Building Electrical Package</p>
<p><i>Question 182: DWG E7.00.11 – Sign Detail when Grades Cannot be Met – Please clarify how many of the proposed signs will require the retaining wall shown on these details.</i></p>	<p>Response 182: It is not anticipated that the sign retaining wall will be needed. It is included as a precaution for if the situation arises.</p>

<p><i>Question 183: DWG E7.01.14 – Please provide a detail for the street light pole foundation.</i></p>	<p>Response 183: Provide pyramidal Precast anchor base as shown on E7.01.14. Contractor to provide structural calculations. Note Oldcastle Precast and Lydny precast locally make these bases if contractor chooses to use them.</p>
<p><i>Question 184: DWG JFE1.11.08 – Please confirm that panels 7EQLCSW1A and 7EQLCSW2A are existing.</i></p>	<p>Response 184: Panels will be existing.</p>
<p><i>Question 185: DWG JFE1.11.08 – Please clarify the location of panels 7EQLCSW1A and 7EQLCSW2A.</i></p>	<p>Response 185: Panels 7EQLCSW1A & 7EQLCSW2A locations are on revised drawing JFE1.11.08 in Add. #5.</p>
<p><i>Question 186: DWG JFE1.11.08 – Please clarify if there are conduit stub outs for the EFSO push buttons.</i></p>	<p>Response 186: Assume no stubs outs are installed.</p>
<p><i>Question 187: Given the current supply chain situation, please advise if the airport is allowing material price escalation on this project.</i></p>	<p>Response 187: (Response will be provided in a future addendum)</p>
<p><i>Question 188: The OUC detail on page 84 of the Vol 2 specifications shows 43' mounting height with a 37' tall pole, and a 60" rise for a 15' span arm. The fixture schedule on sheet CE12.01.01 says to mount the fixture on a 42' pole with a 12' arm. Sheet E7.01.14 shows fixture mounting height of 42', pole height of 38'7", and 15' or 12' span arm, with no specified rise dimension. Please clarify the required dimensions.</i></p>	<p>Response 188: Luminaire total mounting height to be 42'. Pole length to be 35'-1", Span to be 10' long with 6' of rise. Detail on sheet E7.01.15 updated.</p>
<p><i>Question 189: DWG E2.20.17 – Please advise under which bid item the #4/0 Ground grid conductor will be paid.</i></p>	<p>Response 189: Pay items L-108-5.4 4/0 AWG BSD Copper Counterpoise Ground Grid Wire - per linear foot (LF) and L-108-5.5 Ground Rod Inspection Pit - per Each (EA) for the ground grid work. See updated bid form for quantities. Only the 4/0 ground grid conductor for the airfield lighting is paid by the linear foot. All other 4/0 cable is incidental to the respective pay item of which it is a component part.</p>
<p><i>Question 190: DWG E2.30.01 – Please confirm that new cables will be installed through base cans (L-125-5.12) with no lights at the intersection of T/W B13 and Taxilane E1.</i></p>	<p>Response 190: Yes new cables shall be installed through base cans at the TW B13 and TL E1 intersection.</p>

<p><i>Question 191: Bid Item No. 26 05 12-5.11 – OUC Street Service Point – After carefully reviewing drawings CE12.01.02, CE12.01.15 through CE12.01.17, we could not find where the OUC Street Service Point will be located. Also, there are no details showing what is required to build this service. Please advise.</i></p>	<p>Response 191: The service points are existing. The contractor is responsible for all conduit, poles, luminaires, pull boxes, and TC cable in poles. OUC will provide secondary cables and terminate in each pole's handhole. For clarity the existing OUC lighting contactor is located adjacent Lift Station No. 1. There is additional existing contactor on the west side of the perimeter road.</p>
<p><i>Question 192: DWGS CE12.01.15 through CE12.01.17 – Please advise under which bid item the OUC Pull Box (24x36x24) at road crossings is going to be paid.</i></p>	<p>Response 192: Additional bid item created to cover OUC pull box. Note the pull boxes are used at road crossings. The handhole are to be provided at each pole and are covered under the OUC light pole pay item.</p>
<p><i>Question 193: Could you please provide direction as to where the location of the (16) hurricane tie downs can be found?</i></p>	<p>Response 193: Hurricane tie-downs will be located on both sides of each PBB, near the cabs, with PBBs in stowed positions. Final locations will be distanced from joint lines, and shall be field located by the OAR during construction.</p>
<p><i>Question 194: Plans show P403 asphalt mix at the new vehicle service road, taxiway shoulder, and mow strip along the unprotected PCC edge. We were unable to find all the 4,620 tons for this item. Have allowances or extra quantities been added to this item to arrive at the 4,620 ton total?</i></p>	<p>Response 194: Yes, the Contractor will be paid for the quantity of asphalt installed.</p>
<p><i>Question 195: Is it the contractor's responsibility to provide the FOC Cabinet shown on sheet CE3.00.06 in the South RON Building? There is no detail shown for what is required beyond the size and Nema rating of the enclosure.</i></p>	<p>Response 195: (Response will be provided in a future addendum)</p>
<p><i>Question 196: Nine total high mast lights are shown on the bid schedule, but there only appears to be six shown on the drawings. Please clarify.</i></p>	<p>Response 196: (Response will be provided in a future addendum)</p>

<p><i>Question 197: Volume 1 of the specifications book contains two wage determinations for this project, Highway and Heavy Construction. The electrician rates are significantly different between the two wage determinations:</i></p> <p><i>a. Please clarify which of the two wage determinations shall be used for the different electrical scopes of work on this project.</i></p> <p><i>b. If only one of them applies, please clarify which one, either Highway or Heavy, shall be applied across all electrical scopes.</i></p>	<p>Response 197: (Response will be provided in a future addendum)</p>
<p><i>Question 198: As a follow-up to question # 88 & its response from Addendum 3. We propose the following question:</i></p> <p><i>Please refer to 72" RCP pipe run between Structure A-230 & JB-3 on sheet C15.01.35. is the intent here to Replace the existing 64' of 72" RCP & add the 147' of new 72" RCP , for a combined total of 211' of 72" RCP pipe?</i></p>	<p>Response 198: See response to Question 158.</p>
<p><i>Question 199: The quantity for Bid Item P-501-8.1 appears to be about 6% higher than the measured plan area. Please advise if the Bid Item quantity has been adjusted up for contingency.</i></p>	<p>Response 199: Yes, the Contractor will be paid for the quantity of PCC installed.</p>
<p><i>Question 200: Please clarify if the South RON Precast Building needs to comply with specification Section 26 05 00 – 1.3 (G).</i></p>	<p>Response 200: (Response will be provided in a future addendum)</p>
<p><i>Question 201: Please clarify if rigid galvanized conduit will be required for street light conduits crossing roads.</i></p>	<p>Response 201: (Response will be provided in a future addendum)</p>
<p><i>Question 202: The FAA specifications call for extensive test pits (every 1,000 sy) with 8" compaction lifts. This site was previously graded and compacted, will the owner please confirm that these "test pits" are required for earthwork and are incidental to the embankment pay item?</i></p>	<p>Response 202: (Response will be provided in a future addendum)</p>
<p><i>Question 203: Will the contractor be responsible for removing the lift station in the former temporary office complex?</i></p>	<p>Response 203: (Response will be provided in a future addendum)</p>

<i>Question 204: Can the Owner confirm if the existing water lines installed for the former office compounds are operational? If so, can they be used for temporary water sources?</i>	Response 204: (Response will be provided in a future addendum)
<i>Question 205: There are no details regarding fittings and cleanouts for the connections of the 6" & 10" PVC SDR26 to the roof leader, are these fittings and cleanouts supplied and connected by the ASC contractor?</i>	Response 205: (Response will be provided in a future addendum)

TABLE OF CONTENTS – 00 01 00

Division	Section Title	Issue Date	Rev. Date
DIVISION 13 – SPECIAL CONSTRUCTION			
13 47 13	Cathodic Protection System	6/26/2022	
DIVISION 22 – PLUMBING			
<u>22 37 00</u>	<u>Potable Water Cabinet</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
DIVISION 26 – ELECTRICAL			
26 01 00	Operation and Maintenance Manuals	6/26/2022	
26 01 01	General Provisions and Requirements for Electrical Work	6/26/2022	
26 01 03	Minor Electrical Demolition for Remodeling	6/26/2022	
26 01 05	Investigation of Existing Electrical Systems	6/26/2022	
<u>26 05 00</u>	<u>Common Work Results for Electrical</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
26 05 10	Electrical Symbols	6/26/2022	
<u>26 05 12</u>	<u>OUC Underground Electric</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
26 05 19	Building Wire and Cable	6/26/2022	
26 05 26	Grounding and Bonding	6/26/2022	
26 05 29	Hangers and Supports	6/26/2022	
26 05 33	Conduit	6/26/2022	
26 05 34	Outlet Boxes	6/26/2022	
26 05 35	Pull and Junction Boxes	6/26/2022	
<u>26 05 43</u>	<u>Underground and Raceways for Electrical Systems</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
26 05 53	Identification for Electrical Systems	6/26/2022	
26 05 73	Power Systems Study with Arc Flash Analysis	6/26/2022	
26 05 83	Wiring Devices	6/26/2022	
<u>26 08 00</u>	<u>Commissioning of Electrical Systems</u>	<u>6/26/2022</u>	<u>Deleted</u>
26 08 03	Demonstration of Completed Electrical Systems	6/26/2022	
26 08 13	Tests and Performance Verification	6/26/2022	
26 22 13	Dry Type Transformers	6/26/2022	
<u>26 24 13</u>	<u>Switchboards-Draw Out (RON)</u>	<u>7/6/2022</u>	
<u>26 24 17</u>	<u>Distribution Panelboards (RON)</u>	<u>7/6/2022</u>	
26 27 16	Electrical Cabinets and Enclosures	6/26/2022	
26 28 16	Enclosed Switches and Circuit Breakers	6/26/2022	
26 41 13	Lightning Protection System	6/26/2022	
26 43 00	Surge Protection Devices	6/26/2022	
26 56 30	High Mast Area Lighting Systems	6/26/2022	

<u>26 57 00</u>	<u>Pre-Engineered Precast Concrete Building Design/Build</u>	<u>6/26/2022</u>	<u>7/6/2022</u>
<u>26 57 01</u>	<u>South RON Electrical Distribution System</u>	<u>6/26/2022</u>	<u>7/21/2022</u>

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 43 20	Emergency Fuel Shut Off System	6/26/2022	
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DIVISION 33 – UTILITIES

33 05 19	Pressure Piping Tied Joint Restraint System	6/26/2022	
33 11 00	Water Utility Distribution Piping	6/26/2022	
33 13 00	Disinfection of Water Utility Distribution	6/26/2022	
33 52 43	Aviation Fueling System General Requirements	6/26/2022	
33 52 44	Identification of Fuel Piping and Equipment	6/26/2022	
33 52 45	Fuel System Pipe, Connections, and Installation	6/26/2022	
33 52 46	Liquid Fuels Pipeline Coating Systems	6/26/2022	
<u>33 52 47</u>	<u>Fuel System Valves and Equipment</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
33 52 53	Inspection, Testing, and Flushing	6/26/2022	

CIVIL TECHNICAL SPECIFICATIONS

C-100	Contractor Quality Control Program (CQCP)	6/26/2022	
C-102*	Temporary Air and Water Pollution, Soil Erosion, and Siltation Control	6/26/2022	
<u>C-105</u>	<u>Mobilization</u>	<u>6/26/2022</u>	<u>7/6/2022</u>
C-106*	Safety, Security and Maintenance of Traffic	6/26/2022	
C-110*	Method of Estimating Percentage of Material Within Specification Limits (PWL)	6/26/2022	
D-701	Pipe for Storm Drains and Culverts	6/26/2022	
D-705	Pipe Underdrains for Airports	6/26/2022	
<u>D-751</u>	<u>Manholes, Catch Basins, Inlets and Inspection Holes</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
D-756	Trench Drain and Forming System	6/26/2022	
F-162*	Chain Link Fence	6/26/2022	
P-100*	Construction Survey	6/26/2022	
<u>P-101</u>	<u>Preparation/Removal of Existing Pavements</u>	<u>6/26/2022</u>	<u>7/6/2022</u>
P-151	Clearing and Grubbing	6/26/2022	
<u>P-152*</u>	<u>Excavation, Subgrade, and Embankment</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
P-153	Controlled Low-Strength Material (CLSM)	6/26/2022	
P-211*	Lime Rock Base Course	6/26/2022	
P-306*	Lean Concrete Base Course	6/26/2022	
P-403	Asphalt Mix Pavement [Base] [Leveling] [Surface] Course	6/26/2022	
<u>P-501*</u>	<u>Cement Concrete Pavement</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
P-602	Emulsified Asphalt Prime Coat	6/26/2022	

P-603	Emulsified Asphalt Tack Coat	6/26/2022	
P-604*	Compression Joint Seals for Concrete Pavements	6/26/2022	
<u>P-605*</u>	<u>Joint Sealants for Pavements</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
P-606	Adhesive Compounds, Two-Component for Sealing Wire and Lights in Pavement	6/26/2022	
P-608	Emulsified Asphalt Seal Coat	6/26/2022	
P-610	Concrete for Miscellaneous Structures	6/26/2022	
<u>P-620*</u>	<u>Runway and Taxiway Marking</u>	<u>6/26/2022</u>	<u>7/6/2022</u>
SP-100	General Provisions and Requirements for Electrical Work	6/26/2022	
SP-104	General Electrical Safety Requirements and Temporary Airfield Lighting	6/26/2022	
SP-105	Alterations, Removal and Demolition	6/26/2022	
SP-106	Submittals, Record Documents and Maintenance Manuals	6/26/2022	
<u>L-108</u>	<u>Underground Power Cable for Airports</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
L-110	Airport Underground Electrical Duct Banks and Conduits	6/26/2022	
SP-110S-02310	Installation of Underground Electrical Directional Bore Duct	6/26/2022	
SP-111	Airfield Electrical Installation Testing	6/26/2022	
<u>L-115</u>	<u>Electrical Manholes and Junction Structures</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
L-125	Installation of Airport Lighting Systems	6/26/2022	
T-901*	Seeding	6/26/2022	
<u>T-904*</u>	<u>Sodding</u>	<u>6/26/2022</u>	<u>7/21/2022</u>
T-905*	Topsoil	6/26/2022	
 <u>APPENDICES</u>			
<u>Appendix A</u>	<u>Available Inventory List</u>	<u>7/6/2022</u>	
<u>Appendix B</u>	<u>WS-110 LSC Demo Plans</u>	<u>7/6/2022</u>	
<u>Appendix C</u>	<u>Geotechnical Report</u>	<u>7/6/2022</u>	

* Represents Airfield Civil Specifications (MCO STC TERM C BP S196) included in the Airside Concourse Construction Package (MCO STC TERM C BP S195)

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Item D-751 Manholes, Catch Basins, Inlets and Inspection Holes

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, inlets, **inspection holes, and oil grit separator** in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the RPR OAR.

MATERIALS

751-2.1 Brick. The brick shall conform to the requirements of ASTM C32, Grade MS.

751-2.2 Mortar. Mortar shall consist of one part Portland cement and two parts sand. The cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

751-2.3 Concrete. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610.

751-2.4 Precast concrete pipe manhole rings. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches (90 cm) nor more than 48 inches (120 cm). There shall be a gasket between individual sections and sections cemented together with mortar on the inside of the manhole. Gaskets shall conform to the requirements of ASTM C443.

751-2.5 Corrugated metal. Corrugated metal shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M36.

751-2.6 Frames, covers, and grates. The castings shall conform to one of the following requirements:

- a. ASTM A48, Class 35B: Gray iron castings
- b. ASTM A47: Malleable iron castings
- c. ASTM A27: Steel castings
- d. ASTM A283, Grade D: Structural steel for grates and frames
- e. ASTM A536, Grade 65-45-12: Ductile iron castings
- f. ASTM A897: Austempered ductile iron castings

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

751-2.7 Oil Grit Separator. The separator shall be 16,000 Gallon Oil Grit Separator from Oldcastle Infrastructure or approved equal.

751-2.7 Steps. The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of asphalt paint, when directed.

751-2.8 Precast inlet structures. Manufactured in accordance with and conforming to ASTM C913.

CONSTRUCTION METHODS

751-3.1 Unclassified excavation.

a. The Contractor shall excavate for structures and footings to the lines and grades or elevations, shown on the plans, ~~or as staked by the RPR.~~ The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximately only; and the ~~RPR~~ **OAR** may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the ~~RPR~~ **OAR**. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturbed and excavation to final grade shall not be made until immediately before the concrete or reinforcing is placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of **de-watering**, bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. All **de-watering equipment**, bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall not disturb or damage finished masonry. The cost of removal shall be included in the unit price bid for the structure.

e. After excavation is completed for each structure, the Contractor shall notify the ~~RPR~~ **OAR**. No concrete or reinforcing steel shall be placed until the ~~RPR~~ **OAR** has **observed and** approved the depth of the excavation and the character of the foundation material.

751-3.2 Brick structures.

a. Foundations. A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of Item P-610.

b. Laying brick. All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread

on the beds and a shallow furrow shall be made in it that can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and re-laid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

c. Joints. All joints shall be filled with mortar at every course Exterior faces shall be laid up in advance of backing. Exterior faces shall be plastered or parged with a coat of mortar not less than 3/8 inch (9 mm) thick before the backing is laid up. Prior to parging, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4 inch (6 mm) nor more than 1/2 inch (12 mm) wide and the selected joint width shall be maintained uniform throughout the work.

d. Pointing. Face joints shall be neatly struck, using the weather-struck joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

e. Cleaning. Upon completion of the work all exterior surfaces shall be thoroughly cleaned by scrubbing and washing with water. If necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of water.

f. Curing and cold weather protection. The brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost on the brick or when the air temperature is below 50°F (10°C) unless the Contractor has, on the project ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60°F (16°C) for the duration of the curing period.

751-3.3 Concrete structures. Concrete structures which are to be cast-in-place within the project boundaries shall be built on prepared foundations, conforming to the dimensions and shape indicated on the plans. The construction shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the ~~RPR~~ **OAR** before the concrete is placed.

All invert channels shall be constructed and shaped accurately to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

751-3.4 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another ~~RPR~~ **OAR** approved third party certification program.

Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the plans. All precast concrete sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall: (1) be smoothed to a uniform surface on both interior and exterior of the structure or (2) utilize a rubber gasket per

ASTM C443. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal or metal encapsulated steps that are embedded or built into the side walls shall be aligned and placed in accordance to ASTM C478. When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 Corrugated metal structures. Corrugated metal structures shall be prefabricated. All standard or special fittings shall be furnished to provide pipe connections or branches with the correct dimensions and of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to allow the fastening of a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans. Corrugated metal structures shall be constructed on prepared foundations, conforming to the dimensions and locations as shown on the plans. When indicated, the structures shall be placed on a reinforced concrete base.

751-3.6 Inlet and outlet pipes. Inlet and outlet pipes shall extend through the walls of the structures a sufficient distance beyond the outside surface to allow for connections. They shall be cut off flush with the wall on the inside surface of the structure, unless otherwise directed. For concrete or brick structures, mortar shall be placed around these pipes to form a tight, neat connection.

751-3.7 Placement and treatment of castings, frames, and fittings. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the **RPR OAR**, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are placed on previously constructed masonry, the bearing surface of the masonry shall be brought true to line and grade and shall present an even bearing surface so the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed by the **RPR OAR**. All units shall set firm and secure.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for seven (7) days before the grates or covers are placed and fastened down.

751-3.8 Installation of steps. The steps shall be installed as indicated on the plans or as directed by the **RPR OAR**. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is placed. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least seven (7) days. After seven (7) days, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete structures they shall meet the requirements of ASTM C478. The steps shall be cast into the side of the sections at the time the sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches (300 mm).

~~Instead of steps, prefabricated ladders may be installed. For brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. For metal structures, the ladder shall be secured by welding the top support to the structure and grouting the bottom support into drilled holes in the foundation or as directed by the RPR OAR.~~

751-3.9 Oil Grit Separator Placement. The oil grit separator shall be placed in accordance with the manufacturer's recommendations at the location shown on the plans (C15 Series). The materials below the separator shall be prepared in accordance with paragraph 3.1 or per the manufacturer's recommendation and shall be reviewed by the OAR prior to placement of the separator.

751-3.10 Backfilling.

a. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8 inches (200 mm) in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the RPR OAR.

b. Backfill shall not be placed against any structure until approved by the RPR OAR. For concrete structures, approval shall not be given until the concrete has been in place seven (7) days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered an obligation of the Contractor covered under the contract unit price for the structure involved.

751-3.11 Cleaning and restoration of site. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as approved by the RPR OAR. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

METHOD OF MEASUREMENT

751-4.1 Manholes catch basins and inlets shall be measured by the unit.

751-4.2 Oil Grit separators shall be measured by the unit.

751-4.3 Cleanouts shall not be measured and shall be incidental to other applicable elements of work.

751-4.4 The quantity of Adjust Existing Manhole, Inlet, Inspection Hole and Cleanout to grade shall be incidental to specification P-501 Portland Cement Concrete Pavement. This work shall consist of all materials and equipment needed to complete the item as shown on the plans and details.

BASIS OF PAYMENT

751-5.1 The accepted quantities of manholes, catch basins and inlets will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, de-watering, excavation, shoring, backfilling and

placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; and for all labor equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Item D-751-5.1 Manholes – per each

Item D-751-5.2 Inlets – per each

Item D-751-5.3 Oil Grit Separator – per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C913	Standard Specification for Precast Concrete Water and Wastewater Structures.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
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END OF ITEM D-751

Item P-152 Excavation, Subgrade, and Embankment

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 Classification. All material excavated shall be classified as defined below:

a. **Unclassified excavation.** Unclassified excavation shall consist of the excavation and disposal of all material **that do not meet the subgrade requirements for the airfield pavement section as defined in these specifications and on the plans**, regardless of its nature which is not otherwise classified and paid for under one of the following items. **Unclassified excavation shall only be associated with insitu soils that have not been previously disturbed or placed as embankment by the contractor. If approved by the Owner Authorized Representative (OAR), the excavated materials can be placed in locations outside the pavement areas. No additional compensation will be made for hauling, placement and compaction of materials approved to be placed within the project site, outside the pavement areas.**

Replacement of excavated materials that do not meeting the subgrade requirement with compliant materials shall be compensated as Embankment.

No payment will be made for excavated materials that are used for Embankment on the project. The price for Embankment shall be inclusive of excavation, hauling, stockpiling, placement and compaction of materials in the final location.

b. **Muck excavation.** Muck excavation shall consist of the removal and disposal of deposits or mixtures of soils and organic matter not suitable for foundation material. ***Muck Excavation shall consist of the removal and disposal of deposits of soils with an organic content of 5 percent (by weight) or higher which is unsuitable as subgrade and embankment construction material.*** Muck shall include materials that will decay or produce subsidence in the embankment. It may consist of decaying stumps, roots, logs, humus, or other material not satisfactory for incorporation in the embankment.

c. **Drainage excavation.** Drainage excavation shall consist of all excavation made for the primary purpose of drainage and includes drainage ditches, such as intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the plans.

d. **Borrow excavation.** Borrow excavation shall consist of approved material required for the construction of embankments or for other portions of the work in excess of the quantity of usable material available from required excavations. Borrow material shall be obtained from areas designated ***approved*** by the ~~Resident Project Representative (RPR)~~ **Owner Authorized Representative (OAR)** within the limits of the airport property but outside the normal limits of necessary grading, or from areas outside the airport boundaries. ***No borrow areas have been identified on the airport for this project.***

152-1.3 Unsuitable excavation. Unsuitable material shall be disposed in designated waste areas as shown on the plans. Materials containing vegetable or organic matter ***in excess of 5 percent (by weight)***, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in

embankment construction. Material suitable for topsoil may be used on the embankment slope **as topsoil** when approved by the **RPR OAR**.

CONSTRUCTION METHODS

152-2.1 General. ~~Before beginning excavation, grading, and embankment operations in any area, the area shall be cleared or cleared and grubbed in accordance with Item P-151.~~ **Before beginning excavation, grading, and embankment operations in existing pervious areas, the area shall have topsoil stripped to a minimum depth of 6 inches.**

The suitability of material to be placed in embankments shall be subject to approval by the **RPR OAR**. All unsuitable material shall be disposed **of as directed by the OAR**. All waste areas shall be graded to allow positive drainage of the area and adjacent areas. The surface elevation of waste areas shall be specified on the plans or approved by the **RPR OAR**.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the **RPR OAR** notified per Section 70, paragraph 70-20. At the direction of the **RPR OAR**, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Areas outside the limits of the pavement areas where the top layer of soil has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches (100 mm), to loosen and pulverize the soil. Stones or rock fragments larger than 4 inches (100 mm) in their greatest dimension will not be permitted in the top 6 inches (150 mm) of the subgrade.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the **RPR OAR**, who shall arrange for their removal if necessary. The Contractor, at their own expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

a. Blasting. Blasting shall not be allowed.

152-2.2 Excavation. No excavation shall be started until the work has been staked out by the Contractor and the **RPR OAR** has obtained from the Contractor, the survey notes of the elevations and measurements of the ground surface. The Contractor and **RPR OAR** shall agree that the original ground lines shown on the original topographic mapping are accurate, or agree to any adjustments made to the original ground lines.

~~Digital terrain model (DTM) files of the existing surfaces, finished surfaces and other various surfaces were used to develop the design plans.~~

~~Volumetric quantities were calculated by comparing DTM files of the applicable design surfaces and generating Triangle Volume Reports. Electronic copies of DTM files and a paper copy of the original topographic map will be issued to the successful bidder.~~

~~Existing grades on the design cross sections or DTM's, where they do not match the locations of actual spot elevations shown on the topographic map, were developed by computer interpolation from those spot elevations.~~ **The existing ground surface has been defined based on the best available information available at the time of the design. The project site and associated quantities may vary from the conditions defined in the plans.** Prior to disturbing original

grade, Contractor shall **survey the existing site to establish the original ground surface to be used for calculation of earthwork quantities to be paid under this project. The Contractor's survey shall be reviewed and accepted by the OAR before it can be used as a basis for quantities determination.** ~~verify the accuracy of the existing ground surface by verifying spot elevations at the same locations where original field survey data was obtained as indicated on the topographic map. Contractor shall recognize that, due to the interpolation process, the actual ground surface at any particular location may differ somewhat from the interpolated surface shown on the design cross sections or obtained from the DTM's. Contractor's verification of original ground surface, however, shall be limited to verification of spot elevations as indicated herein, and no adjustments will be made to the original ground surface unless the Contractor demonstrates that spot elevations shown are incorrect. For this purpose, spot elevations which are within 0.1 foot of the stated elevations for ground surfaces, or within 0.04 foot for hard surfaces (pavements, buildings, foundations, structures, etc.) shall be considered "no change". Only deviations in excess of these will be considered for adjustment of the original ground surface. If Contractor's verification identifies discrepancies in the topographic map, Contractor shall notify the RPR OAR in writing at least two weeks before disturbance of existing grade to allow sufficient time to verify the submitted information and make adjustments to the design cross sections or DTM's. Disturbance of existing grade in any area shall constitute acceptance by the Contractor of the accuracy of the original elevations shown on the topographic map for that area.~~

All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the RPR OAR. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes **as shown on the plans. All unsuitable material shall be disposed of as shown on the plans or directed by the OAR.**

The grade shall be maintained so that the surface is well drained at all times. **Effective surface water control shall be required to prevent the disturbance to previously prepared or freshly exposed surfaces.**

When the volume of the excavation exceeds that required to construct the embankments to the grades as indicated on the plans, the excess shall be used to grade the areas of ultimate development or disposed as directed by the RPR OAR. **When the material can be utilized for another area within the project, the Contractor shall stockpile the material and shall provide erosion control measures completely around stockpiles.** When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas **approved by the OAR.**

a. Selective grading. When selective grading is indicated on the plans, the more suitable material designated by the RPR OAR shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall **become property of the Owner and shall be properly placed in approved areas as directed by the OAR.** The more suitable material shall then be placed and compacted as specified. Selective grading shall be considered incidental to the work involved. The cost of stockpiling and placing the material shall be included in the various pay items of work involved.

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches (300 mm) below the subgrade or to the depth specified by the RPR OAR. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed off

the airport **or at the direction of the OAR**. The cost is incidental to this item. This excavated material shall be paid for at the contract unit price per cubic yard (per cubic meter) for ~~Unclassified~~ **Unsuitable** Excavation. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities **in accordance with the provisions of Item P-152**. The necessary backfill will constitute a part of the embankment. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans. Undercutting will be paid as ~~unclassified~~ **“Unsuitable Excavation”**.

c. Over-break. Over-break, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the ~~RPR~~ **OAR**. All over-break shall be graded or removed by the Contractor and disposed of as directed by the ~~RPR~~ **OAR**. The ~~RPR~~ **OAR** shall determine if the displacement of such material was unavoidable and their own decision shall be final. Payment will not be made for the removal and disposal of over-break that the ~~RPR~~ **OAR** determines as avoidable. Unavoidable over-break will be classified as ~~Unclassified~~ **Unsuitable Excavation.**”

d. Removal of utilities. The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by the Contractor as indicated on the plans. All existing foundations shall be excavated at least 2 feet (60 cm) below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the ~~RPR~~ **OAR**. All foundations thus excavated shall be backfilled with suitable material and compacted as specified for embankment or as shown on the plans.

152-2.3 Borrow excavation. ~~Borrow areas within the airport property are indicated on the plans. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed by the RPR.~~ **No borrow locations are identified on the Airport for this Project.** All unsuitable material shall be disposed of by the Contractor as shown on the plans **or directed by the OAR**. All borrow pits shall be opened to expose the various strata of acceptable material to allow obtaining a uniform product. Borrow areas shall be drained and left in a neat, presentable condition with all slopes dressed uniformly. Borrow areas shall not create a hazardous wildlife attractant.

There are no borrow sources within the boundaries of the airport property. **If borrow material is necessary to construct the project**, the Contractor shall locate and obtain borrow sources **and any environmental permits, hauling fees or other required incidental items to satisfy the requirements of the project**, subject to the approval of the ~~RPR~~ **OAR**. The Contractor shall notify the ~~RPR~~ **OAR** at least 15 days prior to beginning the excavation so necessary measurements and tests can be made by the ~~RPR~~ **OAR**. All borrow pits shall be opened to expose the various strata of acceptable material to allow obtaining a uniform product. Borrow areas shall be drained and left in a neat, presentable condition with all slopes dressed uniformly. Borrow areas shall not create a hazardous wildlife attractant.

All materials designated as borrow material shall meet the following criteria to be accepted:

Unified Soil Classification	SP, SP-SM Fine Sand, Fine Sand with Silt	SM Silty Fine Sand
% Passing No. 200 Sieve	Less than 12% by weight	Less than 18% by weight

Liquid Limit	Less than 20	Less than 20
Plasticity Index	Less than 4	Less than 4
Organic Content	Less than 3% by weight	Less than 3% by weight

All borrow material to be used for the project must have laboratory tests on file with OAR demonstrating aforementioned criteria prior to material being accepted onto airport property for incorporation as borrow material.

Any change in the sources or composition of borrow material will be discussed with OAR and laboratory test results must be approved prior to any change of material.

152-2.4 Drainage excavation. Drainage excavation shall consist of excavating drainage ditches including intercepting, inlet, or outlet ditches; or other types as shown on the plans. The work shall be performed in sequence with the other construction. Ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas or as directed by the ~~RP~~ **OAR**. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross-section and shall keep them free of debris or obstructions until the project is accepted.

No direct payment shall be made for the work performed under this section.

152-2.5 Preparation of cut areas or areas where existing pavement has been removed. In those areas on which a subbase or base course is to be placed, the top 12 inches of subgrade shall be compacted to not less than 100 % of maximum density for non-cohesive soils, and 95% of maximum density for cohesive soils as determined by ASTM D1557. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

No direct payment shall be made for the work performed under this section. The work shall be incidental to P-152 Subgrade Preparation.

152-2.6 Preparation of embankment area. All sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches (150 mm) and shall then be compacted per paragraph 152-2.10.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches (300 mm) and compacted as specified for the adjacent fill.

Where embankments are to be placed on natural slopes steeper than 1 vertical and 3 horizontal, horizontal benches shall be constructed.

No direct payment shall be made for the work performed under this section. The work shall be incidental to P-152 Subgrade Preparation.

152-2.7 Control Strip. The first half-day of construction of subgrade and/or embankment shall be considered as a control strip for the Contractor to demonstrate, in the presence of the ~~RP~~ **OAR**, that the materials, equipment, and construction processes meet the requirements of this

specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The **RPR OAR** must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the **RPR OAR**. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the **RPR OAR**.

152-2.8 Formation of embankments. The material shall be constructed in lifts as established in the control strip, but not less than 6 inches (150 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

The lifts shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the **RPR OAR**. Materials such as **concrete and masonry debris, crushed concrete, pavement**, brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained due to rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each lift shall be within $\pm 2\%$ of optimum moisture content before rolling to obtain the prescribed compaction. The material shall be moistened or aerated as necessary to achieve a uniform moisture content throughout the lift. Natural drying may be accelerated by blending in dry material or manipulation alone to increase the rate of evaporation.

The Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

The contractor will take samples of excavated materials which will be used in embankment for testing and develop a Moisture-Density Relations of Soils Report (Proctor) in accordance with ASTM D1557. A new Proctor shall be developed for each soil type based on visual classification.

Density tests will be taken by the contractor for every 3,000 square yards of compacted embankment for each lift which is required to be compacted, or other appropriate frequencies as determined by the **RPR OAR**.

If the material has greater than 30% retained on the 3/4-inch (19.0 mm) sieve, follow AASHTO T-180 Annex Correction of maximum dry density and optimum moisture for oversized particles.

Rolling operations shall be continued until the embankment is compacted to not less than 100% of maximum density for non-cohesive soils, and 95% of maximum density for cohesive soils as determined by ASTM D1557. Under all areas to be paved, the embankments shall be compacted to a depth of 12 inches and to a density of not less than 100 percent of the maximum density as

determined by ASTM D1557. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches which shall be prepared for a seedbed in accordance with Item T-901.

The in-place field density shall be determined in accordance with ASTM D1556 or ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Contractor's laboratory shall perform all density tests in the ~~RPR's~~ **OAR's** presence and provide the test results upon completion to the ~~RPR~~ **OAR** for acceptance. If the specified density is not attained, the area represented by the test or as designated by the ~~RPR~~ **OAR** shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

Compaction areas shall be kept separate, and no lift shall be covered by another lift until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each lift is placed. Lift placement shall begin in the deepest portion of the embankment fill. As placement progresses, the lifts shall be constructed approximately parallel to the finished pavement grade line.

When rock, concrete pavement, asphalt pavement, and other embankment material are excavated at approximately the same time as the subgrade, the material shall be incorporated into the outer portion of the embankment and the subgrade material shall be incorporated under the future paved areas. Stones, fragmentary rock, and recycled pavement larger than 4 inches (100 mm) in their greatest dimensions will not be allowed in the top 12 inches (300 mm) of the subgrade. Rockfill shall be brought up in lifts as specified or as directed by the ~~RPR~~ **OAR** and the finer material shall be used to fill the voids forming a dense, compact mass. Rock, cement concrete pavement, asphalt pavement, and other embankment material shall not be disposed of except at places and in the manner designated on the plans or by the ~~RPR~~ **OAR**.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in lifts of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in lifts not exceeding 2 feet (60 cm) in thickness. Each lift shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The lift shall not be constructed above an elevation 4 feet (1.2 m) below the finished subgrade.

Following placement of embankment the Contractor shall survey the site to establish the surface to be used for determination of the quantities of placed embankment. The survey will be reviewed by the OAR for approval prior to determination of the quantity of embankment to be paid.

All costs incidental to placing in lifts, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for embankment.

152-2.9 Proof rolling. The purpose of proof rolling the subgrade is to identify any weak areas in the subgrade and not for compaction of the subgrade. After compaction is completed, the subgrade area shall be proof rolled with a 20 ton (18.1 metric ton) Tandem axle Dual Wheel Dump Truck loaded to the legal limit with tires inflated to 80/100/150 psi (0.551 MPa/0.689 MPa/1.034 MPa) in the presence of the ~~RPR~~ **OAR**. Apply a minimum of 100% coverage, or as specified by

the **RPR OAR**, under pavement areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch (25 mm) or show permanent deformation greater than 1 inch (25 mm) shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications. Removal and replacement of soft areas is incidental to this item.

152-2.10 Compaction requirements. The subgrade under areas to be paved shall be compacted to a depth of 12 inches and to a density of not less than 100percent of the maximum dry density as determined by ASTM D1557. The subgrade in areas outside the limits of the pavement areas shall be compacted to a depth of 12 inches and to a density of not less than 95 percent of the maximum density as determined by ASTM D1557.

The material to be compacted shall be within $\pm 2\%$ of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils). When the material has greater than 30 percent retained on the $\frac{3}{4}$ inch (19.0 mm) sieve, follow the methods in ASTM D1557 Tests for moisture content and compaction will be taken at a minimum of 1,000 S.Y. of subgrade. All quality assurance testing shall be done by the Contractor’s laboratory in the presence of the **RPR OAR**, and density test results shall be furnished upon completion to the **RPR OAR** for acceptance determination.

Under all areas to be paved, the embankments shall be compacted to the depths and densities as specified below:

<i>Depth Below Finished Subgrade (in.)</i>	<i>Compaction for P-152 per ASTM D 1557</i>	<i>Required Soil Type</i>
<i>0 to 25 (fill and cut areas)</i>	<i>100%</i>	<i>SP and SP-SM only (<12% by weight)</i>
<i>25 to 44 (fill and cut areas)</i>	<i>95%</i>	<i>SP and SP-SM only (<12% by weight)</i>
<i>Below 44 (fill areas only)</i>	<i>95%</i>	<i>SP, SP-SM, and SM only (<18% by weight)</i>

Contractor shall provide (by digging) test pits on each 1,000 square yard area under proposed full strength pavement (or per each isolated area of construction) for OAR testing firm to perform density tests. Tests shall be taken at these locations at the various depths for density specified. All testing for excavation and backfilling of test pits shall be incidental to subgrade preparation.

The in-place field density shall be determined in accordance with ASTM D1556 or ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938 within 12 months prior to its use on this contract. The gage shall be field standardized daily.

Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

If the specified density is not attained, the entire lot shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the ~~RPR~~ OAR and the finished subgrade shall be maintained.

152-2.11 Finishing and protection of subgrade. Finishing and protection of the subgrade is incidental to this item. Grading and compacting of the subgrade shall be performed so that it will drain readily. All low areas, holes or depressions in the subgrade shall be brought to grade. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans. All ruts or rough places that develop in the completed subgrade shall be graded, re-compacted, and retested. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes.

The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been accepted by the ~~RPR~~ OAR.

152-2.12 Haul. All hauling, ***both on and off Airport property***, will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

The Contractor's equipment shall not cause damage to any excavated surface, compacted lift or to the subgrade as a result of hauling operations. Any damage caused as a result of the Contractor's hauling operations shall be repaired at the Contractor's expense.

The Contractor shall be responsible for providing, maintaining and removing any haul roads or routes within or outside of the work area, and shall return the affected areas to their former condition, unless otherwise authorized in writing by the Owner. No separate payment will be made for any work or materials associated with providing, maintaining and removing haul roads or routes.

152-2.13 Surface Tolerances. In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (75 mm), reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and approved by the ~~RPR~~ OAR. The Contractor shall perform all final smoothness and grade checks in the presence of the ~~RPR~~ OAR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

- a. **Smoothness.** The finished surface shall not vary more than +/- ½ inch (12 mm) when tested with a 12-foot (3.7-m) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (3.7-m) straightedge for the full length of each line on a 50-foot (15-m) grid.
- b. **Grade.** The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within +/-0.05 feet (15 mm) of the specified grade.

On safety areas, turfed areas and other designated areas within the grading limits where no subbase or base is to be placed, grade shall not vary more than 0.10 feet (30 mm) from specified grade. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.14 Topsoil. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall be located as shown on the plans and the approved CSPP, and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the ~~RPR~~ **OAR**, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further re-handling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as shown on the plans and as required in Item T-905. Topsoil shall be paid for as provided in Item T-905. No direct payment will be made for topsoil under Item P-152.

METHOD OF MEASUREMENT

152-3.1 Measurement for payment for embankment, specified by the cubic yard (cubic meter) shall be computed ***from the comparison of surveyed original and final surface approved by the OAR. The volume computed by a DTM model of the original and final surfaces established by the Contractor surveys and approved by the OAR shall be the basis of measurement.***

152-3.2 The quantity of unsuitable excavation to be paid for shall be the number of cubic yards measured in its original position as approved by the OAR. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

152-3.3 The quantity of subgrade preparation to be paid for shall be the number of square yards measured in its final place and accepted by the OAR. Measurement shall not include the quantity of subgrade preparation performed outside the limits of work defined on the plans without authorization.

152-3.4 **The quantity of unclassified excavation to be paid for shall be the number of cubic yards measured in its original position as approved by the OAR. Measurement shall not include the quantity of materials excavated without authorization beyond approved limits, or the quantity of material used for purposes other than those directed.**

BASIS OF PAYMENT

152-4.1 Embankment payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, **hauling, placement, compaction**, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.2 Unsuitable excavation payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.3 Subgrade preparation payment shall be made at the contract unit price per square yard (square meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.4 Unclassified excavation payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-152-4.1	Embankment - per cubic yard
Item P-152-4.2	Unsuitable Excavation - per cubic yard
Item P-152-4.3	Subgrade Preparation - per square yard
<u>Item P-152-4.4</u>	<u>Unclassified Excavation - per cubic yard</u>

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO T-180	Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
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ASTM International (ASTM)

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2700 kN-m/m ³))
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Advisory Circulars (AC)

AC 150/5370-2	Operational Safety on Airports During Construction Software
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Software

FAARFIELD – FAA Rigid and Flexible Iterative Elastic Layered Design

U.S. Department of Transportation

FAA RD-76-66	Design and Construction of Airport Pavements on Expansive Soils
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END OF ITEM P-152

ORLANDO INTERNATIONAL AIRPORT
BP-S196: TERM C, PH 1X -
AIRFIELD CIVIL, APRON & TAXIWAY PAVING

EXCAVATION, SUBGRADE, AND
EMBANKMENT
ITEM P-152

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SECTION P-501- CEMENT CONCRETE PAVEMENT

PART 1 - DESCRIPTION

- 1.1 This work shall consist of pavement composed of cement concrete without reinforcement constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross-sections shown on the plans. The terms cement concrete, hydraulic cement concrete, and concrete are interchangeable in this specification.

PART 2 - MATERIALS

2.1 AGGREGATES

A. Reactivity

Fine and Coarse aggregates to be used in PCC on this project shall be tested and evaluated by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Tests must be representative of aggregate sources which will be providing material for production. ASTM C1260 and ASTM C1567 tests may be run concurrently.

1. Coarse aggregate and fine aggregate shall be tested separately in accordance with ASTM C1260, however, the length of test shall be extended to 28 days (30 days from casting). Tests must have been completed within 6 months of the date of the concrete mix submittal.
2. The combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.
3. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662 in lieu of ASTM C1567. If lithium nitrate admixture is used, it shall be nominal 30% \pm 0.5% weight lithium nitrate in water. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

B. Fine aggregate

Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and the parameters identified in the fine aggregate material requirements below. Fine aggregate material requirements and deleterious limits are shown in the table below.

Fine Aggregate Material Requirements		
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Sand Equivalent	45 minimum	ASTM D2419
Fineness Modulus (FM)	$2.50 \leq FM \leq 3.40$	ASTM C136
Limits for Deleterious Substances in Fine Aggregate for Concrete		
Clay lumps and friable particles	1.0% maximum	ASTM C142
Coal and lignite	0.5% using a medium with a density of Sp. Gr. of 2.0	ASTM C123
Total Deleterious Material	1.0% maximum	

C. Coarse aggregate

The maximum size coarse aggregate shall be 1.5-inch.

Aggregates delivered to the mixer shall be clean, hard, uncoated aggregates consisting of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates shall have no known history of detrimental pavement staining. Steel blast furnace slag shall not be permitted. Coarse aggregate material requirements and deleterious limits are shown in the table below; washing may be required to meet aggregate requirements.

Coarse Aggregate Material Requirements

Material Test	Requirement	Standard
Resistance to Degradation	Loss: 40% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 for any size group coarser than 3/8 (9.5 mm) sieve ¹	ASTM D4791
Bulk density of slag ²	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29
D-cracking (Freeze-Thaw) ³	Durability factor \geq 95	ASTM C666

¹ A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

² Only required if slag is specified.

³ Coarse aggregate may only be accepted from sources that have a 20-year service history for the same gradation to be supplied with no history of D-Cracking. Aggregates that do not have a 20-year record of service free from major repairs (less than 5% of slabs replaced) in similar conditions without D-cracking shall not be used unless the material currently being produced has a durability factor greater than or equal to 95 per ASTM C666. The Contractor shall submit a current certification and test results to verify the aggregate acceptability. Test results will only be accepted from a State Department of Transportation (DOT) materials laboratory or an accredited laboratory. Certification and test results which are not dated or which are over one (1) year old or which are for different gradations will not be accepted.

The amount of deleterious material in the coarse aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Coarse Aggregate

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve (75 μ m)	ASTM C117	1.0 ¹
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert ² (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.40)	1.0 ³

¹ The limit for material finer than 75- μ m is allowed to be increased to 1.5% for crushed aggregates consisting of dust of fracture that is essentially free from clay or shale. Test results supporting acceptance of increasing limit to 1.5% with statement indicating material is dust of fracture must

be submitted with Concrete mix. Acceptable techniques to characterizing these fines include methylene blue adsorption or X-ray diffraction analysis.

- ² Chert and aggregates with less than 2.4 specific gravity.
- ³ The limit for chert may be increased to 1.0 percent by mass in areas not subject to severe freeze and thaw.

D. Combined aggregate gradation

This specification is targeted for a combined aggregate gradation developed following the guidance presented in United States Air Force Engineering Technical Letter (ETL) 97-5: Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements. Base the aggregate grading upon a combination of all the aggregates (coarse and fine) to be used for the mixture proportioning. Three aggregate sizes may be required to achieve an optimized combined gradation that will produce a workable concrete mixture for its intended use. Use aggregate gradations that produce concrete mixtures with well-graded or optimized aggregate combinations. The Contractor shall submit complete mixture information necessary to calculate the volumetric components of the mixture. The combined aggregate grading shall meet the following requirements:

1. The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in paragraph 2.1d(4) below, the point thus determined shall fall within the parallelogram described therein.

2. The CF shall be determined from the following equation:

$$CF = (\text{cumulative percent retained on the } 3/8 \text{ in. (9.5 mm) sieve})(100) / (\text{cumulative percent retained on the No. 8 (2.36 mm) sieve})$$

3. The WF is defined as the percent passing the No. 8 (2.36 mm) sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds (42 kg) of cementitious material per cubic meter yard greater than 564 pounds per cubic yard (335 kg per cubic meter).
4. A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, WF-28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary. The point determined by the plotting of the CF and WF may be adjusted during production ± 3 WF and ± 5 CF. Adjustments to gradation may not take the point outside of the parallelogram.

- E. Contractors combined aggregate gradation. The Contractor shall submit their combined aggregate gradation using the following format:

Contractor's Combined Aggregate Gradation

Sieve Size	Contractor's Concrete mix Gradation (Percent passing by weight)
2 inch (50 mm)	*
1-1/2 inch (37.5 mm)	*
1 inch (25.0 mm)	*
3/4 inch (19.0 mm)	*
1/2 inch (12.5 mm)	*
3/8 inch (9.5 mm)	*
No. 4 (4.75 mm)	*
No. 8 (2.36 mm)	*
No. 16 (1.18 mm)	*
No. 30 (600 µm)	*
No. 50 (300 µm)	*
No. 100 (150 µm)	*

2.2 CEMENT

Cement shall conform to the requirements of ASTM C150 Type I/II or ASTM C595 Type IL.

2.3 CEMENTITIOUS MATERIALS

A. Fly ash

Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total alkali content less than 3% per ASTM C311. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the ~~Resident Project Representative (RPR)~~ **Owner's Authorized Representative (OAR)**.

B. Slag cement (ground granulated blast furnace (GGBF))

Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

C. Raw or calcined natural pozzolan

Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

D. Ultrafine fly ash and ultrafine pozzolan

UltraFine Fly Ash (UFFA) and UltraFine Pozzolan (UFP) shall conform to ASTM C618, Class F or N, and the following additional requirements:

1. The strength activity index at 28 days of age shall be at least 95% of the control specimens.
2. The average particle size shall not exceed 6 microns.

2.4 JOINT SEAL

The joint seal for the joints in the concrete pavement shall meet the requirements of Item P-604 or P-605 and shall be of the type specified in the plans.

2.5 ISOLATION JOINT FILLER

Premolded joint filler for isolation joints shall conform to the requirements of ASTM D1751 or ASTM D1752 and shall be where shown 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 ~~RPR~~ **OAR**. When the use of more than one piece is required 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 ~~RPR~~ **OAR**.

2.6 STEEL REINFORCEMENT

Reinforcing shall consist of #4 Bars conforming to the requirements of ASTM A615.

2.7 DOWEL AND TIE BARS

Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete.

A. Dowel Bars

Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078, Type 1, with a coating thickness after curing greater than 10 mils. Patched ends are not required for Type 1 coated dowels. The dowels shall be coated with a bond-

breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted. Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

B. Tie Bars

Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.

2.8 WATER

Water used in mixing or curing shall be potable. If water is taken from other sources considered non-potable, it shall meet the requirements of ASTM C1602.

2.9 MATERIAL FOR CURING CONCRETE

Curing materials shall conform to one of the following specifications:

- A. Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class A, or Class B.
- B. White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.
- C. White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.
- D. Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.

2.10 ADMIXTURES

Admixtures shall conform to the following specifications:

- A. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entraining agent and any water reducer admixture shall be compatible.
- B. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D.
- C. Other admixtures. The use of set retarding and set-accelerating admixtures shall be approved by the ~~RPR~~ **OAR** prior to developing the concrete mix. Retarding admixtures shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating admixtures shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

- D. Lithium Nitrate. The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon (1.2 kg/L), and shall have the approximate chemical form as shown below:

Lithium Admixture

Constituent	Limit (Percent by Mass)
LiNO ₃ (Lithium Nitrate)	30 ±0.5
SO ₄ (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

The lithium nitrate admixture dispensing and mixing operations shall be verified and certified by the lithium manufacturer's representative.

2.11 EPOXY-RESIN

All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

- A. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.
- B. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.
- C. Material for use for injecting cracks shall be Type IV, Grade 1.
- D. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

2.12 BOND BREAKER

Choke stone shall be an ASTM C33 Number 89 stone.

2.13 **RAISED SIDEWALK PAVEMENT**

- A. **All materials for 6" Raised Sidewalk Concrete Pavement shall meet the material requirements of Specification P-610.**

2.14 HURRICANE TIE-DOWNS

- A. Hurricane tie-downs shall consist of a mooring device cast into the pavement in accordance with the plans and details at locations selected by the OAR. The mooring device shall be Neenah Model No. R-3490-A or approved equal and consist of Ductile Cast Iron (ASTM A-536). Reinforcing shall consist of #4 Bars conforming to the requirements of ASTM A615. Concrete shall conform to the requirements of this specification.**

PART 3 - CONCRETE MIX

3.1. GENERAL

No concrete shall be placed until an acceptable concrete mix has been submitted to the RPR **OAR** for review and the RPR **OAR** has taken appropriate action. The RPR's **OAR's** review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

3.2 CONCRETE MIX LABORATORY

The laboratory used to develop the concrete mix shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete mix must be included in the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the RPR **OAR** prior to start of construction.

3.3 CONCRETE MIX PROPORTIONS

Develop the mix using the procedures contained in Portland Cement Association (PCA) publication, "Design and Control of Concrete Mixtures." Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 6.6 for a flexural strength of 620 psi per ASTM C78.

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be 470 pounds per cubic yard (280 kg per cubic meter). The ratio of water to cementitious material, including free surface moisture on the aggregates but not including moisture absorbed by the aggregates shall be between 0.38 – 0.45 by weight.

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. At the start of the project, the Contractor shall determine an allowable slump as determined by ASTM C143 not to exceed 2 inches (50 mm) for slip-form placement. For fixed-form placement, the slump shall not exceed 3 inches (75 mm). For hand placement, the slump shall not exceed 4 inches (100 mm).

The results of the concrete mix shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard (meter) basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition.

If a change in source(s) is made, or admixtures added or deleted from the mix, a new concrete mix must be submitted to the ~~RPR~~ **OAR** for approval.

The ~~RPR~~ **OAR** may request samples at any time for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

3.4 CONCRETE MIX SUBMITTAL

The concrete mix shall be submitted to the ~~RPR~~ **OAR** at least 30 days prior to the start of operations. The submitted concrete mix shall not be more than 180 days old and must use the materials to be used for production for the project. Production shall not begin until the concrete mix is approved in writing by the ~~RPR~~ **OAR**.

Each of the submitted concrete mixes (i.e, slip form, side form machine finish and side form hand finish) shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items and quantities as a minimum:

- Certified material test reports for aggregate in accordance with paragraph 2.1. Certified reports must include all tests required; reporting each test, test method, test result, and requirement specified (criteria).
- Combined aggregate gradations and analysis; and including plots of the fine aggregate fineness modulus.
- Reactivity Test Results.
- Coarse aggregate quality test results, including deleterious materials.
- Fine aggregate quality test results, including deleterious materials.
- Mill certificates for cement and supplemental cementitious materials.
- Certified test results for all admixtures, including Lithium Nitrate if applicable.
- Specified flexural strength, slump, and air content.
- Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.
- Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.

- Correlation ratios for acceptance testing and Contractor QC testing, when applicable.
- Historical record of test results documenting production standard deviation, when applicable.

3.5 CEMENTITIOUS MATERIALS

A. Fly ash

When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

B. Slag cement (ground granulated blast furnace (GGBF))

Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25 to 55% of the total cementitious material by weight.

C. Raw or calcined natural pozzolan

Natural pozzolan may be used in the concrete mix. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

D. Ultrafine fly ash (UFFA) and ultrafine pozzolan (UFP)

UFFA and UFP may be used in the concrete mix with the ~~RPR's~~ **OAR's** approval. When UFFA and UFP is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 7% and 16% by weight of the total cementitious material.

3.6 ADMIXTURES

A. Air-entraining admixtures

Air-entraining admixture are to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be 3.5%. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

B. Water-reducing admixtures

Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM C494.

C. Other admixtures

Set controlling, and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM C494.

D. Lithium nitrate

Lithium nitrate shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with paragraph 2.10d.

3.7 RAISED SIDEWALK PAVEMENT

The concrete mix design for 6" Raised Sidewalk Concrete Pavement shall meet the requirements of this Specification or Specification P-610. The Contractor shall clearly indicate on the mix design submittal the Specification to which the mix is designed.

PART 4 - CONSTRUCTION METHODS

4.1 CONTROL STRIP

The control strip(s) shall be to the next planned joint after the initial 250 feet (75 m) of each type of pavement construction (slip-form pilot lane, slip-form fill-in lane, or fixed form). The Contractor shall demonstrate, in the presence of the ~~RPR~~ **OAR**, that the materials, concrete mix, equipment, construction processes, and quality control processes meet the requirements of the specifications. The concrete mixture shall be extruded from the paver meeting the edge slump tolerance and with little or no finishing. Pilot, fill-in, and fixed-form control strips will be accepted separately. Minor adjustments to the mix design may be required to place an acceptable control strip. Minor adjustments to the mix design may be required to place an acceptable control strip. The production mix will be the adjusted mix design used to place the acceptable control strip. Upon acceptance of the control strip by the ~~RPR~~ **OAR**, the Contractor must use the same equipment, materials, and construction methods for the remainder of concrete paving. Any adjustments to processes or materials must be approved in advance by the ~~RPR~~ **OAR**. Acceptable control strips will meet edge slump tolerance and surface acceptable with little or no finishing, air content within action limits, strength equal or greater than requirements of P3.3. The control strip

will be considered one lot for payment (no sublots required for control strip). Payment will only be made for an acceptable control strip in accordance with paragraph 8.1 using a lot pay factor equal to 100.

4.2 EQUIPMENT

The Contractor is responsible for the proper operation and maintenance of all equipment necessary for handling materials and performing all parts of the work to meet this specification.

A. Plant and equipment

The plant and mixing equipment shall conform to the requirements of ASTM C94 and/or ASTM C685. Each truck mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades. The truck mixers shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch (19 mm) or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

Equipment for transferring and spreading concrete from the transporting equipment to the paving lane in front of the finishing equipment shall be provided. The equipment shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

B. Finishing equipment

1. Slip-form. The standard method of constructing concrete pavements shall be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements.
2. Fixed-form. On projects requiring less than 10,000 cubic yards (7650 cubic meters) of concrete pavement or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with equipment specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the ~~RPR~~ **OAR**. Hand screeding and float finishing may only be used on small irregular areas as allowed by the ~~RPR~~ **OAR**.

C. Vibrators

Vibrator shall be the internal type. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation or voids. The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309R, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the ~~RPR~~ **OAR**.

Hand held vibrators may only be used in irregular areas and shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

D. Concrete saws

The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations.

E. Fixed forms

Straight side fixed forms shall be made of steel and shall be furnished in sections not less than 10 feet (3 m) in length. 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. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the ~~RPR~~ **OAR**. The top face of the form shall not vary from a true plane more than 1/8 inch (3 mm) in 10 feet (3 m), and the upstanding leg shall not vary more than 1/4 inch (6 mm). The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the ~~RPR~~ **OAR**. The forms shall extend the full depth of the pavement section.

4.3 FORM SETTING

Forms shall be set to line and grade as shown on the plans, sufficiently in advance of the concrete placement, to ensure continuous paving operation. Forms shall be set to withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the concrete placement.

4.4 BASE SURFACE PREPARATION PRIOR TO PLACEMENT

Any damage to the prepared base, subbase, and subgrade shall be corrected full depth by the Contractor prior to concrete placement. The underlying surface shall be entirely free of frost when concrete is placed. The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete. Bond breaker shall be applied in accordance with 2.12.

4.5 HANDLING, MEASURING, AND BATCHING MATERIAL

Aggregate stockpiles shall be constructed and managed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant. 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. Store and maintain all aggregates at a uniform moisture content prior to use. A continuous supply of materials shall be provided to the work to ensure continuous placement.

4.6 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 are placed into the drum until the drum is emptied into the truck. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94 or ASTM C685.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is discharged from the truck should not exceed 30 minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators. In no case shall the temperature of the concrete when placed exceed 90°F (32°C). Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified is not exceeded.

4.7 WEATHER LIMITATIONS ON MIXING AND PLACING

No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

A. Cold weather

Unless authorized in writing by the ~~RPR~~ **OAR**, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F (4°C) and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F (2°C).

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F (10°C) at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F (66°C). The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials.

Curing during cold weather shall be in accordance with paragraph 4.13d.

B. Hot weather

During periods of hot weather when the maximum daily air temperature exceeds 85°F (30°C), the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90°F (32°C). The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The concrete placement shall be protected from exceeding an evaporation rate of 0.2 psf (0.98 kg/m² per hour) per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. If the Contractor's measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

Curing during hot weather shall be in accordance with paragraph 4.13e.

C. Temperature management program. Prior to the start of paving operation for each day of paving, the Contractor shall provide the ~~RPR~~ **OAR** with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. (Federal Highway Administration HIPERPAV 3 is one example of a temperature management program.) As a minimum, the program shall address the following items:

1. Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.

2. Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 19-9, PCA, Design and Control of Concrete Mixtures.
3. Anticipated timing of initial sawing of joint.
4. Anticipated number and type of saws to be used.

D. Rain

The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils (0.1 mm) thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

4.8 CONCRETE PLACEMENT

At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet (1 m). The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches a flexural strength of 550 psi (3.8 MPa), based on the average of four field cured specimens per 2,000 cubic yards (1,530 cubic meters) of concrete placed. The Contractor must determine that the above minimum strengths are adequate to protection the pavement from overloads due to the construction equipment proposed for the project.

The Contractor shall have available materials for the protection of the concrete during cold, hot and/or inclement weather in accordance with paragraph 4.7.

A. Slip-form construction

The concrete shall be distributed uniformly into final position by a self-propelled slip-form paver without delay. The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well-defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a

series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9 inches (23 cm) for slipform and at the end of the dowels for the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18 inches (0.5 m).

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without, segregation, voids, or vibrator trails and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot (30 cm). The frequency of vibration or amplitude should be adjusted proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

Not more than 15% of the total free edge of each 500-foot (150 m) segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4 inch (6 mm), and none of the free edge of the pavement shall have an edge slump exceeding 3/8 inch (9 mm). (The total free edge of 500 feet (150 m) of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500 feet (150 m) of paving lane originally constructed as a separate lane will have 1,000 feet (300 m) of free edge, 500 feet (150 m) of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches (0.5 m) from the edge.

When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump will be removed the full width of the slip form lane and replaced at the expense of the Contractor as directed by the **RPR OAR**.

B. Fixed-form construction

Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars / dowel bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and coated with a release agent each time they are used and before concrete is placed against them.

Concrete shall be spread, screed, shaped and consolidated by one or more self-propelled machines. These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery. The equipment must be specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the ~~RPR~~ **OAR**.

Concrete for the full paving width shall be effectively consolidated by internal vibrators. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation, voids, or leaving vibrator trails.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

C. Consolidation

Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches (50 mm). Vibrators shall not be used to transport or spread the concrete. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) or over-consolidation (vibrator trails, segregation, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the ~~RPR~~ **OAR**.

If a lack of consolidation of the hardened concrete is suspected by the ~~RPR~~ **OAR**, referee testing may be required. Referee testing of hardened concrete will be performed by the ~~RPR~~ **OAR** by cutting cores from the finished pavement after a minimum of 24 hours curing. The ~~RPR~~ **OAR** shall visually examine the cores for evidence of lack of consolidation. Density determinations will be made by the ~~RPR~~ **OAR** based on the water content of the

core as taken. ASTM C642 shall be used for the determination of core density in the saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards (382 m²) of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if they fail to meet the required density.

The average density of the cores shall be at least 97% of the original concrete mix density, with no cores having a density of less than 96% of the original concrete mix density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

4.9 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 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 reinforcing steel 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 screed. If any portion of the bottom layer of concrete has been placed more than 30 minutes without being covered with the top layer or if initial set has taken place, it 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.

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. 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 ASTM specification requirements.

4.10 JOINTS

Joints shall be constructed as shown on the plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as shown on the plans. Joints shall not vary more than 1/2-inch (12 mm) from their designated position and shall be true to line with not more than 1/4-inch (6 mm) variation in 10 feet (3 m). The surface across the joints shall be tested with a 12-foot (3 m) straightedge as the joints are finished and any irregularities in excess of 1/4 inch (6 mm) shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the plans.

- A. Construction. Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

- B. Contraction

Contraction joints shall be installed at the locations and spacing as shown on the plans. Contraction joints shall be installed to the dimensions required 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. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch (3 mm) wide and to the depth shown on the plans.

- C. Isolation (expansion)

Isolation joints shall be installed as shown on the plans. 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. The filler shall be fastened uniformly along the hardened joint face with no buckling or debris between the filler and the concrete interface, including a temporary filler for the sealant reservoir at the top of the slab. The edges of the joint shall be finished and tooled while the concrete is still plastic.

- D. Dowels and Tie Bars for Joints

1. Tie bars

Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth and within the tolerances in paragraph 4.10(f.). When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.

2. Dowel bars

Dowel bars shall be placed across joints in the proper horizontal and vertical alignment as shown on the plans. The dowels shall be coated with a bond-breaker or other lubricant recommended by the manufacturer and approved by the ~~RPR~~ **OAR**. Dowels bars at longitudinal construction joints shall be bonded in drilled holes.

3. Placing dowels and tie bars

Horizontal spacing of dowels shall be within a tolerance of $\pm 3/4$ inch (19 mm). The vertical location on the face of the slab shall be within a tolerance of $\pm 1/2$ inch (12 mm). The method used to install dowels shall ensure that the horizontal and vertical alignment will not be greater than 1/4 inch per foot (6 mm per 0.3 m), except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The portion of each dowel intended to move within the concrete or expansion cap shall be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following subparagraphs.

- (a) Contraction joints. Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires.

At the Contractor's option, dowels and tie bars in contraction joints may be installed by insertion into the plastic concrete using approved equipment and procedures per the paver manufacturer's design. Approval of installation methods will be based on the results of the control strip showing that the dowels and tie bars are installed within specified tolerances as verified by cores or non-destructive rebar location devices approved by the ~~RPR~~ **OAR**.

- (b) Construction joints. Install dowels and tie bars by the cast-in- place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms.

- (c) Joints in hardened concrete. Install dowels in hardened concrete by bonding the dowels into holes drilled into the concrete. The concrete shall have cured for seven (7) days or reached a minimum flexural strength of 450 psi (3.1 MPa) before drilling begins. Holes 1/8 inch (3 mm) greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur. Spalling beyond the limits of the grout retention ring will require modification of the equipment and operation. Depth of dowel hole shall be within a tolerance of $\pm 1/2$ inch (12 mm) of the dimension shown on the drawings. On completion of the drilling operation, the

dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole by means of a suitable metal or plastic grout retention ring fitted around the dowel.

E. Sawing of joints

Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been sawn. All slurry and debris produced in the sawing of joints shall be removed by vacuuming and washing. Curing compound or system shall be reapplied in the initial saw-cut and maintained for the remaining cure period.

Joints shall be cut in locations as shown on the plans. The initial joint cut shall be a minimum 1/8 inch (3 mm) wide and to the depth shown on the plans. Prior to placement of joint sealant or seals, the top of the joint shall be widened by sawing as shown on the plans.

4.11 FINISHING

Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, edging of joints, and then texturing. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Equipment, mixture, and/or procedures which produce more than 1/4 inch (6 mm) of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way. Fog (mist) sprays or other surface applied finishing aids specified to prevent plastic shrinkage cracking, approved by the **RPR OAR**, may be used in accordance with the manufacturers requirements.

A. Machine finishing with slipform pavers

The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. Equipment, mixture, and/or procedures which produce more than 1/4 inch (6 mm) of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Remove excessive slurry from the surface with a cutting straightedge and wipe off the edge. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

B. Machine finishing with fixed forms

The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

C. Other types of finishing equipment

Clay screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the ~~RPR's~~ **OAR's** approval.

Bridge deck finishers shall have a minimum operating weight of 7500 pounds (3400 kg) and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

D. Hand finishing

Hand finishing methods will not be permitted, except under the following conditions: (1) in the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical.

E. Straightedge testing and surface correction

After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a 12-foot (3.7-m) finishing straightedge swung from handles capable of spanning at least 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 excess water and laitance in excess of 1/8 inch (3 mm) thick shall be removed from the surface of the pavement and wasted. 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 smoothness requirements. Straightedge testing and surface corrections 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. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment.

4.12 SURFACE TEXTURE

The surface of the pavement shall be finished as designated below for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. The texture shall be uniform in appearance and approximately 1/16 inch (2 mm) in depth. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the RPR **OAR**.

A. Brush or broom finish

Shall be applied when the water sheen has practically disappeared. The equipment shall operate transversely across the pavement surface. **All 6" raised sidewalk pavement sections shall receive a brush or broom finish.**

B. Burlap drag finish

Not used.

C. Artificial turf finish

Not used.

4.13 CURING

Immediately after finishing operations are completed and bleed water is gone from the surface, all exposed surfaces of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. 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 1/2 hour during the curing period.

When a two-saw-cut method is used to construct the contraction joint, the curing compound shall be applied to the saw-cut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

A. Impervious membrane method

Curing with liquid membrane compounds should not occur until bleed and surface moisture has evaporated. All exposed surfaces 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 one gallon (4 liters) to not more than 150 square feet (14 sq m). 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 mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the ~~RPR~~ **OAR**, a double application rate shall be used to ensure coverage. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. 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.

B. White burlap-polyethylene sheets

The surface of the pavement shall be entirely covered with the sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to remain in contact with the surface covered, and the covering shall be maintained fully saturated and in position for seven (7) days after the concrete has been placed.

C. Water method

The entire area shall be covered with burlap or other water absorbing material. The material shall be of sufficient thickness to retain water for adequate curing without excessive runoff. The material shall be kept wet at all times and maintained for seven (7) days. When the forms are stripped, the vertical walls shall also be kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing water on the subbase.

D. Concrete protection for cold weather

Maintain the concrete at a temperature of at least 50°F (10°C) for a period of 72 hours after placing and at a temperature above freezing for the remainder of the 7-day curing period. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

E. Concrete protection for hot weather

Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the ~~RPR~~ **OAR**.

4.14 REMOVING FORMS

Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured in accordance with paragraph 4.13.

If honeycombed areas are evident when the forms are removed, materials, placement, and consolidation methods must be reviewed and appropriate adjustments made to assure adequate consolidation at the edges of future concrete placements. Honeycombed areas that extend into the slab less than approximately 1 inch (25 mm), shall be repaired with an approved grout, as directed by the ~~RPR~~ **OAR**. Honeycombed areas that extend into the slab greater than a depth of 1 inch (25 mm) shall be considered as defective work and shall be removed and replaced in accordance with paragraph 4.19.

4.15 SAW-CUT GROOVING

~~If shown on the plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.~~

4.16 SEALING JOINTS

The joints in the pavement shall be sealed in accordance with Items P-604 and P-605.

4.17 PROTECTION OF PAVEMENT

The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the **RPR OAR**. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the **RPR OAR**.

In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days, the joints are protected, the concrete has attained a minimum field cured flexural strength of 450 psi (3100 kPa), and the slab edge is protected.

All new and existing pavement carrying construction traffic or equipment shall be kept clean and spillage of concrete and other materials shall be cleaned up immediately.

Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

4.18 OPENING TO CONSTRUCTION TRAFFIC

The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 450 pounds per square inch (3100 kPa) when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

4.19 REPAIR, REMOVAL, OR REPLACEMENT OF SLABS

New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable as defined by acceptance criteria in paragraph 6.6 shall be removed and replaced or repaired, as directed by the **RPR OAR**, at the Contractor's expense. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. The **RPR OAR** will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall

be have a diameter of 2 inches (50 mm) to 4 inches (100 mm), shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with a bonding agent, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. Repair of cracks as described in this section shall not be allowed if in the opinion of the ~~RPR~~ **OAR** the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch (3 mm) of the pavement surface.

A. Shrinkage cracks

Shrinkage cracks which do not exceed one-third of the pavement depth shall be cleaned and either high molecular weight methacrylate (HMWM) applied; or epoxy resin (Type IV, Grade 1) pressure injected using procedures recommended by the manufacturer and approved by the ~~RPR~~ **OAR**. Sandblasting of the surface may be required following the application of HMWM to restore skid resistance. Care shall be taken to ensure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the ~~RPR~~ **OAR**. Shrinkage cracks which exceed one-third the pavement depth shall be treated as full depth cracks in accordance with paragraphs 4.19b and 19c.

B. Slabs with cracks through interior areas

Interior area is defined as that area more than 6 inches (150 mm) from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than one-third the pavement depth, that extend into the interior area.

C. Cracks close to and parallel to joints

All full-depth cracks within 6 inches (150 mm) either side of the joint and essentially parallel to the original joints, shall be treated as follows.

1. Full depth cracks and original joint not cracked. The full-depth crack shall be treated as the new joint and the original joint filled with an epoxy resin.
 - i. Full-depth crack. The joint sealant reservoir for the crack shall be formed by sawing to a depth of 3/4 inches (19 mm), $\pm 1/16$ inch (2 mm), and to a width of 5/8 inch (16 mm), $\pm 1/8$ inch (3 mm). The crack shall be sawed with equipment specially designed to follow random cracks. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent raveling or spalling. The joint shall be sealed with sealant in accordance with P-605 or as directed by the ~~RPR~~ **OAR**.
 - ii. Original joint. If the original joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.

If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures.

Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

2. Full depth cracks and original joint cracked. If there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced.

D. Removal and replacement of full slabs

Make a full depth cut perpendicular to the slab surface along all edges of the slab with a concrete saw cutting any dowels or tie-bars. Remove damaged slab protecting adjacent pavement from damage. Damage to adjacent slabs may result in removal of additional slabs as directed by the RPR **OAR** at the Contractor's expense.

The underlying material shall be repaired, re-compacted and shaped to grade.

Dowels of the size and spacing specified for other joints in similar pavement on the project shall be installed along all four (4) edges of the new slab in accordance with paragraph 4.10d.

Placement of concrete shall be as specified for original construction. The joints around the new slab shall be prepared and sealed as specified for original construction.

E. Spalls along joints

1. Spalls less than one inch wide and less than the depth of the joint sealant reservoir, shall be filled with joint sealant material.
2. Spalls larger than one inch and/or deeper than the joint reservoir, but less than ½ the slab depth, and less than 25% of the length of the adjacent joint shall be repaired as follows:
 - (a) Make a vertical saw cut at least one inch (25 mm) outside the spalled area and to a depth of at least 2 inches (50 mm). Saw cuts shall be straight lines forming rectangular areas surrounding the spalled area.
 - (b) Remove unsound concrete and at least 1/2 inch (12 mm) of visually sound concrete between the saw cut and the joint or crack with a light chipping hammer.
 - (c) Clean cavity with high-pressure water jets supplemented with compressed air as needed to remove all loose material.
 - (d) Apply a prime coat of epoxy resin, Type III, Grade I, to the dry, cleaned surface of all sides and bottom of the cavity, except any joint face.

- (e) Fill the cavity with low slump concrete or mortar or with epoxy resin concrete or mortar.
 - (f) An insert or other bond-breaking medium shall be used to prevent bond at all joint faces.
 - (g) A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints.
3. Spalls deeper than 1/2 of the slab depth or spalls longer than 25% of the adjacent joint require replacement of the entire slab.

F. Diamond grinding of Concrete surfaces

Diamond grinding shall be completed prior to pavement grooving. Diamond grinding of the hardened concrete should not be performed until the concrete is at least 14 days old and has achieved full minimum strength. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The depth of diamond grinding shall not exceed 1/2 inch (13 mm) and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified.

Diamond grinding shall be performed with a machine specifically designed for diamond grinding capable of cutting a path at least 3 feet (0.9 m) wide. The saw blades shall be 1/8-inch (3-mm) wide with sufficient number of flush cut blades that create grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide; and peaks and ridges approximately 1/32 inch (1 mm) higher than the bottom of the grinding cut. The Contractor shall determine the number and type of blades based on the hardness of the aggregate. Contractor shall demonstrate to the ~~RPR~~ **OAR** that the grinding equipment will produce satisfactory results prior to making corrections to surfaces.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. All grinding shall be at the expense of the Contractor.

4.20 RAISED SIDEWALK CONCRETE PAVEMENT

The Contractor shall adhere to all Construction Methods in this specification as is practicable. The OAR shall approve the use of methods included in Specification P-610 as applicable during construction.

4.21 RAISING EXISTING STRUCTURES TO GRADE

Adjustments of existing structures to grade shall be completed according to the requirements of this Specification. The Contractor shall take appropriate measures to protect existing structures prior to raising to grade. Any damage to existing structures shall be repaired to the OAR's satisfaction at the Contractor's expense.

4.22 HURRICANE TIE-DOWNS

Hurricane tie-downs shall be installed in accordance with the manufacturer's recommendations. Mooring devices shall be cast in place with the pavement in accordance with the plans and details. The Contractor shall take appropriate measures to protect the mooring device during construction.

4.23 SLAB PENETRATIONS

All slabs with penetrations shall be reinforced in accordance with the details contained in the plans.

- A. Any slabs with penetrations located within three (3) feet of a joint shall have block outs placed around the penetration to isolate the penetration and protect against random cracks. The size, configuration and reinforcement of the block outs will be defined in the field by the engineer.
- B. Any slabs with small surface penetrations (less than 1 foot in diameter), such as valves, cleanouts, fire hydrants, etc. shall be reinforced and when the penetration is located within two (2) feet of a joint shall have block outs placed around the penetration. The size, configuration and reinforcement of the block outs will be defined in the field by the engineer.

PART 5 - CONTRACTOR QUALITY CONTROL (CQC)

5.1 QUALITY CONTROL PROGRAM

The Contractor shall develop a Quality Control Program in accordance with Item C-100. No partial payment will be made for materials that are subject to specific quality control requirements without an approved quality control program.

5.2 CONTRACTOR QUALITY CONTROL (CQC)

The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR **OAR** shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR **OAR** will advise the Contractor in writing of any noted deficiencies concerning the QC facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

5.3 CONTRACTOR QC TESTING

The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to this specification and as set forth in the CQCP. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content. A QC Testing Plan shall be developed and approved by the ~~RPR~~ **OAR** as part of the CQCP.

The ~~RPR~~ **OAR** may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of concrete mixture which is rendered unfit for use due to contamination, segregation, or improper slump. Such rejection may be based on only visual inspection. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the ~~RPR~~ **OAR**, and if it can be demonstrated in the laboratory, in the presence of the ~~RPR~~ **OAR**, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

A. Fine aggregate

1. Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.
2. Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C70 or ASTM C566.
3. Deleterious substances. Fine aggregate as delivered to the mixer shall be tested for deleterious substances in fine aggregate for concrete as specified in paragraph 2.1b, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

B. Coarse Aggregate

1. Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.
2. Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C566.
3. Deleterious substances. Coarse aggregate as delivered to the mixer shall be tested for deleterious substances in coarse aggregate for concrete as specified in paragraph 2.1c, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

C. Slump

One test shall be made for each subplot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

D. Air content

One test shall be made for each subplot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

E. Unit weight and Yield

One test shall be made for each subplot. Unit weight and yield tests shall be in accordance with ASTM C138. The samples shall be taken in accordance with ASTM C172 and at the same time as the air content tests.

F. Temperatures

Temperatures shall be checked at least four times per lot at the job site in accordance with ASTM C1064.

G. Smoothness for Contractor Quality Control

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than ¼ inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues.

The Contractor may use a 12-foot (3.7 m) straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot (3.7m) straightedge approved by the ~~RPR~~ **OAR**. Straight-edge testing shall start with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Testing shall be continuous across all joints. The surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using the FAA profile program, ProFAA, or FHWA profile program ProVal, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement shall be evaluated separately for conformance with the plans.

1. Transverse measurements. Transverse measurements shall be taken for each day's production placed. Transverse measurements shall be taken perpendicular to the pavement centerline each 50 feet (15 m) or more often as determined by the ~~RPR~~ **OAR**. The joint between lanes shall be tested separately to facilitate smoothness between lanes.
2. Longitudinal measurements. Longitudinal measurements shall be taken for each day's production placed. Longitudinal tests shall be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet (6 m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6 m) or greater. When placement abuts previously placed material the first measurement shall start with one half the length of the straight edge on the previously placed material.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch (6 mm) shall be corrected with diamond grinding per paragraph 4.19f or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 6.6.

Control charts shall be kept to show area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor's machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by the Contractor.

H. Grade

Grade will be evaluated prior to and after placement of the concrete surface.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically and 0.1 feet (30 mm) laterally. The documentation will be provided by the Contractor to the ~~RPR~~ **OAR** within 48 hours.

Areas with humps or depression that that exceed grade or smoothness and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch (12 mm) less than the thickness specified on the plans. If these areas cannot be corrected with grinding then the slabs that are retaining water must be removed and replaced in accordance with paragraph 4.19d. Grinding shall be in accordance with paragraph 4.19f. All corrections will be at the Contractors expense.

5.4 CONTROL CHARTS

The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, and air content. The Contractor shall also maintain a control chart plotting the coarseness factor/workability factor from the combined gradations in accordance with paragraph 2.1d.

Control charts shall be posted in a location satisfactory to the ~~RPR~~ **OAR** and shall be kept up to date at all times. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and suspension Limits, or Specification limits, applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a potential problem and the Contractor is not taking satisfactory corrective action, the ~~RPR~~ **OAR** may halt production or acceptance of the material.

A. Fine and coarse aggregate gradation

The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Superimposed on the control charts shall be the action and suspension limits. Gradation tests shall be performed by the Contractor per ASTM C136. The Contractor shall take at least two samples per lot to check the final gradation. Sampling shall be per ASTM D75 from the flowing aggregate stream or conveyor belt.

B. Slump and air content

The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

C. Combined gradation. The Contractor shall maintain a control chart plotting the coarseness factor and workability factor on a chart in accordance with paragraph 2.1d.

Control Chart Limits¹

Control Parameter	Individual Measurements	
	Action Limit	Suspension Limit
Gradation ²	*3	*3
Coarseness Factor (CF)	±3.5	±5
Workability Factor (WF)	±2	±3
Slump	+0.5 to -1 inch (+13 to -25 mm)	+1 to -1.5 inch (+25 to -38 mm)
Air Content	±1.5%	±2.0%

¹ Control charts shall developed and maintained for each control parameter indicated.

- ² Control charts shall be developed and maintained for each sieve size.
- ³ Action and suspension limits shall be determined by the Contractor.

5.5 CORRECTIVE ACTION AT SUSPENSION LIMIT

The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of control. The CQCP shall detail what action will be taken to bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

- A. Fine and coarse aggregate gradation. When two consecutive averages of five tests are outside of the suspension limits, immediate steps, including a halt to production, shall be taken to correct the grading.
- B. Coarseness and Workability factor. When the CF or WF reaches the applicable suspension limits, the Contractor, immediate steps, including a halt to production, shall be taken to correct the CF and WF.
- C. Fine and coarse aggregate moisture content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.
- D. Slump. The Contractor shall halt production and make appropriate adjustments whenever:
 - 1. one point falls outside the Suspension Limit line for individual measurements
 - OR
 - 2. two points in a row fall outside the Action Limit line for individual measurements.
- E. Air content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:
 - 1. one point falls outside the Suspension Limit line for individual measurements
 - OR
 - 2. two points in a row fall outside the Action Limit line for individual measurements.

PART 6 - MATERIAL ACCEPTANCE

6.1 QUALITY ASSURANCE (QA) ACCEPTANCE SAMPLING AND TESTING

All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section, with the exception of coring for thickness determination, will be performed by the ~~RPR~~ **OAR**. The Contractor shall provide adequate facilities for the initial curing of beams. The Contractor shall bear the cost of providing initial curing facilities and coring and filling operations, per paragraph 6.5b(1).

The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60° to 80°F (16° to 27°C), and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or using other suitable methods, provided the temperature and moisture loss requirements are met.

6.2 QUALITY ASSURANCE (QA) TESTING LABORATORY

Quality assurance testing organizations performing these acceptance tests will be accredited in accordance with ASTM C1077. The quality assurance laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods will be submitted to the **RPR OAR** prior to start of construction.

6.3 LOT SIZE

Concrete will be accepted for strength and thickness on a lot basis. A lot will consist of a day's production not to exceed 2,000 cubic yards (1530 cubic meters). This is the equivalent of 4,000 square yards of 18-inch thick PCC or 6,000 SY of 12-inch thick PCC. Each lot will be divided into approximately equal sublots with individual sublots between 400 to 600 cubic yards. Where three sublots are produced, they will constitute a lot. Where one or two sublots are produced, they will be incorporated into the previous or next lot. Where more than one plant is simultaneously producing concrete for the job, the lot sizes will apply separately for each plant.

6.4 PARTIAL LOTS

When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot or for overages or minor placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

Where three sublots have been produced, they will constitute a lot. Where one or two sublots have been produced, they will be incorporated into the next lot or the previous lot and the total number of sublots will be used in the acceptance criteria calculation, that is, $n=5$ or $n=6$.

6.5 ACCEPTANCE SAMPLING AND TESTING

A. Strength

1. Sampling. One sample will be taken for each subplot from the concrete delivered to the job site. Sampling locations will be determined by the **RPR OAR** in accordance with random sampling procedures contained in ASTM D3665. The concrete will be sampled in accordance with ASTM C172.
2. Test Specimens. The **RPR OAR** will be responsible for the casting, initial curing, transportation, and curing of specimens in accordance with ASTM C31. Two (2) specimens will be made from each sample and slump, air content, unit weight, and temperature tests will be conducted for each set of strength specimens. Within 24 to 48 hours, the samples will be transported from the field to the laboratory while in the molds. Samples will be cured in saturated lime water.

The strength of each specimen will be determined in accordance with ASTM C78. The strength for each subplot will be computed by averaging the results of the two test specimens representing that subplot.

3. Acceptance. Acceptance of pavement for strength will be determined by the **RPR OAR** in accordance with paragraph 6.6b(1). All individual strength tests within a lot will be checked for outliers in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded and the remaining test values will be used to determine acceptance in accordance with paragraph 6.5b.

B. Pavement thickness

1. Sampling. One core will be taken by the Contractor for each subplot in the presence of the **RPR OAR**. Sampling locations will be determined by the **RPR OAR** in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, will be excluded from sample locations.

Cores shall be a minimum 4 inch (100 mm) in diameter neatly cut with a core drill. The Contractor will furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes will be filled by the Contractor with a non-shrink grout approved by the **RPR OAR** within one day after sampling.

2. Testing. The thickness of the cores will be determined by the **RPR OAR** by the average caliper measurement in accordance with ASTM C174. Each core shall be photographed and the photograph included with the test report.
3. Acceptance. Acceptance of pavement for thickness will be determined by the **RPR OAR** in accordance with paragraph 6.6.

6.6 ACCEPTANCE CRITERIA

A. General

Acceptance will be based on the following characteristics of the completed pavement discussed in paragraph 6.5b:

1. Strength
2. Thickness
3. Grade
4. ~~Profilograph smoothness~~
5. Adjustments for repairs

Acceptance for strength, thickness, and grade, will be based on the criteria contained in accordance with paragraph 6.6b(1), 6.6b(2), and 6.6b(3), respectively. Acceptance for profilograph smoothness will be based on the criteria contained in paragraph 6.6b(4).

Production quality must achieve 90 PWL or higher to receive full payment.

Strength and thickness will be evaluated for acceptance on a lot basis using the method of estimating PWL. Production quality must achieve 90 PWL or higher to receive full pavement. The PWL will be determined in accordance with procedures specified in Item C-110.

The lower specification tolerance limit (L) for strength and thickness will be:

Lower Specification Tolerance Limit (L)

Strength	$0.93 \times$ strength specified in paragraph 3.3
Thickness	Lot Plan Thickness in inches, - 0.50 in

B. Acceptance criteria

1. Strength. If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 8.1.
2. Thickness. If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 8.1.

3. Grade. The final finished surface of the pavement of the completed project will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically [or 0.1 feet (30 mm) laterally]. The documentation, stamped and signed by a licensed surveyor shall be in accordance with paragraph 5.3h. Payment for sublots that do not meet grade for over 25% of the subplot shall be reduced by 5% and not be more than 95%.
4. ~~Profilograph roughness for QA Acceptance. The final profilograph shall be the full length of the project to facilitate testing of roughness between lots. The Contractor, in the presence of the RPR shall perform a profilograph roughness test on the completed project with a profilograph meeting the requirements of ASTM E1274 or a Class I inertial profiler meeting ASTM E950. Data and results shall be provided within 48 hrs of profilograph roughness tests.~~

~~The pavement shall have an average profile index less than 15 inches per mile per 1/10 mile. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2-inch (5 mm) blanking band. The bump template must span one inch (25 mm) with an offset of 0.4 inches (10 mm). The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch (25 mm) equals 25 feet (7.5 m) and a vertical scale of one inch (25 mm) equals one inch (25 mm). Profilograph shall be performed one foot right and left of project centerline and 15 feet (4.5 m) right and left of project centerline. Any areas that indicate "must grind" shall be corrected with diamond grinding per paragraph 4.19f or by removing and replacing full depth of surface course, as directed by the RPR. Where corrections are necessary, a second profilograph run shall be performed to verify that the corrections produced an average profile index of 15 inches per mile per 1/10 mile or less.~~

5. Adjustments for repair. Sublots with spall repairs, crack repairs, or partial panel replacement, will be limited to no more than 95% payment.
6. Adjustment for grinding. For sublots with grinding over 25% of a subplot, payment will be reduced 5%.

6.7 **RAISED SIDEWALK CONCRETE PAVEMENT**

Concrete for each day's placement will be accepted on the basis of the compressive strength as specified in Specification P-610, Section 4.1. The OAR will sample the concrete in accordance with ASTM C172; test the slump in accordance with ASTM C143; test air content in accordance with ASTM C231; make and cure compressive strength specimens in accordance with ASTM C31; and test in accordance with ASTM C39. The QA testing agency will meet the requirements of ASTM C1077.

The Contractor shall provide adequate facilities for the initial curing of cylinders.

PART 7 - METHOD OF MEASUREMENT

- 7.1 Concrete pavement shall be measured by the number of square yards (~~square meters~~) of plain or reinforced pavement as specified in-place, completed and accepted.
- 7.2 ***Raised sidewalk concrete pavement shall be measured by the number of square yards of plain reinforced pavement as specified in-place, completed and accepted.***
- 7.3 **Adjustment of structures to grade shall be measured and paid for individually within the Airside Concourse (ASC) work area. Adjustment of structures to grade is incidental to associated items of work within the Airfield Civil (AFC) work area.**
- 7.4 ***Hurricane tie-downs shall be measured by each number (EA) of mooring devices installed as specified, completed and accepted by the OAR.***

PART 8 - BASIS OF PAYMENT

8.1 PAYMENT

Payment for concrete pavement meeting all acceptance criteria as specified in paragraph 6.6. Acceptance Criteria shall be based on results of strength, smoothness, and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with paragraph 8.1a for strength and thickness; 8.1b for repairs; 8.1c for grinding; and 8.1d for smoothness, subject to the limitation that:

The total project payment for concrete pavement shall not exceed 100 percent of the product of the contract unit price and the total number of square yards (square meters) of concrete pavement used in the accepted work (See Note 1 under the Price Adjustment Schedule table below).

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings.

A. Basis of adjusted payment

The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule table below. A pay factor shall be calculated for both strength and thickness. The lot pay factor shall be the higher of the two values when calculations for both strength and thickness are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either strength or thickness is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both strength and thickness are less than 100%.

Price Adjustment Schedule¹

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject ²

¹ Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in paragraph 8.1.

² The lot shall be removed and replaced unless, after receipt of FAA concurrence, the Owner and Contractor agree in writing that the lot will remain; the lot paid at 50% of the contract unit price; and the total project payment limitation reduced by the amount withheld for that lot.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%; except for rejected lots which remain in place and/or sublots with adjustments for repairs.

B. Adjusted payment for repairs

The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots which contain repairs in accordance with paragraph 4.19 on more than 20% of the slabs within the subplot. Payment factors greater than 100 percent for the strength and thickness cannot be used to offset adjustments for repairs.

C. Adjusted payment for grinding

The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots with grinding over 25% of a subplot.

~~D. Profilograph Roughness~~

~~The Contractor will receive full payment when the profilograph average profile index is in accordance with paragraph 6.6b(4). When the final average profile index for the entire length of pavement does not exceed 15 inches per mile per 1/10 mile, payment will be made at the contract unit price for the completed pavement.~~

E. ***Raised sidewalk concrete pavement***

No PWL lot pay factors shall be applied to concrete placed as raised sidewalk concrete pavement.

F. **Raise Existing Structure to Grade**

Payment for raising structures to grade, per each, shall only be made for applicable structures within the Airside Concourse (ASC) work area and shall include all labor materials, equipment, block outs and all incidental items required to complete the work.

All costs associated with raising existing structures to grade within the Airfield Civil (AFC) work area, including all labor materials, equipment, block outs and all incidental items required to complete the work, shall be incidental to pay item P-501-8.1.

Construction of all new structures within the Airfield Civil (AFC) work area, including all labor materials, equipment, block outs and all incidental items required to complete the work, shall be incidental to the price for the respective structures.

G. Payment

Payment shall be made under:

Item P-501-8.1	18" Aircraft Rated Concrete Pavement	- per Square Yard (SY)
Item P-501-8.2	12" Non-Aircraft Rated Concrete Pavement	- per Square Yard (SY)
Item P-501-8.3	6" Raised Sidewalk Concrete Pavement	- per Square Yard (SY)
Item P-501-8.4	Raise Existing Structures to Grade <u>(ASC Only)</u>	- per Each (EA)
Item P-501-8.5	Hurricane Tie-Down	- per Each (EA)

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
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ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A996	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1035	Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C78	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C94	Standard Specification for Ready-Mixed Concrete

ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C117	Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C123	Standard Test Method for Lightweight Particles in Aggregate
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C227	Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C295	Standard Guide for Petrographic Examination of Aggregates for Concrete

ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregates by Drying
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1064	Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis

ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber and Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
ASTM E2133	Standard Test Method for Using a Rolling Inclinometer to Measure Longitudinal and Transverse Profiles of a Traveled Surface
American Concrete Institute (ACI)	
ACI 305R	Guide to Hot Weather Concreting
ACI 306R	Guide to Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete
Advisory Circulars (AC)	
AC 150/5320-6	Airport Pavement Design and Evaluation
Federal Highway Administration (FHWA)	
HIPERPAV 3, version 3.2	

Portland Concrete Association (PCA)

PCA Design and Control of Concrete Mixtures, 16th Edition

U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD)

CRD C662 Determining the Potential Alkali-Silica Reactivity of Combinations of
Cementitious Materials, Lithium Nitrate Admixture and Aggregate
(Accelerated Mortar-Bar Method)

United States Air Force Engineering Technical Letter (ETL)

ETL 97-5 Proportioning Concrete Mixtures with Graded Aggregates for Rigid
Airfield Pavements

END OF SECTION P-501

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ITEM P-605 JOINT SEALANTS FOR PAVEMENTS

PART 1 - DESCRIPTION

- 1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints in pavement; joints between different types of pavements; and cracks in existing pavement.

PART 2 - MATERIALS

2.1 JOINT SEALANTS

Joint sealant materials shall meet the requirements of **ASTM D5893** ~~D6690~~.

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

2.2 BACKER ROD

The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant in accordance with ASTM D5249. The backer-rod material shall be $25\% \pm 5\%$ larger in diameter than the nominal width of the joint.

2.3 BOND BREAKING TAPES

Provide a bond breaking tape or separating material that is a flexible, non-shrinkable, non-absorbing, non-staining, and non-reacting adhesive-backed tape. The material shall have a melting point at least 5°F (3°C) greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The bond breaker tape shall be approximately 1/8 inch (3 mm) wider than the nominal width of the joint and shall not bond to the joint sealant.

PART 3 - CONSTRUCTION METHODS

3.1 TIME OF APPLICATION

Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement

temperature shall be 50°F (10°C) and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

3.2 EQUIPMENT

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 30 days prior to use on the project.

- A. Tractor-mounted routing tool. Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.
- B. Concrete saw. Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified.
- C. Sandblasting equipment. The Contractor must demonstrate sandblasting equipment including the air compressor, hose, guide and nozzle size, under job conditions, before approval in accordance with paragraph 3.3. The Contractor shall demonstrate, in the presence of the ~~Resident Project Representative (RPR)~~ **Owner's Authorized Representative (OAR)**, that the method cleans the joint and does not damage the joint.
- D. Waterblasting equipment. The Contractor must demonstrate waterblasting equipment including the pumps, hose, guide and nozzle size, under job conditions, before approval in accordance with paragraph 3.3. The Contractor shall demonstrate, in the presence of the ~~RPR~~ **OAR**, that the method cleans the joint and does not damage the joint.
- E. Hand tools. Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces. Hand tools should be carefully evaluated for potential spalling effects prior to approval for use.
- F. Hot-poured sealing equipment. The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

3.3 PREPARATION OF JOINTS

Pavement joints for application of material in this specification must be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. The Contractor shall demonstrate, in the presence of the **RPR OAR**, that the method cleans the joint and does not damage the joint.

- A. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.
- B. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by sandblasting, tractor-mounted routing equipment, concrete saw or waterblaster as specified in paragraph 3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch (12 mm) from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches (75 mm) from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.
- C. Backer Rod. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod in accordance with paragraph 2.2 to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod is placed at the specified depth and is not stretched or twisted during installation.
- D. Bond-breaking tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-separating tape breaker in accordance with paragraph 2.3 to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

3.4 INSTALLATION OF SEALANTS

Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the **RPR OAR** before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet (15 m) ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch (6 mm) \pm 1/16 inch (2 mm) below the top of pavement surface; or bottom of groove for grooved pavement. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be

used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the **RPR OAR**. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

3.5 INSPECTION.

The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

3.6 CLEAN-UP.

Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

PART 4 - METHOD OF MEASUREMENT

4.1 Joint sealing shall be considered incidental and no separate measurement shall be made.

PART 5 - BASIS OF PAYMENT

5.1 Joint sealing shall be considered incidental and no separate payment shall be made.

PART 6 - REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

ASTM D6690 Standard Specification for Joint and Crack Sealants, Hot Applied,
for Concrete and Asphalt]

Advisory Circulars (AC)

AC 150/5340-30 Design and Installation Details for Airport Visual Aids

END OF ITEM P-605

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SECTION L-108 - UNDERGROUND POWER CABLE FOR AIRPORTS

PART 1 - DESCRIPTION

- 1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the **OAR RPR**. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities.

PART 2 - EQUIPMENT AND MATERIALS

2.1 GENERAL

- A. Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.
- B. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the **OAR RPR**.
- C. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the **OAR RPR**) and replaced with materials that comply with these specifications at the Contractor's cost.
- D. All materials and equipment used to construct this item shall be submitted to the **OAR RPR** for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

- E. The data submitted shall be sufficient, in the opinion of the **OAR RPR**, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly electronically submitted in pdf format. The **OAR RPR** reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.
- F. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall maintain a minimum insulation resistance in accordance with paragraph 3.10e with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period when tested in accordance with AC 150/5340-26, *Maintenance Airport Visual Aid Facilities*, paragraph 5.1.3.1, Insulation Resistance Test.

2.2 CABLE

Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge (AWG), L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Commercial Item Description A-A-59544A and shall be type THWN-2, 75°C for installation in conduit and RHW-2, 75°C for direct burial installations. Conductors for parallel (voltage) circuits shall be type and size and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600-volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600-volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

2.3 BARE COPPER WIRE (COUNTERPOISE, BARE COPPER WIRE GROUND AND GROUND RODS)

Wire for counterpoise or ground installations for airfield lighting systems shall be No. 2 AWG bare solid copper wire for counterpoise and/or No. 2 AWG insulated stranded for grounding bond wire per ASTM B3 and ASTM B8 and shall be bare copper wire. For voltage powered circuits, the equipment grounding conductor shall comply with NEC Article 250.

Ground rods shall be copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet (2.54 m) long and 3/4 inch (19 mm) in diameter.

2.4 CABLE CONNECTIONS

In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

- A. The cast splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or an approved equivalent, used for potting the splice is acceptable.
- B. The field-attached plug-in splice. Field attached plug-in splices shall be installed as shown on the plans. The Contractor shall determine the outside diameter of the cable to be spliced and furnish appropriately sized connector kits and/or adapters. Tape or heat shrink tubing with integral sealant shall be in accordance with the manufacturer's requirements. Primary Connector Kits manufactured by Amerace, "Super Kit", Integro "Complete Kit", or approved equal is acceptable.
- C. The factory-molded plug-in splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.
- D. The taped or heat-shrink splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable

tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

2.5 SPLICER QUALIFICATIONS

Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the ~~OAR RPR~~ **OAR RPR** proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

2.6 CONCRETE

Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

2.7 FLOWABLE BACKFILL

Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

2.8 CABLE IDENTIFICATION TAGS

Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

2.9 TAPE

Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

2.10 ELECTRICAL COATING

Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

2.11 EXISTING CIRCUITS

Whenever the scope of work requires connection to an existing circuit, the existing circuit's insulation resistance shall be tested, in the presence of the **OAR RPR**. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the **OAR RPR**. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the **OAR RPR**. The Contractor shall record the results on forms acceptable to the **OAR RPR**. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the existing circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

2.12 DETECTABLE WARNING TAPE

Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item. Detectable warning tape for communication cables shall be orange. Detectable warning tape color code shall comply with the APWA Uniform Color Code.

PART 3 - CONSTRUCTION METHODS

3.1 GENERAL

The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Cable shall be run without splices, from fixture to fixture.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the **OAR RPR** or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed and on both sides of slack loops where a future connector would be installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the **OAR RPR**.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

3.2 INSTALLATION IN DUCT BANKS OR CONDUITS

This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light

bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the **OAR RPR** of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the **OAR RPR** prior to any cable installation. If required by the **OAR RPR**, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the **OAR RPR**. Cable pull tensions shall be recorded by the Contractor and reviewed by the **OAR RPR**. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the **OAR RPR**, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

3.3 INSTALLATION OF DIRECT-BURIED CABLE IN TRENCHES. Not used.

3.4 CABLE MARKERS FOR DIRECT-BURIED CABLE. Not used.

3.5 SPLICING

Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

- A. Cast splices. These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the **OAR RPR**.
- B. Field-attached plug-in splices. These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint or (3) On connector kits equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.
- C. Factory-molded plug-in splices. These shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) Wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint. (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint. or (3) On connector kits so equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.
- D. Taped or heat-shrink splices. A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping, wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. The manufacturer's recommendation for stretching tape during splicing shall be followed. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch (25 mm) over the original jacket. Cover rubber tape

with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminants prior to application.

- E. Assembly. Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

3.6 BARE COUNTERPOISE WIRE INSTALLATION FOR LIGHTNING PROTECTION AND GROUNDING

If shown on the plans or included in the job specifications, bare solid #2 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The **OAR RPR** shall select one of two methods of lightning protection for the airfield lighting circuit based upon sound engineering practice and lightning strike density.

- A. Equipotential. The counterpoise size is as shown on the plans. The equipotential method is applicable to all airfield lighting systems; i.e. runway, taxiway, apron – touchdown zone, centerline, edge, threshold and approach lighting systems. The equipotential method is also successfully applied to provide lightning protection for power, signal and communication systems. The light bases, counterpoise, etc. – all components - are bonded together and bonded to the vault power system ground loop/electrode.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. The counterpoise is centered over the cable/conduit/duct to be protected.

The counterpoise conductor shall be installed no less than 8 inches (200 mm) minimum or 12 inches (300 mm) maximum above the raceway or cable to be protected, except as permitted below:

1. The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

2. The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection, (45 degrees on each side of vertical creating a 90 degree angle).

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

All components rise and fall at the same potential; with no potential difference, no damaging arcing and no damaging current flow.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Equipotential Method of lightning protection.

Reference FAA STD-019E, Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment, Part 4.1.1.7.

- B. Isolation. Not used.
- C. Common Installation requirements. Grounding electrodes may be rods, ground dissipation plates, radials, or other electrodes listed in the NFPA 70 (NEC) or NFPA 780.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

- D. Parallel Voltage Systems. Provide grounding and bonding in accordance with NFPA 70, National Electrical Code.

3.7 COUNTERPOISE INSTALLATION ABOVE MULTIPLE CONDUITS AND DUCT BANKS

Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete area of protection measured 45 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

3.8 COUNTERPOISE INSTALLATION AT EXISTING DUCT BANKS

When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

3.9 EXOTHERMIC BONDING

Bonding of counterpoise wire shall be by the exothermic welding process or equivalent method accepted by the **OAR RPR**. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the **OAR RPR**, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

- A. All slag shall be removed from welds.
- B. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See AC 150/5340-30 for galvanized light base exception.
- C. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

3.10 TESTING

The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the **OAR RPR**. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the **OAR RPR**. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

- A. Earth resistance testing methods shall be submitted to the **OAR RPR** for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the **OAR RPR**. All such testing shall be at the sole expense of the Contractor.
- B. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The **OAR RPR** shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the **OAR RPR** the following:

- C. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.
- D. That all affected circuits (existing and new) are free from unspecified grounds.
- E. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 500 megohms. Verify continuity of all series airfield lighting circuits prior to energization.
- F. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.
- G. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.
- H. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

That the impedance to ground of each ground rod does not exceed 10 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters

may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the **OAR RPR** prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the **OAR RPR**. Where connecting new cable to existing cable, insulation resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

PART 4 - METHOD OF MEASUREMENT

- 4.1 The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.
- 4.2 Counterpoise wire installed in above conduit or duct bank, and cable installed in duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each counterpoise wire installed above conduit or duct bank, and cable installed in duct bank or conduit. The measurement for this item shall include additional quantities required for slack.
- 4.3 Ground rods shall be measured by each 10-foot section installed complete, **including the earth resistance readings of each completed installation being tested and recorded for the engineer per 3.10. See specification SP-111 "AIRFIELD ELECTRICAL INSTALLATION TESTING" for ground rod testing method and "EARTH RESISTANCE TEST"**.

PART 5 - BASIS OF PAYMENT

- 5.1 Payment will be made at the contract unit price for bare counterpoise wire installed above duct bank or conduit, or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the **OAR RPR**. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-5.1	1/C L-824-Type C Unshielded #8 AWG 5 KV Stranded Copper Cable, Installed in Duct or Conduit	-- per Linear Foot (LF)
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Item L-108-5.2	1/C #2 AWG Solid Copper Counterpoise Cable, Installed over Duct or Conduit	-- per Linear Foot (LF)
Item L-108-5.3	3/4" Diameter by 10.00' Long Copper Clad Steel Sectional Ground Rod	-- per Each (EA)
<u>Item L-108-5.4</u>	<u>4/0 AWG BSD Copper Counterpoise Ground Grid Wire</u>	<u>-- per Linear Foot (LF)</u>
<u>Item L-108-5.5</u>	<u>Ground Rod Inspection Pit</u>	<u>-- per Each (EA)</u>

PART 6 - REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description

A-A-59544A	Cable and Wire, Electrical (Power, Fixed Installation)
A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

ASTM International (ASTM)

ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

Mil Spec

MIL-PRF-23586F Performance Specification: Sealing Compound (with Accelerator),
Silicone Rubber, Electrical

MIL-I-24391 Insulation Tape, Electrical, Plastic, Pressure Sensitive

National Fire Protection Association (NFPA)

NFPA-70 National Electrical Code (NEC)

NFPA-780 Standard for the Installation of Lightning Protection Systems

American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers
(IEEE)

ANSI/IEEE STD 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance,
and Earth Surface Potentials of a Ground System

Federal Aviation Administration Standard

FAA STD-019E Lightning and Surge Protection, Grounding Bonding and Shielding
Requirements for Facilities and Electronic Equipment

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SECTION L-115 - ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

PART 1 - DESCRIPTION

- 1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the **OAR RPR**. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the **OAR RPR**.

PART 2 - EQUIPMENT AND MATERIALS

2.1 GENERAL

- A. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the **OAR RPR**.
- B. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the **OAR RPR**) and replaced with materials that comply with these specifications at the Contractor's cost.
- C. All materials and equipment used to construct this item shall be submitted to the **OAR RPR** for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.
- D. d. The data submitted shall be sufficient, in the opinion of the **OAR RPR**, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The **OAR RPR** reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

- E. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

2.2 CONCRETE STRUCTURES

Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures. Cast-in-place concrete structures shall be as shown on the plans.

2.3 PRECAST CONCRETE STRUCTURES

Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another engineer approved third party certification program. Provide precast concrete structures where shown on the plans.

Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 100,000 lb aircraft loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown on the plans.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the **OAR RPR** shall be submitted by the Contractor to allow for a full evaluation by the **OAR RPR**. The **OAR RPR** shall review per the process defined in the General Provisions.

2.4 JUNCTION BOXES

Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a L-894 blank cover, gasket, and stainless steel hardware. All bolts, studs, nuts, lock washers, and other similar fasteners used for the light fixture assemblies must be fabricated from 316L (equivalent to EN 1.4404), 18-8, 410, or 416 stainless steel. If 18-8, 410, or 416 stainless steel is utilized it shall be passivated and be free from any discoloration. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868. All junction boxes shall be provided with both internal and external ground lugs.

2.5 MORTAR

The mortar shall be composed of one part of cement and two parts of mortar sand, by volume. The cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C206. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

2.6 CONCRETE

Concrete shall be proportioned, placed and cured per Item P-610, Concrete for Miscellaneous Structures.

2.7 FRAMES AND COVERS

The frames shall conform to one of the following requirements:

- A. ASTM A48 Gray iron castings
- B. ASTM A47 Malleable iron castings
- C. ASTM A27 Steel castings
- D. ASTM A283, Grade D Structural steel for grates and frames
- E. ASTM A536 Ductile iron castings
- F. ASTM A897 Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum load of 100,000 lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

2.8 LADDERS Not used.

2.9 REINFORCING STEEL

All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

2.10 BEDDING/SPECIAL BACKFILL

Bedding or special backfill shall be as shown on the plans.

2.11 FLOWABLE BACKFILL

Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

2.12 CABLE TRAYS Not used.

2.13 PLASTIC CONDUIT

Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

2.14 CONDUIT TERMINATORS

Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

2.15 PULLING-IN IRONS

Pulling-in irons shall be manufactured with 7/8-inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, 1/2-inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 MPa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

2.16 GROUND RODS

Ground rods shall be one piece copper clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 10 feet long nor less than 3/4 inch in diameter.

PART 3 - CONSTRUCTION METHODS

3.1 UNCLASSIFIED EXCAVATION

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the **OAR RPR** without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the **OAR RPR**. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to Item L-115. Dewatering necessary for structure installation and erosion per federal, state, and local requirements is incidental to Item L-115.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the **OAR RPR**. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the **OAR RPR**. Structures shall be placed after the **OAR RPR** has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the **OAR RPR** as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

3.2 CONCRETE STRUCTURES

Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the **OAR RPR** before the concrete is placed.

3.3 PRECAST UNIT INSTALLATIONS

Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS

All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the **OAR RPR** and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written approval is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the **OAR RPR** and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

3.5 INSTALLATION OF LADDERS

Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.

3.6 REMOVAL OF SHEETING AND BRACING

In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The **OAR RPR** may direct the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

3.7 BACKFILLING

After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the **OAR RPR**.

Backfill shall not be placed against any structure until approval is given by the **OAR RPR**. In the case of concrete, such approval shall not be given until tests made by the laboratory under supervision of the **OAR RPR** establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the **OAR RPR** may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

3.8 CONNECTION OF DUCT BANKS

To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

3.9 GROUNDING

A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4-inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtailed shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

3.10 CLEANUP AND REPAIR

After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

3.11 RESTORATION

After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective Item L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

3.12 INSPECTION

Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 10 ~~25~~ ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

3.13 MANHOLE ELEVATION ADJUSTMENTS Not used.

3.14 DUCT EXTENSION TO EXISTING DUCTS

Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

PART 4 - METHOD OF MEASUREMENT

- 4.1 Electrical junction structures shall be measured by each unit completed in place and accepted. The following items shall be included in the price of each unit: All required excavation and dewatering; sheeting and bracing; all required backfilling with on-site materials; restoration of all surfaces and finished grading and turfing; all required connections; temporary cables and connections; and ground rod testing

PART 5 - BASIS OF PAYMENT

- 5.1 The accepted quantity of junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other

structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

- Item L-115-5.1 Junction Can Plaza – Eight L-867D Cans -- per Each (EA)

This item includes all materials, labor, transportation, supervision, services and all incidentals required to provide and install a junction can plaza with L-867D, 24" deep light bases. Conduit, ground rods and counterpoise wire are paid under their respective pay items. This item includes all concrete, rebar, excavation, forming, backfill, sod, light bases, cover plates, hardware, identification tags, etc., and all appurtenances to construct a junction can plaza with eight light bases in accordance with the Contract Documents and to the satisfaction of the Engineer.

- Item L-115-5.2 Aircraft Rated Electrical Manhole Type A-1 -- per Each (EA)

This item includes all materials, labor, transportation, supervision, services, ground rods and all incidentals required to provide and install an aircraft rated electrical manhole type A-1. This item includes all concrete, rebar, excavation, forming, backfill, sod, light bases, cover plates, hardware, identification tags, etc., and all appurtenances to construct an aircraft rated electrical manhole type A-1 in accordance with the Contract Documents and to the satisfaction of the Engineer.

- Item L-115-5.3 Aircraft Rated Electrical Manhole Type A-2 -- per Each (EA)

This item includes all materials, labor, transportation, supervision, services, ground rods and all incidentals required to provide and install an aircraft rated electrical manhole type A-2. This item includes all concrete, rebar, excavation, forming, backfill, sod, light bases, cover plates, hardware, identification tags, etc., and all appurtenances to construct an aircraft rated electrical manhole type A-2 in accordance with the Contract Documents and to the satisfaction of the Engineer.

- Item L-115-5.4 Existing Aircraft Rated Electrical Manhole/Handhole/Junction Structure Elevation Adjustment up to and Including 5'x5' Inside Dimension -- per Each (EA)

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American National Standards Institute / Insulated Cable Engineers Association (ANSI/ICEA)

ANSI/IEEE STD 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

Advisory Circular (AC)

AC 150/5345-7 Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits

AC 150/5345-26 Specification for L-823 Plug and Receptacle, Cable Connectors

AC 150/5345-42 Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories

AC 150/5340-30 Design and Installation Details for Airport Visual Aids

AC 150/5345-53 Airport Lighting Equipment Certification Program

Commercial Item Description (CID)

A-A 59544 Cable and Wire, Electrical (Power, Fixed Installation)

ASTM International (ASTM)

ASTM A27 Standard Specification for Steel Castings, Carbon, for General Application

ASTM A47 Standard Specification for Ferritic Malleable Iron Castings

ASTM A48 Standard Specification for Gray Iron Castings

ASTM A123 Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products

ASTM A283 Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

ASTM A536 Standard Specification for Ductile Iron Castings

ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

ASTM A897 Standard Specification for Austempered Ductile Iron Castings

ASTM C144 Standard Specification for Aggregate for Masonry Mortar

ASTM C150 Standard Specification for Portland Cement

ASTM C206 Standard Specification for Finishing Hydrated Lime

FAA Engineering Brief (EB)

EB #83 In Pavement Light Fixture Bolts

Mil Spec

MIL-P-21035 Paint High Zinc Dust Content, Galvanizing Repair

National Fire Protection Association (NFPA)

NFPA-70 National Electrical Code (NEC)

END OF SECTION L-115

Item T-904 Sodding

DESCRIPTION

904-1.1 This item shall consist of furnishing, hauling, and placing approved live sod **and Type 3 Plastic Erosion Mat (FDOT Specification 571)** on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the **RPR OAR**.

MATERIALS

904-2.1 Sod. Sod furnished by the Contractor shall have a good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials that might be detrimental to the development of the sod or to future maintenance. At least 70% of the plants in the cut sod shall be composed of ~~the species stated in the special provisions~~ ***Pensacola Bahia grass***, and any vegetation more than 6 inches (150 mm) in height shall be mowed to a height of 3 inches (75 mm) or less before sod is lifted. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not less than that stated in the special provisions.

904-2.2 Lime. Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 (850 µm) mesh sieve and 50% will pass through a No. 100 (150 µm) mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of ~~conforming to the requirements of 901-2.2~~. All liming materials shall conform to the requirements of ASTM C602.

904-2.3 Fertilizer. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

- a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;
- b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or
- c. A granular or pellet form suitable for application by blower equipment.

Fertilizers ~~shall be commercial fertilizer and shall be spread at the rate of~~ ***conform to the requirements of 901-2.3***.

904-2.4 Water. The water shall be sufficiently free from oil, acid, alkali, salt, or other harmful materials that would inhibit the growth of grass.

904-2.5 Soil for repairs. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the ~~RPR~~ **OAR** before being placed.

CONSTRUCTION METHODS

904-3.1 General. ~~Areas to be solid, strip, or spot sodded shall be shown on the plans.~~ **All sod shall be laid solid and shall be done so in locations of disturbance as depicted in Contract Drawings.** Areas requiring special ground surface preparation such as tilling and those areas in a satisfactory condition that are to remain undisturbed shall also be shown on the plans.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be on hand, in good condition, and shall be approved by the ~~RPR~~ **OAR** before the various operations are started. The Contractor shall demonstrate to the ~~RPR~~ **OAR** before starting the various operations that the application of required materials will be made at the specified rates.

904-3.2 Preparing the ground surface. After grading of areas has been completed and before applying fertilizer and limestone, areas to be sodded shall be raked or otherwise cleared of stones larger than 2 inches (50 mm) in any diameter, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes occurs after grading of areas and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. ~~This may include filling gullies, smoothing irregularities, and repairing other incidental damage.~~

904-3.3 Applying fertilizer and ground limestone. Following ground surface preparation, fertilizer shall be uniformly spread at a rate which will provide not less than the minimum quantity of each fertilizer ingredient, as stated in the special provisions. If use of ground limestone is required, it shall then be spread at a rate that will provide not less than the minimum quantity stated in the special provisions. These materials shall be incorporated into the soil to a depth of not less than 2 inches (50 mm) by discing, raking, or other suitable methods. Any stones larger than 2 inches (50 mm) in any diameter, large clods, roots, and other litter brought to the surface by this operation shall be removed.

904-3.4 Obtaining and delivering sod. After inspection and approval of the source of sod by the ~~RPR~~ **OAR**, the sod shall be cut with approved sod cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than 2 inches (50 mm). Sod sections or strips shall be cut in uniform widths, not less than 10 inches (250 mm), and in lengths of not less than 18 inches (0.5 m), but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside. The Contractor may be required to mow high grass before cutting sod.

The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stacked, kept moist, and protected from exposure to the air and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, approval to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

904-3.5 Laying sod. Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the RPR OAR, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches (100 mm) immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitch forks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and ensure knitting without displacement of the sod or deformation of the surfaces of sodded areas. ***All sod shall be rolled within twenty-four (24) hours of placement.*** Where the sod may be displaced during sodding operations, the workmen, when replacing it, shall work from ladders or treaded planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sods. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately one inch (25 mm) below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than one (1) vertical to 2-1/2 horizontal and in v-shaped or flat-bottom ditches or gutters, the sod shall be pegged with wooden pegs not less than 12 inches (300 mm) in length and have a cross-sectional area of not less than 3/4 sq inch (18 sq mm). The pegs shall be driven flush with the surface of the sod.

904-3.6 Erosion Control Mat. Place erosion control mat on the prepared grade, prior to placement of sod, at the locations shown on the plans (C12 Series) in accordance with the FDOT Specification 571 and the manufacturer's recommendation.

904-3.7 Watering. Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner that will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

904-3.8 Establishing turf. The Contractor shall provide general care for the sodded areas as soon as the sod has been laid and shall continue until final inspection and acceptance of the work. All sodded areas shall be protected against traffic or other use by warning signs or barricades approved by the RPR OAR. The Contractor shall mow the sodded areas with approved mowing equipment, depending upon climatic and growth conditions and the needs for mowing specific areas. Weeds or other undesirable vegetation shall be mowed and the clippings raked and removed from the area.

904-3.9 Repairing. When the surface has become gullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil, as directed by the RPR OAR, and shall then be sodded as specified in paragraph 904-3.5.

904-3.10 Warranty. All new sod shall be warranted through the end of the construction period and for sixty (60) days following final acceptance.

METHOD OF MEASUREMENT

904-4.1 This item shall be measured on the basis of the area in square yards of the surface covered with sod or erosion control mat and accepted.

BASIS OF PAYMENT

904-5.1 This item will be paid for on the basis of the contract unit price per square yard for Sodding, which price shall be full compensation for all labor, equipment, material, staking, and incidentals necessary to satisfactorily complete the items as specified.

904-5.2 This item will be paid for on the basis of the contract unit price per square yard for Type 3 Plastic Erosion Control Mat, which price shall be full compensation for all labor, equipment, material, staking, and incidentals necessary to satisfactorily complete the items as specified.

Payment will be made under:

Item T-904-5.1 Sodding - per square yard

Item T-904-5.2 Type 3 Plastic Erosion Control Mat - per square yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C602 Standard Specification for Agricultural Liming Materials

Advisory Circulars (AC)

AC 150/5200-33 Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-904

SECTION 22 37 00 – POTABLE WATER CABINET

PART 1 – GENERAL

1.1 GENERAL DESCRIPTION

A. This section of the specifications covers the following components:

1. Potable Water Cabinet

1.2 REFERENCES

A. Applicable Standards:

1. National Fire Protection **Association** Associated (NAPA):
2. National Electrical Manufacturer's Association (NEMA).
3. Occupational Safety and Health Act (OSHA).
4. Underwriters Laboratories (UL).
5. Florida Building Code (FBC).
- 6. NFPA 70, National Electrical Code**
- 7. OUC Potable Water System Requirements**

1.3 SUBMITTALS

A. See section 01 3323 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

1.4 QUALITY ASSURANCE

- A. NFPA Compliance.
- B. NEMA Compliance.
- C. UL Compliance: All internal components shall be UL-listed and labeled.
- D. Comply with all applicable Local Building Codes.

PART 2 - PRODUCTS

2.1. CABINET

- A. Manufacturer: Semler Industries, Inc. Model SI-1500 or approved equal.
- B. Material: Stainless steel, Type 304, 16-gauge, #4 finish interior and exterior.

- C. Construction: Welded double wall construction throughout, including bottom and doors with 1" polystyrene insulation. Welded and ground joints, rounded corners, brushed and polished interior and exterior. Cabinet to be provided with:
1. 1-1/2" NPS fitting for drain (located at the bottom center of cabinet)
 2. Penetration for 1" water connection (located at back wall of cabinet)
 3. Penetration for 1" electrical connection (located at back wall of cabinet)

No support braces or equipment to be mounted on bottom of cabinet to impede drainage or cabinet cleaning.

2.2. DOORS

- A. Material: Stainless steel, Type 304, 16-gauge, #4 finish interior and exterior.
- B. Construction: Double wall construction, welded and ground joints, rounded corners, polished interior and exterior with 1" insulation between inside and outside walls. Two-point door latch with stainless steel recessed locking D-ring handle and full-length stainless-steel piano hinge with top mounted stainless steel door holder/closer.

2.3. MOUNTING

- A. Shall be mounted on the Passenger Boarding Bridge wheel bogie or on the concrete pavement at the locations shown on the plans, per manufacturers recommendations.

2.4. ELECTRICAL

All components mounted within the cabinet shall be UL listed or recognized, weatherproof, suitable for service at 120 volts.

- A. Light: 100-watt equivalent LED fixture, weatherproof-vapor proof, with guard and on-off switch.
- B. Heaters: None
- C. 15 A. 120 VAC GFCI duplex service outlet with waterproof cover.
- D. All wiring enclosed in flexible "Sealtite" conduit or rigid galvanized conduit. Provide one (1) 115 Volt, 1 Phase, 15-amp circuit for each cabinet.
- E. Hose Reel: Hannay Model RXX60-0046-D or approved equal, 1" bronze swing joint, bronze internal piping, aluminum drum, stainless steel disks and poly-coated frame. Reel includes 1/2 HP 115-volt, explosion-proof electric rewind motor with horsepower rated momentary contact control switch. Auxiliary hand rewind crank to be provided. Adjustable reel drag brake. Reel mounted to back wall of cabinet. Reel capacity 3/4" x 300'.

- F. Potable Water Cabinet shall be NRTL listed and marked as required by federal regulations.
- G. Circuits to be provided at face of building by others. Materials, devices and equipment for electrical connection of Potable Water Cabinet shall meet Florida Building Code and U.L. requirements.

2.5. PIPING COMPONENTS

- A. Nozzle: Semler model #PWC-1-MNZ or approved equal, long barrel coupler with plug/drag cushion, stainless steel nylon coated security cable, control valve and protective bumpers.
- B. Shut-off Valve: 1" bronze ball valve with Teflon seat and stainless-steel ball.
- C. Pressure Regulator: Conbraco, 1" bronze adjustable 25-75 PSI or approved equal.
- D. Pressure Gauge: 2-1/2" 0-100 PSI bronze internals and brass case.
- E. Pipe Fittings: Bronze, threaded ANSI B16.15.
- F. Integrated Backflow Preventer.
- G. Piping: 1" schedule 40 Brass ASTM Specification B43-91.
- H. Connector: 1" x 8" 304 stainless steel flexible connector to relieve piping stress on hose reel swivel joint.
- I. Hose: 3/4" x 300' drinking water hose Model 075-3150 with FDA-CFR title #2 parts #170-199 or approved equal.
- J. Water connection shall be the equivalent nominal pipe size copper tubing as provided water service connection point.

PART 3 - METHOD OF MEASUREMENT

3.1. METHOD OF MEASUREMENT

- A. The quantity of Water Cabinets will be measured by the completed in place and accepted unit per each.

PART 4 - BASIS OF PAYMENT

4.1. BASIS OF PAYMENT

A. Water Cabinets will be paid for at the contract unit price for each water cabinet installed and accepted. This payment shall be inclusive of all materials, appurtenances, labor, equipment, tools, and incidentals necessary to complete the item.

B. Payment will be made under:

Item 22 37 00-4.1 Water Cabinet - per Each (EA)

END OF SECTION 22 37 00

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Contractual Conditions and other Division 01 Specification sections apply to this section.

1.2 SUMMARY

- A. This section includes Basic Electrical Requirements specifically applicable to Division 26 Sections.

1.3 DESCRIPTION

- A. Provide and install all equipment, labor, material and accessories, and mounting hardware for a complete and operating system as described within these Division 26 Specification Sections.
- B. Furnish, perform, or provide all labor including planning, purchasing, transporting, storing, installing, testing, cutting and patching, trenching, excavating, backfilling, coordination, field verification, equipment (installation and safety), supplies, and materials necessary for the installation of complete electrical systems (as described or implied by these specifications and the applicable drawings) in strict accordance with applicable codes, which may not be repeated in these specifications, but are expected to be common knowledge of qualified Bidders.
- C. All work shall comply with all applicable codes as a minimum and with the additional requirements called for in these Contract Documents.
- D. Only trained and licensed personnel shall perform work. No Work shall be performed which violates applicable Codes, even if called for in the Contract Documents.
- E. Coordinate requirements with Utility Company and all applicable GOAA Testing, Certification and repair contractor prior to bid. Bid to include all work required.
- F. Make connections of all items in the Work using electric power including wire, conduit, circuit protection, disconnects and accessories. Securing of roughing-in drawings and connection information for equipment involved shall also be included under this division. See other divisions for specifications for electrically operated equipment.

- G. The Contractor shall provide and install panic hardware on all electrical room doors where the electrical room houses switchboards or MCC's rated 800 amps or more per NEC 110.26. All electrical room doors shall open in the direction of egress.

1.4 QUALITY ASSURANCE

- A. Install Work in locations shown or described in the Contract Documents, unless prevented by Project conditions.
- B. Install all equipment so that all Code and Manufacturer recommended working and servicing clearances are maintained. Properly arrange and install all equipment within designated spaces. If a departure from the Contract Documents is necessary, submit to the OAR for approval, detailed drawings of the proposed changes with written reasons for the changes. No change shall be implemented without the issuance of a change order or other directive permitted by the General Conditions.
- C. The Contractor shall verify finish dimensions at the project site in preference to using dimensions noted on Contract Documents.

1.5 INVESTIGATION OF SITE

- A. Investigate the site and existing conditions thoroughly before bidding. Advise OAR of discrepancies or questions noted.
- B. During the course of the site visit, electrical bidder shall become familiar with all aspects of the proposed work and existing field conditions of the work. No compensation or reimbursement for additional expenses for failure to investigate the existing facilities will be authorized. This shall include rerouting around existing obstructions.
- C. Submission of a proposal will be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered will not be recognized.
- D. Existing conditions and utilities indicated are taken from existing construction documents, surveys, and field investigations. Unforeseen conditions probably exist and existing conditions shown on drawings may differ from the actual existing installation with the result being that new work may not be field located exactly as shown on the drawings. Notify OAR if deviations are found.
- E. All existing electrical is not shown. The Contractor shall become familiar with all existing conditions prior to bidding, and include in his bid the removal of all electrical equipment, wire, conduit, devices, fixtures, etc. that is abandoned due to renovation.
- F. Protect all existing electrical raceways within concrete slabs, below concrete slabs, overhead raceways, equipment, etc. from damage due to renovation. Repair or replacement of utilities or other property damaged by operations in conjunction with the work will be at no cost to the Owner.

- G. Remove existing power, lighting, systems, material and equipment which are made obsolete or which interfere with the construction of the project. Reinstall power, lighting, systems, materials and equipment which are required to remain active for the facility to be fully functional.
- H. Reroute conduit and wiring in area of construction remaining active. Include temporary connections necessary to maintain continuity of existing circuitry required to remain active during renovation. Existing conduits indicated in Contract Documents are approximate locations only. Determine routing of existing conduits and pipes prior to any excavation, cutting or demolition.
- I. Occupied existing buildings must remain in operation while work is being performed. Schedule work for a minimum outage to Owner. Notify the OAR appropriately for any shut- down of existing systems.
- J. Bid shall include all removal and relocation of all piping, fixtures or other items required for completion of alterations and new construction.
- K. Refer to Section 26 01 03 Minor Electrical Demolition for Remodeling for additional requirements associated with existing conditions.

1.6 CONTRACT DOCUMENTS

- A. The drawings are diagrammatic and are not intended to include every detail of construction, materials, methods, and equipment. They indicate the result to be achieved by an assemblage of various systems. Coordinate equipment locations with Architectural and Structural drawings. Layout equipment before installation so that all trades may install equipment in spaces available. Coordinate installation in a neat and workmanlike manner. Provide 1/4" scale coordination drawings per specifications prior to start of work.
- B. Contractor shall provide 1/4" scale coordination drawings for all electrical, mechanical and communications rooms during the shop drawing submittal phase, utilizing detailed dimensions from equipment actually submitted (all disciplines) and field-measured/verified existing conditions. These drawings are also required for any room where conduits equal to or over 1-1/4" in size, equipment (panels, HVAC, disconnects, comm. racks) or other large objects are being installed. Drawings shall show all electrical, mechanical, plumbing, fire protection, structural, etc. coordinated so that problems are discovered/prevented prior to installation. Claims during construction for additional funding in rooms where properly coordinated drawings were not submitted will not be considered.
- C. Wiring arrangements for equipment shown on the drawings are intended to be diagrammatic and do not show all required conductors and functional connections. All such items incidental to a complete and operating system shall be provided.
- D. Submit specific shop drawings which indicate the fabrication, assembly, installation, and erection of particular systems' components. Drawings that are part of the Contract Documents shall not be considered a substitute for required shop drawings, field

installation drawings, code requirements, or applicable standards.

- E. Locations indicated for outlets, switches, and equipment are approximate and shall be coordinated with the Contract Documents. Where instructions or notes are insufficient to locate the item, notify the OAR.

1.7 MATERIALS AND EQUIPMENT

- A. Unless otherwise noted, all material shall be new and UL listed or labeled. In lieu of UL listing or labeling, a statement or data demonstrating compliance with contract documents from a nationally recognized testing agency shall be submitted to the OAR.
- B. All materials shall comply with the requirements for Low Emitting Materials. This shall include:
 - 1. Low Emitting Materials for Paints and Coatings
 - 2. Low Emitting Materials for Adhesives and Sealants
 - 3. Low Emitting Composite Wood
- C. Reference section 01 8113.14 "Sustainable Design Requirements – LEED V4 BD+C for additional information.
- D. Where Contract Documents list design selection, manufacturer or type, this model shall set the standard of quality and performance required. Where no brand name is specified, the source and quality shall be subject to Designers/OAR review and approval. Where Contract Documents list approved substitutions, these items shall comply with Division 01 requirements for substitutions.
- E. When a product is specified to be in accordance with a trade association or government standard and at the request of Designers/OAR the Contractor shall furnish a certificate that the product complies with the referenced standard and supporting test data to substantiate compliance.
- F. Where multiple items of the same equipment or materials are required, they shall be the product of the same Manufacturer.
- G. Prior to placing equipment orders, verify the physical size of specified equipment to fit spaces allotted on the drawings and with NEC working clearances. Internal access for proposed equipment substitutions shall be provided. Provide 1/4" scale drawings showing that this coordination has taken place.
- H. Electrical equipment shall be protected from the weather, during shipment, storage, and construction per manufacturer's recommendations. Should any apparatus be subjected to possible damage by water, it shall be thoroughly dried and put through a dielectric test, at the expense of the Contractor, to ascertain the suitability of the apparatus, or it shall be replaced without additional cost to the Owner.

- I. Inspect all electrical equipment and materials prior to installation. Damaged equipment and materials shall not be installed or placed in service. Replace or repair and test damaged equipment in compliance with industry standards at no additional cost to the Owner. Equipment required for the test shall be provided by the Contractor.
- J. Material and equipment shall be provided complete and shall function up to the specified capacity/function. Should any material or equipment as a part or as a whole fail to meet performance requirements, replacements shall be made to bring performance up to specified requirements. Damages to finish by such replacements, alterations, or repairs shall be restored to prior conditions, at no additional cost to the Owner.
- K. Where tamperproof screws are specified or required, Phillips head or Allen head devices shall not be accepted. For each type used, provide OAR with three tools. OAR will designate the specific hardware design to correspond with existing devices elsewhere in the building, to limit special tool requirements.
- L. Communications backboards shall be 3/4" A/B grade, Class A, flame spread, painted with light gray fire retardant paint. Neatly mask off a minimum of one (1) plywood manufactures pre-printed certified fire rating stamp per section of board prior to application of paint. Remove masking after paint has cured. Plywood shall comply with the requirements of Low Emitting Materials for composite wood.

1.8 SUPERVISION OF THE WORK

- A. Reference the General Conditions for additional requirements.
- B. A qualified and experienced electrical superintendent shall be in charge of the work in progress at all times. If, in the judgement of the OAR, the electrical superintendent is not performing his duties satisfactorily, the Contractor shall immediately replace him upon receipt of a letter of request from the OAR. Once a satisfactory electrical superintendent has been assigned to the work, he shall not be withdrawn by the Contractor without the written consent of the OAR.
- C. Provide field superintendent who has had a minimum of four (4) years previous successful experience on projects of comparable sizes and complexity. Superintendent shall be present at all times that work under this Division is being installed or affected. All work performed by a non-licensed Journeyman shall be under the direct supervision (in the presence of) of a Licensed Journeyman as specified herein. Increase the quantity of licensed Journeymen as required for supervision of all areas where direct contact is not possible. Project Superintendent and supervising Journeyman shall have passed a proctored H.H. Block Journeyman Exam with 75% grade or better and shall be a licensed Journeyman within the State of Florida. A resume of the Project superintendent's experience shall be submitted to OAR before starting work. At least one member of the electrical contracting firm shall hold a State Master Certificate of Competency. Each Journeyman shall have possession of licensing documentation at all times during work. Display to designer/OAR when requested.

- D. Superintendent shall be employed by a State Registered (Type "E.R." License) or State certified (Type "E.C." License) electrical contractor.

1.9 COORDINATION

- A. Provide all required coordination and supervision where work connects to or is affected by work of others, and comply with all requirements affecting this Division. Work required under other divisions, specifications or drawings to be performed by this Division shall be coordinated with the Contractor and such work performed at no additional cost to Owner including but not limited to electrical work required for:
 - 1. Door hardware
 - 2. Roll-up doors
 - 3. Roll-up grilles
 - 4. Signage
 - 5. Fire shutters
 - 6. Elevators
 - 7. Escalators
 - 8. Sliding doors
 - 9. Mechanical Division of the Specifications
 - 10. Landscape Architect drawings
 - 11. Lifts
 - 12. Lift Station
 - 13. Kitchen equipment
 - 14. Conveyors
 - 15. Flight information display systems
 - 16. Interior design drawings
 - 17. Fountains
 - 18. Millwork design drawings and shop drawings
 - 19. Parking control equipment
- B. Provide electrical subcontractor a set of Contract Documents for all areas of Electrical Work.
- C. Installation studies shall be made to coordinate the electrical work with other trades. Work shall be preplanned. Unresolved conflicts shall be referred to the OAR prior to installation of the equipment.
- D. Coordination drawings shall be prepared prior to the start of work. Drawings shall show the actual physical dimension required for the installation to assure proper integration of equipment with building systems and NEC required clearances. Location of conduit racking, etc., shall be provided. Coordination drawings shall be provided for all areas. Comply with the requirements of Division 01.

- E. Secure approved shop drawings from all required disciplines and verify final electrical characteristics before roughing power feeds to any equipment. When electrical data on approved shop drawings differs from that shown or called for in Construction Documents, make adjustments to the wiring, disconnects, and branch circuit protection to match that required for the equipment installed. Adjustments to contract value will not be considered due to lack of coordination.
- F. Damage from interference caused by inadequate coordination shall be corrected at no additional cost to the Owner.
- G. Coordinate the exact location of floor outlets, floor ducts, floor stub-ups, etc. with OAR and Designer (and receive their approval) prior to rough-in. Locations indicated in Contract Documents are only approximate locations.
- H. The Contract Documents describe specific sizes of switches, breakers, fuses, conduits, conductors, motor starters and other items of wiring equipment. These sizes are based on specific items of power consuming equipment (heaters, lights, motors for fans, compressors, pumps, etc.). Coordinate the requirements of each load with each load's respective circuitry shown and with each load's requirements as noted on its nameplate data and manufacturer's published electrical criteria. Adjust circuit breaker, fuse, conduit, and conductor sizes to meet the actual requirements of the equipment being provided and installed and change from single point to multiple points of connection (or vice versa) to meet equipment requirements. Changes shall be made at no additional cost to the Owner.

1.10 PROVISION FOR OPENINGS

- A. Locate openings required for work. Provide sleeves, guards or other approved methods to allow passage of items installed.
- B. Coordinate with roofing Contractor on installation of electrical items which penetrate the roof. Roof penetrations shall be installed so as to not void roof warranty.
- C. Where work pierces waterproofing, it shall maintain the integrity of the waterproofing. Coordinate roofing materials which pierce roof for compatibility with membrane or other roof types with Contractor.

1.11 CONCRETE PADS

- A. Furnish and install reinforced concrete pads for transformers, switchgear, generators, motor control centers, and other free-standing equipment. Unless otherwise noted, pads shall be ~~four (4)~~ **three (3)** inches high and shall exceed dimensions of equipment being set on them, including future sections, by three (3) inches each side, except when equipment is flush against a wall where the side against the wall shall be flush with the equipment. Pads shall be reinforced with W1.4 x 1.4 6 x 6 welded wire mesh. Chamfer top edges 1/2". Trowel all surfaces smooth. ~~Provide 3000 psi concrete.~~ **Concrete shall comply with P-610.**

1.12 SURFACE MOUNTED EQUIPMENT

- A. Surface mounted fixtures, outlets, cabinets, conduit, panels, etc. shall have finish or shall be painted as directed by designer. Paint shall be in accordance with applicable sections and/or divisions of these specifications.

1.13 CUTTING AND PATCHING

- A. Reference Division 01 - General Requirements.
- B. New Construction:
 - 1. Cutting of work in place shall be cut, drilled, patched and refinished by trade responsible for initial installation.
 - 2. Backfill new grades to match adjacent undisturbed surface.
- C. Remodeling:
 - 1. See Section 26 01 03 Minor Electrical Demolition.

1.14 INSTALLATION

- A. Erect equipment to minimize interference and delays with the execution of the Work.
- B. Take care in erection and installation of equipment and materials to avoid marring finishes or surfaces. Any damage shall be repaired or replaced as determined by the designer/OAR at no additional cost to the Owner.
- C. Equipment requiring electrical service shall not be energized or placed in service until OAR is notified and is present or have waived their right to be present. Where equipment to be placed in service involves service or connection from another Contractor or the OAR, notify the OAR in writing as appropriate when the equipment will be ready.
- D. Equipment supports shall be secured and supported from structural members unless written approval is granted by OAR.
- E. Plywood material shall not be used as a backboard for mounting panel boards, disconnects, motor starters, and dry type transformers. Provide "cast in place" type inserts or install expansion type anchor bolts. Electrical equipment shall not be mounted directly to dry wall for support without additional channels as anchors. Channels shall be anchored to the floor and structure above. Panelboards and terminal cabinets shall be provided with structural framing located within drywall partitions.

- F. Inserts, pipe sleeves, supports, and anchorage of electrical equipment shall be provided. Where items are to be set or embedded in concrete or masonry, the items shall be furnished and layout made for setting or embedment thereof so as to cause no delay.
- G. Conduit or piping systems that contain water or liquid of any kind shall not be installed over the top of any electrical equipment, transformers, racks, cabinets, or enclosures without prior written approval from the OAR.

1.15 AS-BUILT DOCUMENTS

- A. As-Built Documents: As-built Documents include Drawings, Shop Drawings, Specifications, Addenda, Change Orders, and other modifications permitted by the General Conditions.
- B. Comply with all requirements of Division 01
- C. Verify aspects of redlined as-builts for accuracy. As-Built Documents shall show all components including but not limited to:
 - 1. All raceways 1-1/4" and above, cable tray systems, and grouped raceway racking as installed, including dimensions from fixed building lines such as column lines.
 - 2. All site underground raceways and duct banks indicating burial depths and distances from fixed building lines or global tracking coordinates.
 - 3. Underground pull boxes and manholes including elevations. Detail manhole and pull boxes, conduit terminations (butterfly layout) including conduit sizes, designated systems and cabling description.
 - 4. General conduit routing from receptacle to receptacle, fixture to fixture, device to device. (Exact routing is not required for raceways 1" and smaller.)
 - 5. Lighting: Diagrammatically show junction boxes that are located above accessible ceiling with flexible conduit connections to luminaries.
 - 6. All junction boxes for Sections 28 31 11, 27 13 00 / 27 15 00, 27 13 00 / 27 15 00 and 27 51 16 shall be shown exactly where installed.
 - 7. Junction box splices shall be shown in exact location and clearly noted referring to the written authorization by the OAR.
 - 8. The first junction box within each homerun, regardless of size shall be shown in the installed location.
 - 9. All junction boxes and pull boxes located above non-accessible ceilings shall be shown in exact location. All junction boxes 6"X6" and larger shall be shown in exact location.
 - 10. Any combining of circuits (which is only allowed by specific permission) or change in homerun outlet box shall be indicated.
 - 11. Any circuit number changes.
 - 12. All conductors and cables, conductors and cable sizes, raceway sizes, etc. not shown on contract documents and any changes from the documents.
 - 13. Any switchboard, panelboard, motor control center, relay panel, or dimming

- control panel schedule changes, including load changes.
 14. All access panels.
 15. All existing conditions.
 16. Location of lighting control devices such as photocell controls, space occupancy sensors, etc.
 17. Exact quantity of conductors and cables shall be shown for all raceway systems.
 18. All devices, wall outlet boxes, and control components.
 19. All wireway and cable tray systems.
 20. Exact location of all driven grounding electrodes including burial depths and dimensions from fixed building lines. Location of all grounding system busbars.
 21. All building automation system (BAS) control panels and associated electrical devices, connections, power supplies, and dampers.
 22. Riser diagrams exactly as installed.
 23. Motor control devices, terminal cabinets, equipment racks, disconnects and switches and surge protection devices.
 24. Change the equipment schedules (i.e., symbol legends, light fixture schedule, etc.) to agree with items actually furnished.
 25. Change plan notes to agree with items actually furnished, actual installation methods, etc. respectfully.
 26. Cross-out all items, circuitry, devices, etc. not applicable.
- D. As-Built red line information shall not compromise the clarity of the Contract Documents and Shop Drawings. Major components such as grouped raceway assemblies, cable tray systems, larger conduits, duct banks, racking, elevations, dimensions, etc. shall be shown on a clean architectural base plan(s) separate from the Contract Electrical Documents, as required to clearly delineate work. Obtain electronic base plan file from OAR.

1.16 "OBSERVATION OF WORK" REPORT

- A. Reference the General Conditions.
- B. Items noted by designer/OAR during construction and before final acceptance which do not comply with the Contract Documents will be listed in an "Observation of Work" report which will be sent to the Contractor for action. Correct all deficiencies in a prompt concise manner. After completion of the outstanding items, provide a written confirmation report for each item. The report shall indicate each item noted, and method of correction. Enter the date on which the item was corrected, and return the signed reports so items can be rechecked. Failure to correct the deficiencies in a prompt concise manner or failure to return the signed reports shall be cause for disallowing request for payments.
- C. The electrical project superintendent shall be present at all required observation of work reviews as project progresses. Provide the OAR with equipment for access and review of all Work in place, as well as personnel fully familiar with all aspects of the work. Provide access to all electrical components such as junction boxes, panelboards, switchboards, devices and fixtures for their review by the designer/OAR.

- D. Prior to start of Substantial Completion inspection, provide access to and prepare all electrical equipment and related components complete and ready for review by designer/OAR including but not limited to the following :
1. All panelboard covers removed
 2. Switchboard and distributions panelboards readily for immediate removal of covers
 3. Terminal cabinet covers open or removed.
 4. Wireway covers open or removed
 5. Underground pull boxes ready for immediate removal of cover(s)
 6. Access to all grounding/bonding terminations
 7. Access to rated wall and through floor fire stopping
 8. Access to all control systems for the CCTV, Voice, Data, Fire Alarm, and Sound/Paging.
 9. Access to mechanical equipment, electrical connection points, and control devices
 10. Access to elevator and escalator machine rooms, hoistway, pits, etc.
 11. Access to all raceways crossing structural expansion/deflection joints.
 12. Access to all components of the fire alarm control system including control devices and fire dampers.
 13. Access to power company equipment
 14. Removal of access panels
 15. Removal of a minimum of one (1) acoustical lay-in ceiling tile throughout each area of work. Larger areas shall have one (1)-ceiling tile removed for every 30 square foot of ceiling area.
 16. Each and every item deemed necessary by A/E to perform a comprehensive review of the work as installed relative to the contract documents.
- E. Items noted after acceptance during one-year guarantee period shall be checked by the Contractor in the same manner as above. The signed reports are to be returned by him when the items have been corrected.

1.17 SYSTEMS WARRANTY

- A. Reference the General Conditions.
- B. Warranty shall be by the Contractor to the Owner and shall cover for a period of one year from the date of the Substantial Completion. Warranty shall not include light bulbs lamps in service after one month from date of substantial completion of the System.
1. Explain the provisions of warranty to the Owner at the "Demonstration of Completed System" meeting to be scheduled with the OAR upon project completion.
- C. Where items of equipment or materials carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material.

- D. Where extended Guarantees are called for herein, furnish three copies to be inserted in Operation and Maintenance Manuals.
- E. All preventative maintenance and normal service will be performed by the Owner's maintenance personnel after final acceptance of the work which shall not alter the Contractor's warranty.

1.18 WASTE MATERIALS DISPOSAL

- A. Include in base bid the transport and disposal or recycling of all waste materials generated by this project in accordance with all rules, regulations and guidelines applicable. Comply fully with Florida Statute 403.7186 regarding mercury containing devices and lamps. Lamps, ballasts and other materials shall be transported and disposed of in accordance with all DEP and EPA guidelines applicable at time of disposal. Provide OAR with written certification of approved disposal.

1.19 PROHIBITION OF ASBESTOS AND PCB

- A. Prior to the Final Review field visit the Contractor shall certify in writing that the equipment and materials installed in this Project under this Division 26 contain no asbestos or PCB. Additionally, all manufacturers shall provide a statement with their submittal that indicates that their product contains no asbestos or PCB. This statement shall be signed by a duly authorized agent of the manufacturer.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

PART 4 - METHOD OF MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. The items described in Specification 26 05 00 are incidental to other pay items and shall not be measured for payment.

PART 5 - BASIS OF PAYMENT

5.1 BASIS OF PAYMENT

- A. No direct payment shall be made for the work described in Specification 26 05 00. The work described in Specification 26 05 00 is incidental to other items and shall be paid for in the respective bid item of which it is a component part.

END OF SECTION 26 05 00

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SECTION 26 05 12 - OUC UNDERGROUND ELECTRIC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Conditions/Provisions of Contract, including Contractual Conditions and other Division 1 specification Sections, apply to this Section.

1.2 PROJECT DESCRIPTION

- A. These specifications are for the construction of certain Orlando Utilities Commission (OUC) underground facilities and street lighting systems as shown in the contract documents. These facilities shall be more particularly described in later paragraphs of these specifications and by attached drawings. The nature and location of these facilities shall be further described on drawings, which are part of the contract documents. In general, these specifications shall cover the construction of, but not necessarily be limited to, the following general types:
 - 1. Manholes, hand holes, pull boxes, and junction boxes
 - 2. Direct buried duct line, concrete encased duct lines and conduit runs
 - 3. Street lighting poles, fixtures, bracket arms, controllers, services etc.
- B. All manholes pull boxes, junction boxes, conduit, street lighting components, electrical service components, etc. shall be fabricated and installed in accordance with current OUC requirements and specifications. All materials, equipment and installations shall comply and be fabricated in accordance with current OUC requirements and specifications. All materials shall be submitted to the OAR for review by OUC and the Engineer.
- C. The requirements of specification SP-100-1.4 and SP-100-1.5 are applicable to the work performed on the 26 05 12 installations.
- D. Establishing Grade and Right of Way: In undeveloped, developing or road right-of-way areas where street grades and other final grades have not been established, it shall be the Contractor's responsibility to obtain this information from the appropriate group or individual so that completed installations shall be at required depths and final grades. It shall also be the Contractor's responsibility to establish the boundaries of right-of-way areas such that completed installations shall be within the proper right-of-way areas.
- E. The Contractor shall perform and include in the price bid for the work all work shown on the plans.

- F. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.
- G. Where required, all items shall be installed by the specific FDOT Standard Indexes referenced in the Contract Documents.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 METHOD OF PERFORMANCE

- A. The Contractor shall perform all work in accordance with the contract documents and shall comply with the latest directives of the State of Florida Department of Transportation, Orange County, the City of Orlando, OUC, Greater Orlando Aviation Authority (GOAA) Standards, NEC and other governmental authorities having jurisdiction.

3.2 MANHOLES

All manholes shall be precast concrete manholes consisting of two (2) sections, top and bottom, with bell ends cast in place in each end wall, 1" pulling eyes and drilled ½" zinc inserts.

Design loading shall include dead load, live load, impact load, load due to water table, and any other loads which may be placed upon the structure. Live loading design shall conform to AASHTO H20 and/or H20-S16 specifications. Live load shall be the loading, which produces the maximum shear and bending moments in the structure. All concrete aggregates, fine or course, shall conform to ASTM C-33 specifications. Written certification, of these strengths, sealed by a Professional Engineer, shall be submitted to the OAR for review prior to ordering the manhole. Mating surfaces shall be flush between top and bottom manhole halves, resulting in a flush interior surface. A tolerance no greater than 3/8" shall be permissible. The complete manhole submittal shall be reviewed, signed and sealed by a registered professional engineer licensed in the state of Florida. Test results certifying the concrete used to cast the manhole complies with the strength required by the registered professional engineer shall be delivered with each manhole.

No. 5, Grade 60 reinforcing steel rods shall be provided on a maximum of eight (8) inch centers in both directions for top, bottom and walls for reinforcement. Pulling eyes shall be galvanized steel rod 1" inch minimum diameter. Install pulling eyes on each end wall ABOVE and BELOW the duct entrance as shown in the contract documents. See plans and details for required quantity per manhole wall.

A fourteen (14) inch diameter by five (5) inch deep sump is to be located approximately in the center of the manhole floor. The sump is to have a watertight bottom. Install two (2) inch wide channel sloped towards the sump from the four corners.

The size, number and location of conduits shall be ten (10) six (6) inch and two (2) two (2) inch PVC Schedule 40 bell ends centered in each end wall and two (2) six (6) inch PVC Schedule 40 bell ends in both upper corners of each end wall, minimum, unless otherwise specified. Refer to plan sheets for specific additional conduit entries. Contractor shall provide additional size, number and location of conduits as shown in the plans. Bell ends shall be "LONG BELL ENDS" manufactured by Carlon or OUC accepted equivalent.

Manhole lids shall have 3" high embossed letters "OUC ELECTRIC." Design shall be approved by OUC. OUC Manhole lids shall be Neenah Foundry R-3498-TS2 with spring assist or accepted equivalent.

Built-in-place type manholes may be used or required in lieu of the precast manholes. Manholes shall comply with the design contained in the drawing package titled "OUC AIRCRAFT RATED MANHOLE".

OUC via the OAR shall be contacted for exact location of windows and/or conduit entrances in existing manholes.

3.3 CONCRETE ENCASED CONDUIT RUNS

- A. All conduit/duct shall be concrete encased except as noted in Paragraph 3.4. The conduit run shall consist of electrical grade Schedule 40 or Schedule 80 polyvinyl chloride conduit or rigid galvanized steel conduit, as noted. Rigid galvanized steel conduit shall be used for the first ten feet of all pole risers. The conduit shall be encased in concrete with 2 inch spacing between ducts and 3 inches of concrete cover on top, bottom and sides. Concrete or plastic spacers shall be used. The concrete envelope shall be P-610 or FDOT Class II concrete with 1 inch maximum size coarse aggregate (FDOT #57 stone) with a minimum 28 day compressive strength of ~~3,400~~ **4,000** PSI or equivalent. The concrete encasing the ducts shall be free of voids and air pockets; a vibrator or other mechanical means of consolidation shall be used. The concrete encasement for the duct line shall have a minimum cover of 36 inches measured from final grade, unless specifically noted otherwise. Bell end fittings shall be used on each conduit where it terminates in a manhole or pull box and as required by the Authority Having Jurisdiction. The PVC conduit used in the duct line shall be solvent welded to prevent water from entering around the couplings. The Contractor shall install a 4/0 bare copper ground wire and terminations as part of the duct, pull box and manhole installation with no separate measurement or payment. The Contractor shall use an

exothermic type welding process for 4/0 conductor terminations/splicing. The OAR shall inspect all welds with random inspections performed by OUC. A close fitting duct plug shall be installed in each duct end. A polyolefin jet line pulling string, 200 pound test, shall be installed in each conduit in a duct run. Schedule 80 PVC duct and rigid galvanized steel conduit shall not be paid for separately and shall be incidental to the respective size Schedule 40 PVC duct pay item.

- B. Encasement of primary power voltage duct banks shall have a red dye added to the PCC to achieve a distinguishable red color of the encasement for identification in the field if encountered in a future excavation.

3.4 DIRECT BURIED STREET LIGHT CONDUIT RUNS

- A. Street lighting conduit shall have a minimum cover of 30" and a maximum cover of 36", unless specifically approved on a case by case basis by OUC. Street lighting conduit shall not be concrete encased except where installed under roadways or where the 30" minimum cover cannot be obtained. When concrete encasement is required for street lighting conduits, as noted above, the additional cost of the concrete encasement shall be considered incidental to the respective size direct buried street lighting conduit installation. The conduit run shall consist of electrical grade Schedule 40 or Schedule 80 polyvinyl chloride conduit or rigid galvanized steel conduit, as noted. Rigid galvanized steel conduit shall be used for the first ten feet of all pole risers and under roadways. The direct buried street light conduit shall be encased in sand or natural earth, no part of which is retained by a 0.25" sieve, with 2 inch spacing between ducts and 4 inches of sand cover on top, bottom and sides. Concrete or plastic spacers shall be used. The fill encasing the ducts shall be free of voids and air pockets and vegetation. The direct buried duct line shall have a minimum cover of 36 inches measured from final grade. Bell end fittings shall be used on each conduit where it terminates in a manhole or pull box and as required by the Authority Having Jurisdiction. The conduit used in the duct line shall be solvent welded to prevent water from entering around the couplings. A close fitting duct plug shall be installed in each duct end. A polyolefin jet line pulling string, 200 pound test, shall be installed in each conduit in a duct run. Schedule 80 PVC duct and rigid galvanized steel conduit shall not be paid for separately but shall be paid for under the respective size Schedule 40 PVC duct pay item.

3.5 CONDUIT REQUIREMENTS

- A. The route, nature and size of the conduits and the location of the conduit runs shall be as indicated in the contract documents. All conduits used shall be designated as electrical grade, have 5° chamfered ends and shall comply with OUC requirements. OUC data sheets are included at the end of this Item.
- B. All ducts shall be securely fastened in place during construction and progress of the work and shall be plugged to prevent seepage of grout, water, or dirt. Any duct section having a defective joint shall not be installed.

- C. All conduits shall be installed with joints properly mated and glued. All conduit ends shall be chamfered 5° with an OUC approved chamfering tool. Any burrs or sharp projections at conduit ends or within the conduit shall be removed.
- D. All exposed ends of conduit shall be plugged during construction to prevent the entrance of foreign matter and moisture into the conduit.
- E. All rigid galvanized steel conduits installed below grade shall be coated with 12 mil of asphaltum paint.
- F. All directional bore ducts shall be schedule 80 electrical utility grade PVC with 5 degree chamfered ends.
- G. OUC approved restrained-joint schedule 40 conduit manufacturers:
 - 1. Carlon; Bore-gard
 - 2. Certainteed; Certa-Com
- H. Bore-guard duct is stiffer than conventional HDPE duct. The contractor shall comply with the Bore-gard manufacturer's requirements.
- I. Maintain 10 foot horizontal clearance and 5 foot vertical clearance between directional bore duct banks and all other underground utilities and structures, unless noted otherwise.
- J. Maintain 20 feet minimum clearance between the bottom of a pond/canal and the top of any directional bore duct. Any blow-out of the drill mud shall be immediately corrected and cleaned up by the contractor at no additional cost to the owner.
- K. Conduit to meet all applicable ASTM testing and be UL listed. Conduit to be chamfered on inside diameter male ends to minimize cable damage. The **"in trench"** bending radius for 4" PVC pipe should be no **smaller** greater than 100' as recommended by the PVC Pipe Industry, **and 150' for 6" pipe**. Installation bend radius should be kept at a minimum to reduce the tensile pull forces displaced onto the pipe. Pipe installation and joint assembly shall be per manufacturer recommendations. **The minimum primary conduit/duct bend radius for all bends is 60-inches.**
- L. Conduits terminating at a pole or a building shall be rigid galvanized steel, Schedule 40 walls, with one (1) full length (10 foot) up the structure preceded by a galvanized ell. Bell ends shall be "LONG BELL ENDS" manufactured by Carlon and shall be used on each conduit where it terminates in a manhole, pull box, or hand hole. Conduits terminating in the ground to be used for future extensions shall be closed up with a PVC cap and glued to the conduit stub out. Conduits at the base of a riser pole shall be terminated using a galvanized rigid coupling and a threaded PVC plug. A subgrade location marker provided by OUC shall be buried in line with the stubbed conduit. Contractor shall contact OUC to obtain markers and install markers in accordance with OUC requirements. Acquisition and installation of subgrade location markers is incidental to the respective duct installation.

- M. Where conduits pass under driveways or other paved areas, a permanent marker (an 'E' cut in the concrete curb) shall be installed in the curb or in the edge of pavement when curbing is not used above the conduit installation. Street lighting conduits installed under roadways shall be rigid galvanized steel conduit.
- N. A 200-pound test polyolefin pulling string furnished by the Contractor shall be installed in each and every conduit.
- O. Where necessary, pipe bending should be utilized for offsets, "dog-legs", back- sided risers, or other such runs in galvanized conduits. The cost of bending these pipes and the installation of these pipes is the responsibility of the Contractor. Bending of PVC pipe shall not be allowed without prior approval of the usage and bending technique by OUC. Bends, fittings, offsets/rolling of ducts around/over/under obstructions, etc. are an incidental component of the raceway pay items.
- P. The use of "split" couplings or other such fittings shall be used only in those locations where it is extremely difficult to negotiate and where additional excavation or relocation of existing facilities is impractical and/or unreasonable. OUC shall approve the use of "split" couplings or other such fittings on a case- by-case basis. Approval for one instance does not constitute a blanket approval. Where these type fittings are used, it is the responsibility of the Contractor to insure a watertight fit and take required steps in water-proofing by sealing and grouting or by adapting the galvanized conduit and using a PVC fitting for this connection.
- Q. A 4/0 bare copper ground wire shall be installed by the Contractor where specified. Maintain 3" minimum between the 4/0 copper cable above and the concrete encasement of the duct bank. The Contractor shall use an exothermic type welding process for conductor splicing. The OAR shall inspect all welds with random inspections performed by OUC's Inspector. Bare copper wire for counterpoise installations shall be #4/0 AWG stranded wire conforming to ASTM Specifications B-1 and B-8 or B-3 and B-8, as required by the plans and details. The Contractor shall install a 4/0 bare copper ground wire as part of the duct, pull box and manhole installation with no separate measurement or payment.
- R. The OUC duct bank size between manholes is designated on the plan sheets. Due to existing conditions, elevation changes, directional changes, clearance from objects and route. Each of the multiple duct installations shall be the same physical length. Contractor is responsible for "means and methods" and shall account for this installation condition for the OUC duct bank. Each additional duct bank requires an additional 4/0 copper ground wire installed alongside each duct bank.
- S. All conduits and fittings shall be of electrical grade only, Schedule 40 or 80, or rigid galvanized steel conduit as specified, and furnished by the Contractor.
- T. All conduit runs shall have 4 mil thick, polyethylene, 6" wide, red color, black printing warning tape OUC stock # 048-03819 installed directly over the conduits, 18 inches below final grade. Multiple duct bank trenches shall have tape provided over each duct. OUC data sheets are included at the end of this Item.

Marked	
Buried Electric Line Below	1-1/4" High
Caution Caution Caution	1-1/4" High
Call Orlando Utilities Commission 407-434-4247	3/4" High
Buried Electric Line Below	1-1/4" High

- U. **Manholes and ducts shall be thoroughly cleaned. Installation of manholes ducts, etc. shall pass OUC acceptance test for compliance with OUC requirements and cleanliness. Contractor is required to provide support for OUC inspection and remedial action in the appropriate bid item. The Contractor shall mandrel each duct. A 6" diameter wire brush by Greenlee, Cat # 39286 followed by a Greenlee piston Cat # 619 shall be pulled through each 6" duct to thoroughly clean duct. Multiple passes in both directions will be required. Cleaning of other sized ducts shall be completed in a similar manner. The OAR and OUC will check each component for compliance with the Contract Documents.**
- V. All conduit shall be inspected, mandrel tested, pulling string installed, and accepted by OUC prior to any cable being installed or any meters being installed.

3.6 ASPHALTUM PAINT

- A. All iron, steel, galvanized steel and similar metallic items (not intended to be a grounding electrode) installed underground or within 12 inches of the earth shall be protected by a 12-mil thick layer of asphaltum coating. Apply coating in strict accordance with the manufacturer's instructions. Apply to clean dry surfaces. Asphaltum coating shall be applied in two applications/coats minimum. Observe the manufacturer's minimum cure time between applications/coats. Each application of the coating shall be given ample time to dry and harden before the next application is applied. Touch up areas damaged during installation, wrench marks, tooling, bonding clamps, exothermic welds, etc. Apply the proper consistency of asphaltum coating uniformly. The finished coating shall be free from sags, holidays, and smears. Asphaltum coating shall be Carboline Bitumastic 50 or Sumter Coatings Coal Black Asphaltum 100N8507 or accepted equivalent.
- B. Where steel conduit is threaded in the field the threads shall be coated with an approved electrically conductive, corrosion resistant compound in accordance with NEC Section 300.6(A). Use TNB KOPR_SHIELD or accepted equivalent.

3.7 TRENCHING AND BACKFILLING

- A. The Contractor shall do all trenching and backfilling. Backfill shall comply with civil specifications. Consideration shall be given to the property at all times. Restoration shall be to the original condition. All restoration is incidental to the respective pay item of which it is a component part.
- B. The Contractor shall install underground ducts at the locations indicated in the plans.

If necessary, the OAR shall indicate specific locations as the work progresses. Ducts shall be of the size, material, and type indicated in the plans or specifications. All duct lines shall be laid so as to grade toward hand holes, manholes and duct ends for drainage. Grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct lines shall be graded from the center in both directions toward manholes, hand holes, or duct ends. Pockets or traps where moisture may accumulate shall be avoided.

- C. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.
- D. Trenches for ducts may be excavated manually or with mechanical trenching equipment. Walls of trenches adjacent to the duct bank and encasement shall be essentially vertical and may act as a side form if approved by inspector. Collapsed sidewalls shall be repaired to maintain minimum encasement coverage shown on the plans. Otherwise, additional back slopes or forms may be required. so that a minimum of shoulder surface is disturbed. Blades of road patrols or graders shall not be used to excavate the trench. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All excavation shall be unclassified.
- E. Dewatering necessary for manhole, pull box, conduit, duct bank and street light installation, erosion and turbidity control, in accordance with Federal, State, and Local requirements is incidental to the respective pay item of which it is a component part. The cost of all excavation regardless of type of material encountered, shall be included in the 26 05 12 Item. The cost of all area restoration, grading, sodding, paving, etc., shall be included in and is incidental to the 26 05 12 Item. All rigid galvanized steel conduit, fittings, etc. furnished and installed, as required, for 26 05 12 items shall be incidental to and included within the respective 26 05 12 PVC duct.

3.8 RESURFACING AND RESTORATION

- A. All trenching and street openings shall be made by the Contractor. Back filling, compacting and resurfacing shall be done by the Contractor in strict accordance with the latest directives of the Greater Orlando Aviation Authority, City of Orlando, Orange County, and the latest edition of the Florida Department of Transportation standard specification for Road and Bridge Construction and the contract documents.
- B. It shall be the responsibility of the Contractor to be thoroughly familiar with these directives and to notify the respective departments at least two weeks prior to starting any construction or any related segment of construction. It is a requirement of these agencies that newly sodded areas be watered until they are established.
- C. All work shall be done in reasonable harmony with the respective property owners and all disturbed areas shall be restored to their satisfaction. All materials and equipment shall be subject to inspection by the Authority, City, County and/or State Inspector.

3.9 MISCELLANEOUS

- A. The Contractor shall have all manholes, pull boxes, hand holes, and junction boxes clean and free of trash, dirt and other debris.
- B. The Contractor shall adhere to the following OUC Safety Procedures:
- C. When entering OUC manholes, the following equipment shall be utilized -
 - 1. Air blower per OSHA Guidelines.
 - 2. Ladder, non-metallic, with a minimum of 3 feet extending out of the top of the manhole.
 - 3. Gas detection meter (Continuous monitoring).
- D. Water removal from the manholes is the responsibility of the Contractor.
- E. Where manholes, pull boxes, etc. have OUC facilities already installed, where line covers are required, or where existing lines need protection the Contractor shall notify the OUC construction office for scheduling an OUC stand-by crew, (407) 434-4011. A minimum of 72-hour notice shall be given.

3.10 ACCESS TO FACILITIES

- A. For emergency power restoration, maintenance and any other necessary construction activities, OUC vehicles shall be able to access electric facilities at all times. A stabilized road bed is required for access to all OUC manholes, transformers and switch gear. Landscaping or other permanent structures placed in close proximity to OUC facilities shall be approved by OUC engineering prior to installation.
- B. Manhole covers and junction box covers shall remain visible at all times.
- C. Clearances:
 - 1. Manholes - A 20' horizontal radius of unobstructed area and a 18' vertical clearance is required.
 - 2. Transformers and Switch Gear – Contact OUC for minimum unobstructed horizontal clearance required. Vertical clearance shall vary depending on the size of the equipment. This clearance shall be determined by OUC engineering.
 - 3. Meters - A minimum 3' clearance shall be maintained in front of meters. Mounting height shall be a minimum of 4' to a maximum of 6'.

3.11 DIRECTIONAL BORE DUCTS

- A. Directional Bored Ducts shall be installed in accordance with OUC requirements and Item SP-110S-02310, however no separate payment shall be made for directional bore duct. Directional bore duct shall be considered a component part of the respective 26 05 12 duct pay items.

- B. Provide boring to place new duct banks under existing utilities, roadways and structures. Boring shall not weaken the roadbed or structures, or interfere with their operation. Boring tolerances shall be 2 percent in the lateral alignment and one percent in vertical grade. Jetting of ducts is not permitted.
- C. The diameter of the excavation shall conform to the outside diameter of the pipe as close as practical. Any voids developed outside of the diameter of the bore shall be pressure grouted with an approved mix.
- D. Submit for approval a plan showing proposed method of boring, boring equipment, dewatering method, material removal, pit excavation and shoring.

3.12 STREET LIGHTING

- A. OUC street lighting luminaire, horizontal cutoff type (flat lens), LED light source, with photocell receptacle, photocell shorting device, painted with a semi-gloss enamel paint, standard gray. LED roadway lighting Luminaires shall be 4000K as noted on plans, with multi-volt (120/208/240/277v/480v) ballast. Part numbers and approved manufacturers are listed on the plans.
- B. The furnishing and installation of the fixture and appurtenances is incidental to the 26 05 12 street light pay item.
- C. OUC street lighting brackets shall be truss style, tapered with 2" slip-fitter at luminaire end, capable of supporting a 60-pound luminaire, for mounting on a flat surface concrete pole. Part numbers and approved manufacturers are listed on the plans.
- D. The furnishing and installation of the truss bracket is incidental to the 26 05 12 street light installation.
- E. OUC Street lighting poles shall be as shown on the plans.
 - 1. Poles shall be 606S- T4 ALUMINUM ALLOY TUBE, manufactured in accordance with OUC specifications. Approved manufacturer is VALMONT INDUSTRIES INC.
 - 2. Poles shall be pre-stressed concrete, manufactured in accordance with OUC specifications. Approved manufacturer is ACCORD INDUSTRIES, Winter Park, Florida. Poles shall be Type 3 concrete street light pole.
 - 3. Poles shall comply with OUC requirements.
- F. The furnishing and installation of the pole is incidental to the 26 05 12 street light installation.
- G. Cable used for street lighting shall comply with OUC Engineering requirements. Power and control Type TC (tray cable) with THHN/THWN insulated conductors, UL listed, 600 volt. Cable shall be #14 AWG, 3 conductor, 7 strand soft copper per ASTM B3, class B

concentrically stranded; have one black, one white and one green insulated conductor (solid colors); have an overall PVC jacket of approximately 45 mils; be sunlight resistant and suitable for direct burial. Manufacturer's wire shall conform to IEAC T-29-520 or T-30-520 and be in accordance (for installation) with Article 340 and other applicable parts of the National Electrical Code.

Cable shall be packaged in 1000-foot lengths on non-returnable wooden reels. The arbor hole centered in each hub shall be a minimum of 2-3/4 inches in diameter. OUC shall terminate and determinate all OUC cable, except 14/3 TC cable in the fixture. OUC shall install and remove all OUC cable, except the 14/3 TC cable in the pole.

Conductors for OUC systems shall be as previously specified. OUC wire and cable shall be as listed below:

#14-3 TC cable, OUC stock # 018-21143. OUC data sheets are included at the end of this Item.

Bare copper wire for grounding and bonding use shall be #4 AWG stranded wire conforming to ASTM Specifications B-1 and B-8 or B-3 and B-8, as required by the plans and details.

The Contractor shall coordinate all work with OUC. OUC shall perform all splicing, termination and determination of all OUC cables except connection to the pole-mounted fixture. Contractor shall be responsible for providing and installing the 14-3 TC cable and ground conductor within the pole, termination of the 14-3 cable in the fixture, bonding the #4 AWG ground wire to the bracket arm and coiling 10' minimum of each cable in the pull box. Connection to the fixture and bracket arm shall be the responsibility of the Contractor and shall be performed in accordance with OUC requirements.

Conductors shall be continuous and unspliced where located within conduit. Splices shall only occur within pull boxes installed for the purpose.

Allow adequate conductor lengths in all pull boxes, 10' minimum. In fixtures all termination of conductors in which conductor is in tension shall be rejected and shall be replaced with conductors of adequate length. A calibrated torque wrench shall be used for all bolt tightening.

The furnishing, installation and termination of the 14-3 TC cable and #4 AWG ground wire is incidental to the L-112 streetlight pay item.

- H. The OUC power cable between each streetlight shall be provided and installed by OUC.
- I. 13" X 24" flush to ground secondary service junction box and cover shall be light traffic rated (minimum 5000-pound wheel bearing weight). Junction box shall be tapered, have open flanged bottom, and the cover shall fasten down with at least one (1) pentahead stainless steel bolt. A polymer concrete ring and cover (or preapproved overhang device of another type) around the top shall act a concrete (side walk) lock in device. Covers shall have a non-skid surface and the "OUC ELECTRIC" logo

- permanently embedded into the top. Each junction box shall have the cover bolted into place when shipped. The covers and pentahead bolts shall not be shipped separately. Boxes shall be OUC stock # 046-08000. Order per OUC specifications. OUC data sheets are included at the end of this Item. The 13" X 24" secondary service pull box and cover shall be considered incidental to its respective 26 05 12 conduit installations.
- J.** 10" X 15" flush to ground street light junction box and cover shall be light traffic rated (minimum 5000-pound wheel bearing weight). Junction box shall be tapered, have open flanged bottom, and the cover shall fasten down with at least one (1) pentahead stainless steel bolt. A polymer concrete ring and cover (or preapproved overhang device of another type) around the top shall act a concrete (side walk) lock in device. Covers shall have a non-skid surface and the "OUC ELECTRIC" logo permanently embedded into the top. Each junction box shall have the cover bolted into place when shipped. The covers and pentahead bolts shall not be shipped separately. Boxes shall be OUC stock #036-26039. Order per OUC specifications. OUC data sheets are included at the end of this Item. The 10" X 15" street light junction box and cover shall be considered incidental to the OUC Street Light 26 05 12 street light installation.
- K.** **24" X 36" X 24" deep, flush to ground OUC pull box and cover shall be ANSI/SCTE 77 Tier 8. Junction box shall be tapered, have open flanged bottom, and the cover shall fasten down with at least one (1) pentahead stainless steel bolt. A polymer concrete ring and cover (or preapproved overhang device of another type) around the top shall act a concrete (side walk) lock in device. Covers shall have a non-skid surface and the "OUC ELECTRIC" logo permanently embedded into the top. Each junction box shall have the cover bolted into place when shipped. The covers and pentahead bolts shall not be shipped separately.**
~~13" X 24" flush to ground secondary service junction box and cover shall be light traffic rated (minimum 5000 pound wheel bearing weight). Junction box shall be tapered, have open flanged bottom, and the cover shall fasten down with at least one (1) pentahead stainless steel bolt. A polymer concrete ring and cover (or preapproved overhang device of another type) around the top shall act a concrete (side walk) lock in device. Covers shall have a non-skid surface and the "OUC ELECTRIC" logo permanently embedded into the top. Each junction box shall have the cover bolted into place when shipped. The covers and pentahead bolts shall not be shipped separately. Boxes shall be OUC stock # 046-08000. Order per OUC specifications. OUC data sheets are included at the end of this Item. The 13" X 24" secondary service pull box and cover shall not be paid for separately and shall be considered incidental to its respective L-112-2" duct pay item.~~
- L.** Street light controller shall be provided and installed by OUC. Post and other support materials by Contractor.
- M.** Install all fixtures in accordance with manufacturers' written instructions, and the requirements of GOAA, OUC, NEC, IES and National Electrical Safety Code.

- N. Install lighting poles at locations indicated. Install poles plumb. On aluminum poles, provide double nuts to adjust plumb and grout around each base using non-shrink grout specified elsewhere. Install lamps in each luminaire. Bond luminaires, metal accessories and metal poles to branch circuit equipment grounding conductor as required by OUC standards. All grounding required by FDOT, GOAA, NEC and OUC is incidental to the OUC Street Light 26 05 12 (Civil) pay item. Provide supplementary grounding electrodes at each pole as required by FDOT and OUC standards. Grounding conductors and electrodes shall be considered incidental to the OUC Street Light 26 05 12 installation. Pole installation shall comply with wind loading criteria stated on the plans. Duct sealing compound shall be installed to seal all conduits entering exterior light fixtures from underground.

- O. Street light pole ground rods shall be copper clad steel sectional type, 3/4" in diameter. 20' of ground rod shall be installed at each street light pole and 40' of ground rod at each street light service. Additional length of the rod shall be determined by earth resistance testing. Each rod shall be individually tested for a not to exceed earth resistance of 25 ohms prior to connection of the grounding conductors. Additional sections shall be added until the not to exceed value of 25 ohms is obtained. The Contractor shall perform the necessary inspection and test for these items concurrently with the installation because of subsequent inaccessibility of some components. Earth resistance test method shall be by the "Three Point Method" and the proposed method shall be submitted to the OAR for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the OAR. All grounding materials and installation is incidental to the 26 05 12 installation of which it is a component part.

3.13 ELECTRIC UTILITY SERVICES

- A. Electric Utility Service: Provide service post, primary disconnect, meter base, and secondary service fused disconnect per OUC requirements. Contractor shall confirm these requirements with OUC prior to start of work. OUC to provide high voltage transformers, primary cabling, and transformer grounding. Contractor shall furnish and install transformer pads and switch pads, all trenches and conduit from primary power manhole/pull box to transformer/switch and metering post. Utility to install transformers, primary feeders and transformer grounding. Contractor shall provide and install all transformer secondary cable, meter base, meter post equipment and electrical distribution equipment.

- B. The Contractor's installation shall comply with the requirements of GOAA, OUC, NEC, IES, National Electrical Safety Code and the Authority Having Jurisdiction. Contractor is responsible for obtaining all electrical permits and required inspections. The costs for permits and inspections shall be considered incidental to the respective pay item of which it is a component part. Contractor is responsible to furnish and install all materials and equipment to provide a fully operational electrical service in accordance with the contract documents and acceptable to the OAR.

- C. Ground rods shall be copper clad steel sectional type, 3/4" in diameter. The length of the rod shall be determined by earth resistance testing. Each rod shall be individually tested for a not to exceed earth resistance of 5 ohms prior to connection of the counterpoise or grounding conductors. Additional sections shall be added until the not to exceed value of 5 ohms is obtained. The Contractor shall perform the necessary inspection and test for these items concurrently with the installation because of subsequent inaccessibility of some components. Each ground rod shall be located and dimensioned on the As-built Drawings. Earth resistance test method shall be by the "Three Point Method" and the proposed method shall be submitted to the OAR for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the OAR. All grounding materials and installation is incidental to the 26 05 12 (Civil) pay item of which it is a component part.

PART 4 – METHOD OF MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. The quantity of units to be paid for under this item (except duct) shall be the number of each type installed, complete and in place, ready for operation, and accepted by the OAR. Each unit shall include the installation of all incidentals and appurtenances as detailed in the Contract Documents.
- B. The quantity of duct to be paid for under this item shall be the linear feet of each type installed, complete and in place, ready for operation, and accepted by the OAR. Each duct installation shall include all incidentals and appurtenances as detailed in the Contract Documents.


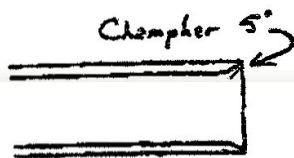

PART 5 – BASIS OF PAYMENT

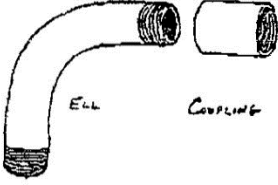
5.1 BASIS OF PAYMENT

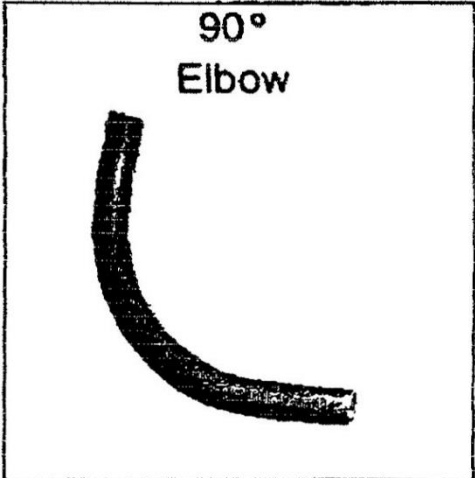
- A. General
1. All work identified on the plans and described herein shall be the responsibility of the Contractor. The Contractor shall coordinate all work for underground OUC electric, street lighting and electrical service facilities. GOAA emergency generator primary power manholes, duct, grounding and all incidentals shall be paid for within the OUC pay items provided below. The following pay items have been developed for payment purposes to the Contractor. **The Contractor shall install a 4/0 bare copper ground wire as part of the 6" duct, pull box and manhole installation with no separate measurement or payment.** This price shall include all concrete, rebar, markers, tags, sealants, adhesives, gravel, sodding, excavation, backfill, dewatering, incidentals and appurtenances, etc., necessary for the complete installation of the item to the satisfaction of the OAR

and OUC. This price shall be full compensation for furnishing all materials and for all preparation, assembly and installation of these materials, and for all appurtenances necessary to complete these items. Any incidental work items not specifically identified and not provided by OUC shall be part of the Contractor's work effort, and included as part of the pay items below with no separate identification and payment.

Item 26 05 12-5.1	1 W 2" Schedule 40 PVC OUC Direct Buried Streetlight Duct	- per Linear Foot (LF)
Item 26 05 12-5.2	2 W 2" Schedule 40 PVC OUC Concrete Encased Streetlight Duct	- per Linear Foot (LF)
Item 26 05 12-5.3	1 W 6" Schedule 40 PVC OUC Concrete Encased Duct	- per Linear Foot (LF)
Item 26 05 12-5.4	2 W 6" Schedule 40 PVC OUC Concrete Encased Duct	- per Linear Foot (LF)
Item 26 05 12-5.5	4 W 6" Schedule 40 PVC OUC Concrete Encased Duct	- per Linear Foot (LF)
Item 26 05 12-5.6	8 W 6" Schedule 40 PVC OUC Concrete Encased Duct	- per Linear Foot (LF)
Item 26 05 12-5.7	12 W 6" Schedule 40 PVC OUC Concrete Encased Duct	- per Linear Foot (LF)
Item 26 05 12-5.8	10' X 20' X 8' OUC Aircraft Rated Manhole - Complete	- per Each (EA)
Item 26 05 12-5.9	<u>24" X 36" X 24"D OUC Pull Box – Complete - per Each (EA)</u> 10' X 20' X 8' OUC Aircraft Rated Manhole Elevation Adjustment, Existing Manhole to New Apron - Complete	- per Each (EA)
Item 26 05 12-5.10	OUC LED Street Light Assembly, Inclusive of Fixture, Arm, Pole, Wiring, Pull Box - Complete	- per Each (EA)
Item 26 05 12-5.11	OUC Street Service Point – Complete	- per Each (EA)
Item 26 05 12-5.12	OUC Transformer Pad – 250 kVA to 3,000 kVA – Complete	- per Each (EA)

Description / Requirements		SCHEDULE 40 AND 80 PVC CONDUIT																																																													
<p>Conduit, PVC (Polyvinyl Chloride) Gray Electrical Grade</p> <p>- Schedule 40 is ordered in ten and twenty feet lengths - Schedule 80 in only 10 feet lengths. A coupling at one end is required and may be either a glued-on or expanded type (if expanded type is supplied, min. socket depth dimensions must comply with ASTM F512-95 Table 2). The end without coupling must have the inside lip edge chamfered 5 degrees to remove any sharpness from the edges (this requirement applies to both Schedule 40 and Schedule 80 conduit and all of the various diameter sizes). - Conduit must be shipped in bundles in a manner which allows unloading by a forklift (preferably on an open flatbed truck or trailer). - Order by type and size per above specifications.</p>																																																															
<p>Beveled End Dimensions (Inches):</p> <table border="1"> <thead> <tr> <th rowspan="2">Size</th> <th colspan="2">Avg. Entrance</th> <th rowspan="2">Tolerance On Diameters</th> <th rowspan="2">Out of Round Tolerance</th> <th colspan="2">Socket Depth</th> </tr> <tr> <th>Diameter</th> <th>Avg. Bottom Diameter</th> <th>Min.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.331</td> <td>1.320</td> <td>+/- 0.005</td> <td>0.060</td> <td>1.000</td> <td>1.750</td> </tr> <tr> <td>1 1/2</td> <td>1.921</td> <td>1.906</td> <td>+/- 0.006</td> <td>0.060</td> <td>1.375</td> <td>2.125</td> </tr> <tr> <td>2</td> <td>2.400</td> <td>2.381</td> <td>+/- 0.006</td> <td>0.060</td> <td>1.750</td> <td>2.500</td> </tr> <tr> <td>3</td> <td>3.538</td> <td>3.508</td> <td>+/- 0.008</td> <td>0.060</td> <td>2.875</td> <td>3.625</td> </tr> <tr> <td>4</td> <td>4.544</td> <td>4.509</td> <td>+/- 0.009</td> <td>0.100</td> <td>3.375</td> <td>4.125</td> </tr> <tr> <td>5</td> <td>5.614</td> <td>5.573</td> <td>+/- 0.010</td> <td>0.100</td> <td>4.000</td> <td>4.750</td> </tr> <tr> <td>6</td> <td>6.687</td> <td>6.636</td> <td>+/- 0.011</td> <td>0.100</td> <td>5.000</td> <td>5.750</td> </tr> </tbody> </table>				Size	Avg. Entrance		Tolerance On Diameters	Out of Round Tolerance	Socket Depth		Diameter	Avg. Bottom Diameter	Min.	Max.	1	1.331	1.320	+/- 0.005	0.060	1.000	1.750	1 1/2	1.921	1.906	+/- 0.006	0.060	1.375	2.125	2	2.400	2.381	+/- 0.006	0.060	1.750	2.500	3	3.538	3.508	+/- 0.008	0.060	2.875	3.625	4	4.544	4.509	+/- 0.009	0.100	3.375	4.125	5	5.614	5.573	+/- 0.010	0.100	4.000	4.750	6	6.687	6.636	+/- 0.011	0.100	5.000	5.750
Size	Avg. Entrance		Tolerance On Diameters		Out of Round Tolerance	Socket Depth																																																									
	Diameter	Avg. Bottom Diameter		Min.		Max.																																																									
1	1.331	1.320	+/- 0.005	0.060	1.000	1.750																																																									
1 1/2	1.921	1.906	+/- 0.006	0.060	1.375	2.125																																																									
2	2.400	2.381	+/- 0.006	0.060	1.750	2.500																																																									
3	3.538	3.508	+/- 0.008	0.060	2.875	3.625																																																									
4	4.544	4.509	+/- 0.009	0.100	3.375	4.125																																																									
5	5.614	5.573	+/- 0.010	0.100	4.000	4.750																																																									
6	6.687	6.636	+/- 0.011	0.100	5.000	5.750																																																									
Details & OUC Stock No.		Manufacturer & Catalog No.																																																													
<p><u>Schedule 40</u></p> <table border="1"> <tbody> <tr><td>1 inch x 10 feet</td><td>046-22010</td><td>See above -</td></tr> <tr><td>1 1/2 inch x 10 feet</td><td>046-22015</td><td>See above -</td></tr> <tr><td>2 inch x 20 feet</td><td>046-22020</td><td>See above -</td></tr> <tr><td>2 inch x 10 feet</td><td>046-22021</td><td>See above -</td></tr> <tr><td>3 inch x 20 feet</td><td>046-02030</td><td>See above -</td></tr> <tr><td>3 inch x 10 feet</td><td>046-22031</td><td>See above -</td></tr> <tr><td>4 inch x 20 feet</td><td>046-02040</td><td>See above -</td></tr> <tr><td>4 inch x 10 feet</td><td>046-22041</td><td>See above -</td></tr> <tr><td>5 inch x 20 feet</td><td>046-02050</td><td>See above -</td></tr> <tr><td>5 inch x 10 feet</td><td>046-22051</td><td>See above -</td></tr> <tr><td>6 inch x 20 feet</td><td>046-02060</td><td>See above -</td></tr> <tr><td>6 inch x 10 feet</td><td>046-22061</td><td>See above -</td></tr> </tbody> </table> <p><u>Schedule 80</u></p> <table border="1"> <tbody> <tr><td>1 inch x 10 feet</td><td>046-22810</td><td>See above -</td></tr> <tr><td>2 inch x 10 feet</td><td>046-22820</td><td>See above -</td></tr> <tr><td>3 inch x 10 feet</td><td>046-02830</td><td>See above -</td></tr> <tr><td>4 inch x 10 feet</td><td>046-02840</td><td>See above -</td></tr> <tr><td>6 inch x 10 feet</td><td>046-02860</td><td>See above -</td></tr> </tbody> </table>		1 inch x 10 feet	046-22010	See above -	1 1/2 inch x 10 feet	046-22015	See above -	2 inch x 20 feet	046-22020	See above -	2 inch x 10 feet	046-22021	See above -	3 inch x 20 feet	046-02030	See above -	3 inch x 10 feet	046-22031	See above -	4 inch x 20 feet	046-02040	See above -	4 inch x 10 feet	046-22041	See above -	5 inch x 20 feet	046-02050	See above -	5 inch x 10 feet	046-22051	See above -	6 inch x 20 feet	046-02060	See above -	6 inch x 10 feet	046-22061	See above -	1 inch x 10 feet	046-22810	See above -	2 inch x 10 feet	046-22820	See above -	3 inch x 10 feet	046-02830	See above -	4 inch x 10 feet	046-02840	See above -	6 inch x 10 feet	046-02860	See above -	<p>Approved Manufacturers for PVC conduit are Cantex, Carlon and Georgia Pipe</p> 										
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		<p>Electric System Approved Material Manual</p>																																																													
		<p>Revision Date: 08 / 25 / 99 Category CONDUIT Page Identification No. CO-40</p>																																																													

Description / Requirements	GALVANIZED CONDUIT ACCESSORIES																																																																																											
<ul style="list-style-type: none"> - Couplings, galvanized conduit, 1 inch diameter to 6 inch diameter sizes. - Ells, 90 degree, galvanized conduit, 1 inch diameter to 6 inch diameter sizes. - Ells, 45 degree, galvanized conduit, 2 - 4 inch diameters only. - Ells, 11 and 22.5 degree, galv., in 4 inch and 6 inch diameters. - Sweep ells, galv., 3 ft. radius. Specify diameter and length. <p>* All galvanized ells must have threads which will accept common PVC to galvanized female adapters.</p>																																																																																												
<p>Details & OUC Stock No.</p>	<p>Manufacturer & Catalog No.</p>																																																																																											
<p>Approved Manufacturers for galvanized conduit and conduit accessories are: Conduit Pipe Products, Picoma, Pittsburgh Nipple, Robroy, Shamrock and Wheatland.</p>																																																																																												
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<p>ORLANDO UTILITIES COMMISSION Electric Engineering Standards Approved Material List</p>	<p>Date June 8, 1998 Category CONDUIT Page Identification No. CO-30 ✓</p>																																																																																											

DESCRIPTION / REQUIREMENTS	Sweep - SCH 40 PVC																																																																
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<p>OUC / ST. CLOUD ELECTRIC ENGINEERING STANDARDS APPROVED MATERIAL LIST</p>	<p>DATE: MAY 1, 1997 CATEGORY: CONDUIT PAGE IDENTIFICATION NO. CO-705 ✓</p>																																																																

Revision Date:

Description:

TAPE
WARNING
"RED"

Specs/Remarks:

Warning Tape for buried "Electric" cables - placed in ground as a warning device a short distance above underground cables and ducts, 4 mils thick, polyethylene, 6" wide x 1000' long. ARE@ in color with Black printing. Marked: BURIED ELECTRIC LINE BELOW - CAUTION CAUTION CAUTION = (1 1/4" high) Call Orlando Utilities Commission 407-823-9150 = (3/4" high) BURIED ELECTRIC LINE BELOW (1 1/4" high)

Available Spec Sheets Online:

Manufacturer	Catalog # Revision Date	Revised By
MICHAEL ARNOLD	PER SPEC	AURSI
REEF INDUSTRIES	PER SPEC TERRA TAPE	AURSI
THOR ENTERPRISES	PER SPEC SHIELDTEC	AURSI

Engineering Contact(s)

Mark Hoover	mhoover@ouc.com	407-384-4173
Ric Dy-Liacco	rdyliacco@ouc.com	407-384-4028

Purchasing Contact(s)

Harvey Lippa	hlippa@ouc.com	407-737-4290
Mark Ausley	mausley@ouc.com	407-384-4080

[Provided by www.aursi.com](http://www.aursi.com)

Revision Date:

Description:

SHORTING CAP TWIST-LOCK

Specs/Remarks:

Available Spec Sheets Online:

Manufacturer	Catalog #	Revised By	Revision Date
FISHER PIERCE	S1039	AURSI	
GE	C403G003	AURSI	
LAMPAS	6120-SC	AURSI	
RIPLEY	6005	AURSI	

Engineering Contact(s)

Mark Hoover	mhoover@ouc.com	407-384-4173
Ric Dy-Liacco	rdyliacco@ouc.com	407-384-4028

ORLANDO INTERNATIONAL AIRPORT
BP-S196: TERM C, PH 1X -
AIRFIELD CIVIL, APRON & TAXIWAY PAVING

OUC UNDERGROUND ELECTRIC
SECTION 26 05 12

Purchasing Contact(s)

Harvey Lippa	hlippa@ouc.com	407-737-4290
Mark Ausley	mausley@ouc.com	407-384-4080

[Provided by www.aursi.com](http://www.aursi.com)

Description:

BOX, FLUSH TO GROUND STREET LIGHT 10 X 15 INCH

Specs/Remarks:

Box and Cover, for streetlight cable connections, 10K "parkway" load rated. Approximate dimensions: 10 inches wide x 15 inches long (top measurements) x 12 inches deep. Box will be tapered and have an open flanged bottom and the cover will fasten down with at least one pentahead stainless steel bolt. A poly-mer concrete ring and cover around the top will act as a concrete (sidewalk) lock-in device. Covers will have a non-skid surface and the "OUC ELECTRIC" logo and "10K" (load rating) permanently embedded into the top. Each box will have the cover bolted (pentahead bolts) into place when shipped.

Available Spec Sheets Online:

Manufacturer	Catalog #	Revised By	Revision Date
ARMORCAST	A6001923AX12	Mark Hoover	11/7/2002
CARSON INDUSTRIES CDR SYSTEMS	1419-12-HP-PR-BL PA40-1015-12	AURSI AURSI	

Engineering Contact(s)

Mark Hoover	mhoover@ouc.com	407-384-4173
Ric Dy-Liacco	rdyliacco@ouc.com	407-384-4028

Purchasing Contact(s)

Harvey Lippa	hlippa@ouc.com	407-737-4290
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**AURSI - Online Approved Materials
Manual Orlando Utilities**

Commission

Stock #: 046-08000

Revision Date: 11/18/2002

Description:

BOX, FLUSH TO GROUND SECONDARY JUNCTION 13 X 24 INCH

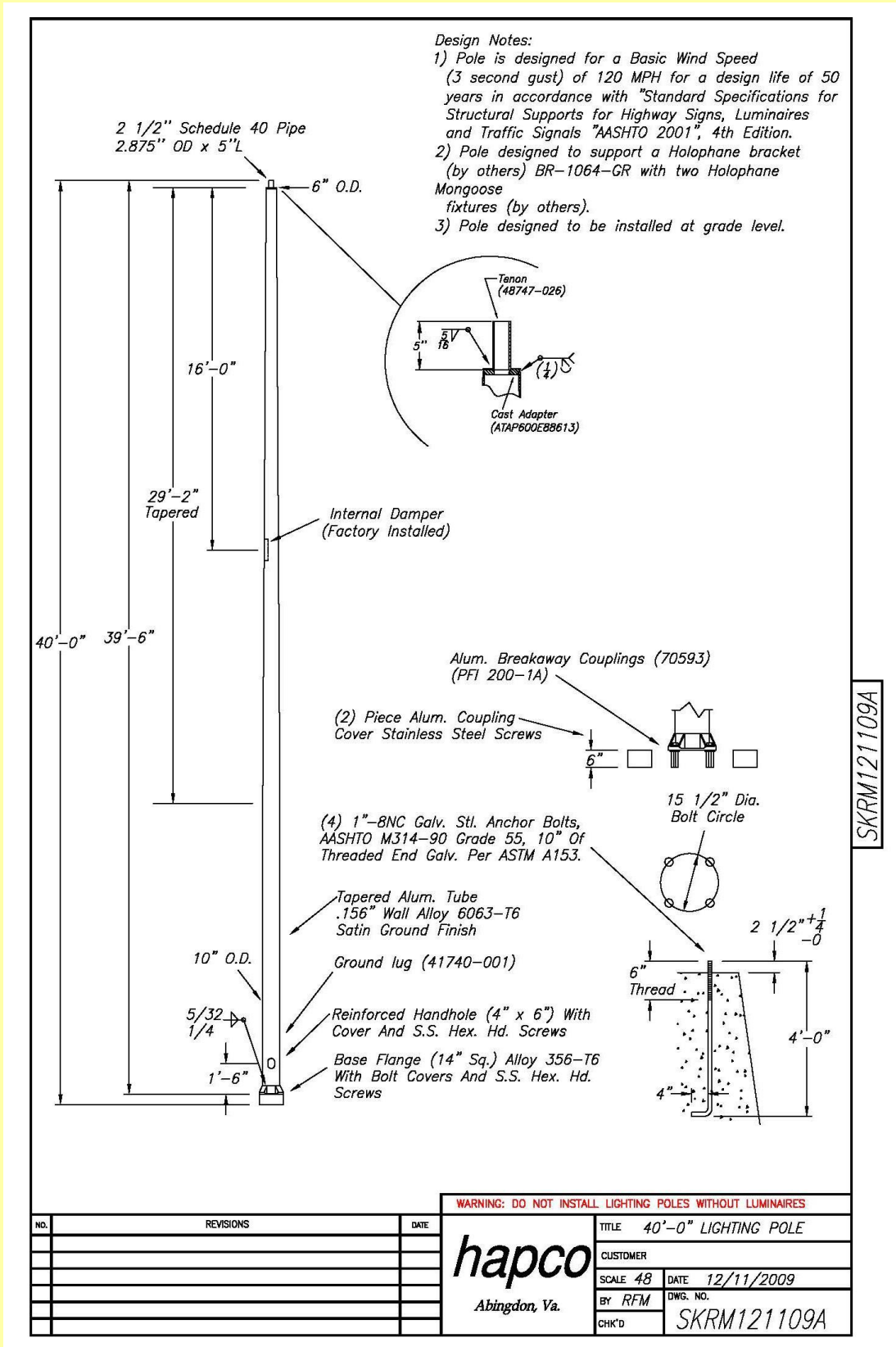
Specs/Remarks:

Box and cover - for secondary services, 10K "Parkway" load rated. Approximate dimensions: 13 inches wide x 24 inches long (top measurements) x 18 inches deep. Box will be tapered, have an open flanged bottom and the cover will fasten down with at least one pentahead stainless steel bolt. A polymer concrete ring and cover around the top will act as a concrete (sidewalk) lock-in device. Covers will have a non-skid surface and the "OUC ELECTRIC" logo and "10K" (load rating) permanently embedded into the top. Each box will have the cover bolted (with pentahead bolts) into place when shipped.

Available Spec Sheets Online:

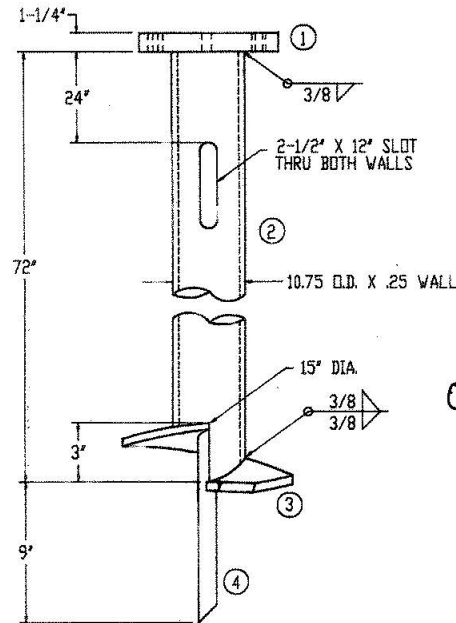
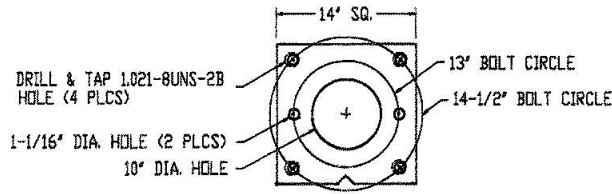
Manufacturer	Catalog #	Revised By	Revision Date
ARMORCAST	A6001946AX18	Mark Hoover	11/7/2002
CARSON INDUSTRIES	1324-15-HP-BL	AURSI	
CDR SYSTEMS	PA10-1324-18	AURSI	
QUAZITE	PG1324BA18	AURSI	
Engineering Contact(s)			
Mark Hoover	mhoover@ouc.com	407-384-4173	
Ric Dy-Liacco	rdyliacco@ouc.com	407-384-4028	
Purchasing Contact(s)			
Harvey Lippa	hlippa@ouc.com	407-737-4290	
Mark Ausley	mausley@ouc.com	407-384-4080	

[Provided by www.aursi.com](http://www.aursi.com)



SKRM121109A

USE WITH T-BASE 036-26089 ONLY



OUC #036-26092

ITEM NO.	DESCRIPTION	QUANTITY				
		A	B	C	D	E
1.	TOP PLATE - PLATE, STEEL HRM ASTM A36, 1-1/4 X 14 X 14	1				
2.	PIPE SHAFT - PIPE, STEEL HRM ASTM A36, 10" SCH 20	1				
3.	HELIX SLIDER, 1/2 X 15 X 1-1/4	1				
4.	STINGER - ROUND BAR, STEEL HRM ASTM A36, 1-1/4 X 12	1				
5.	BOLT, HEX HD MACH, 1 X 4 (FULL THREAD)	4				
6.	NUT, HEX JAM, 1	4				

NOTES :

- HOT DIP GALV PER ASTM A123, AFTER FABRICATION.
- ANCHOR SHALL BE SHIPPED WITH HARDWARE BAGGED AND SECURED TO PIPE SHAFT.
- ANCHOR IS DESIGNED TO WITHSTAND 10,000 FT-LBS OF INSTALLATION TORQUE.
- ALL HARDWARE SHALL BE ASTM A325 OR SAE J429 GRADE 5.

CATALOG NO.	PART
0-1061514.5	A

ALL UNTOLERANCED DIMENSIONS ARE FOR REFERENCE PURPOSES AND HAVE BEEN PREVIOUSLY DIMENSIONED AND TOLERANCED ON LOWER LEVEL DRAWINGS.

SUFFIC NO.	CHANGED FROM	E. A. NO.	DATE
A	ADDED CATALOG NUMBER		6-2-89

ALL INFORMATION CONTAINED IN THIS DISCLOSURE WHETHER PAYABLE TO OTHERS OR EMPLOYEES PROPRIETARY INFORMATION OF DIXIE ELECTRICAL MANUFACTURING CO AND ITS UNAUTHORIZED USE OR PUBLICATION WITHOUT THE EXPRESS CONSENT OF DIXIE ELECTRICAL MANUFACTURING CO IS STRICTLY PROHIBITED.

DIXIE ELECTRICAL
 MANUFACTURING COMPANY
 P.O. BOX 170040 BIRMINGHAM, ALABAMA 35217-0040

NAME	DRAWN	DATE	SCALE	PROJECT	REV.
FOUNDATION ANCHOR, 10 X 72 FOR ORLANDO UTILITIES	KOSVATH	6-2-89	1:1	P908	A

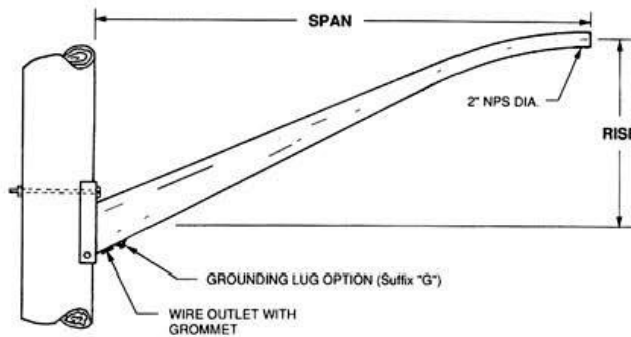
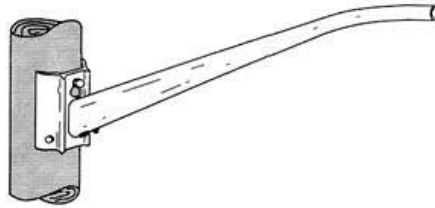


- Home
- What's New
- Company Information
- Mounting Specifications
- Tapered Brackets**
- Pipe Brackets
- Floodlighting
- "A" Frames & Truss Designs

▶ Tapered Brackets

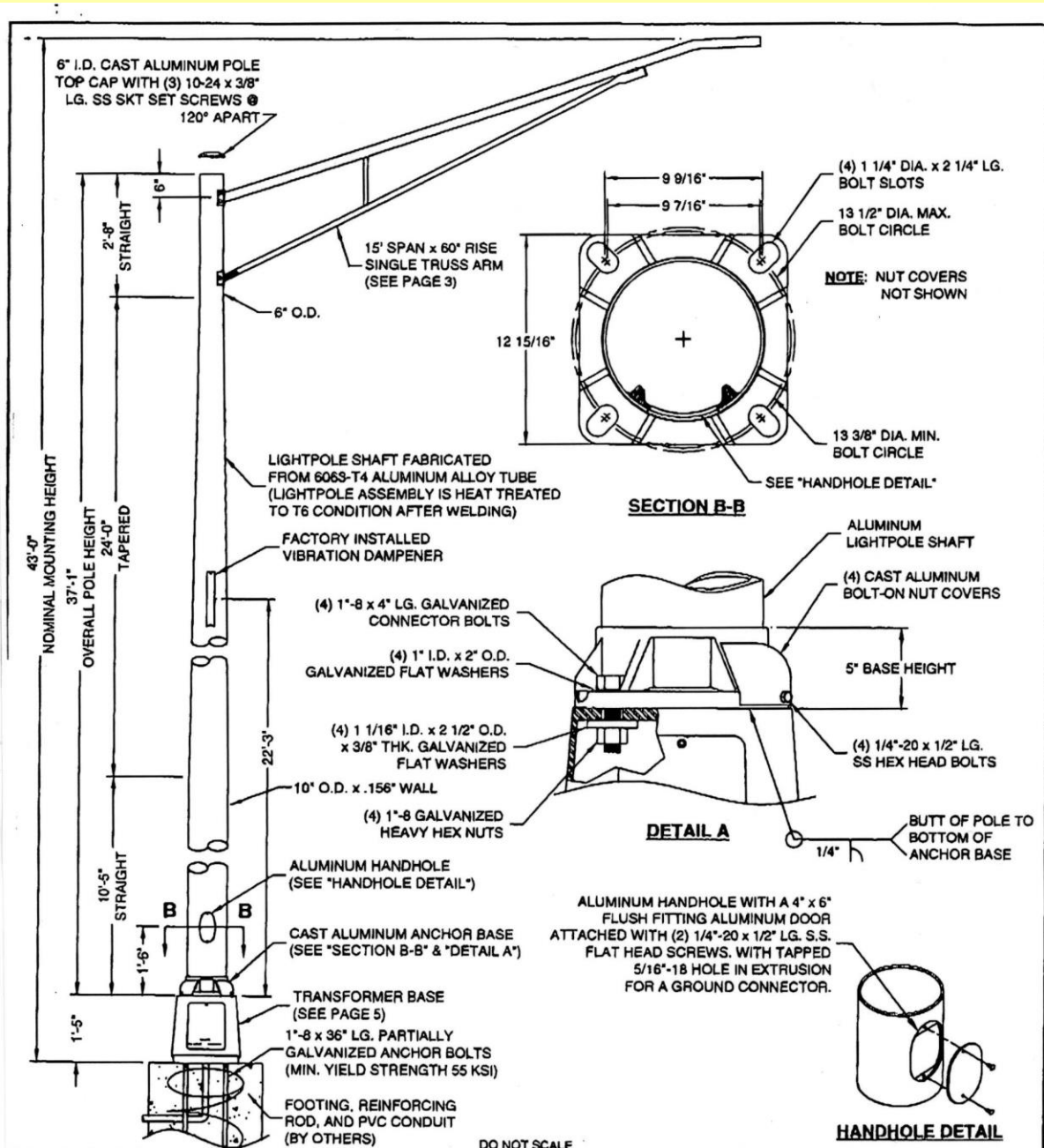
"Tapertruss" - Fabricated Aluminum Brackets for Wood, Concrete or Fiberglass Poles

NOTE:
 Type of pole to be mounted must be specified. If other than wood, manufacturer class and/or mounting diameter of pole must be specified.



CATALOG NO.	TYPE	SPAN	RISE
2004515T(G)	4 FT.	45"	15"
2006824T(G)	6 FT.	68"	24"
2009032T(G)	8 FT.	90"	32"
20011439T(G)	10 FT.	114"	39"
20013846T(G)	12 FT.	138"	46"

"Tapertruss" - Fabricated Aluminum Brackets



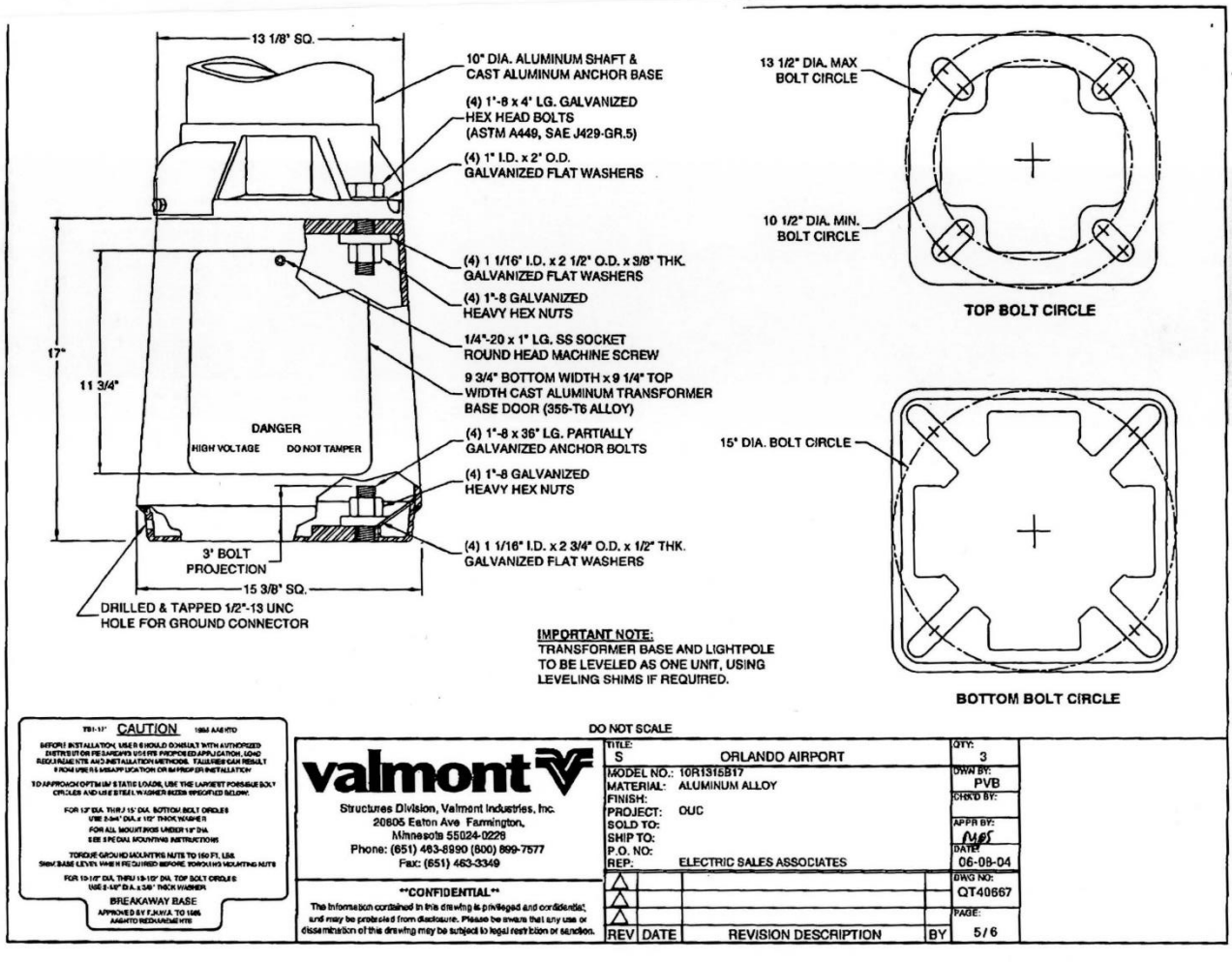
valmont
 Structures Division, Valmont Industries, Inc.
 20805 Eaton Ave Farmington,
 Minnesota 55024-0228
 Phone: (651) 463-8990 (800) 899-7577
 Fax: (651) 463-3349

TITLE: S	ORLANDO AIRPORT	QTY: 3
MODEL NO.:		DWN BY: PVB
MATERIAL: FINISH:	ALUMINUM ALLOY 100 GRIT SATIN POLISH	CHK'D BY:
PROJECT:	OUC	APPR BY: M
SOLD TO:		DATE: 06-08-04
SHIP TO:		DWG NO.:
P.O. NO.:		QT40667
REP.:	ELECTRIC SALES ASSOCIATES	PAGE:
REV	DATE	REVISION DESCRIPTION
		BY
		1 / 6

"CONFIDENTIAL"
 The information contained in this drawing is privileged and confidential, and may be protected from disclosure. Please be aware that any use or dissemination of this drawing may be subject to legal restriction or sanction.

JUN 21 '04 17:11

651 463 7379
 PAGE 05



CAUTION
 BEFORE INSTALLATION, USER SHOULD CONSULT WITH AUTHORIZED DISTRIBUTION FOR SPECIFIC USE AND PROPER APPLICATION, LOAD RATING, WEIGHTS AND INSTALLATION METHODS. FAILURE TO FOLLOW THESE INSTRUCTIONS OR AN IMPROPER INSTALLATION TO APPROXIMATELY 50% OF THE LOADS, USE THE LARGEST POSSIBLE BOLT CIRCLES AND USE STEEL WASHERS UNDER WOODEN BOLDS.
 FOR 10" DIA. THRU 15" DIA. BOTTOM BOLT CIRCLES USE 3/4" DIA. x 10" THICK WASHERS
 FOR ALL MOUNTING POINTS UNDER 10" DIA. SEE 5/10" DIA. MOUNTING INSTRUCTIONS
 TORQUE GROUND MOUNTING NUTS TO 160 FT. LBS. SHIM BASE LEVEL WHEN REQUIRED BEFORE TORQUING MOUNTING NUTS
 FOR 10" DIA. THRU 15" DIA. TOP BOLT CIRCLES USE 2" DIA. x 2 1/2" THICK WASHERS
BREAKAWAY BASE
 APPROVED BY F.L.A. TO 146
 A64170 REDUCED/MS/HT

valmont
 Structures Division, Valmont Industries, Inc.
 20805 Eaton Ave. Farmington, Minnesota 55024-0228
 Phone: (651) 463-8990 (800) 869-7577
 Fax: (651) 463-3349
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DO NOT SCALE

TITLE:	S ORLANDO AIRPORT	QTY:	3
MODEL NO.:	10R1516B17	OWN BY:	PVB
MATERIAL:	ALUMINUM ALLOY	CHKD BY:	
FINISH:		APPR BY:	MS
PROJECT:	OUC	DATE:	06-08-04
SOLD TO:		DWG NO.:	QT40667
SHIP TO:		PAGE:	5/6
P.O. NO.:		REP:	ELECTRIC SALES ASSOCIATES
REV	DATE	REVISION DESCRIPTION	BY

END OF SECTION 26 05 12

SECTION 26 05 43 – UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL
SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Contractual Conditions and Division 01 Specification sections apply to this section.

1.2 SUMMARY

- A. This section includes the requirements for provision and installation of underground ducts and raceways for electrical systems.

1.3 DESCRIPTION

- A. Provide and install all equipment, labor, material, accessories and mounting hardware for a complete and operating duct bank system including, but not limited to:
 - 1. Plastic conduit.
 - 2. Metal conduit.
 - 3. Rigid Metal.
 - 4. Duct.
 - 5. Manholes.
- B. System to include PVC conduit with asphaltum coated rigid galvanized sweeping elbows for all changes in direction, all encased in 3 inch red concrete envelope.
- C. Manholes are to be size and type as required for use. Manholes for primary power must comply with requirements of local utility company (OUC).
- D. Provide and install ductbank, can plaza, manhole, conduit systems for all electrical for airfield primary electric, electrical feeders & branch circuits, communications and fiber optics.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate dimensions, reinforcement, size and locations of openings and accessory locations for manholes.
- B. Product Data: Provide for nonmetallic conduit and manhole accessories.

- C. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation.

1.5 PROJECT AS-BUILT DOCUMENTS

- A. Record actual locations of exact routing of duct bank, dimension from known landmarks (Survey Points).
- B. Record actual locations of each manhole, dimension from known landmarks (Survey Points).

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified with minimum three years experience.

1.7 REFERENCES AND REGULATORY REQUIREMENTS

- A. Furnish products listed and classified by Underwriters Laboratories, Inc. and testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.
- B. Conform to the requirements of the following:
 1. AASHTO - Standard Specification for Highway Bridges.
 2. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.
 3. ANSI/ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.
 4. ANSI/ASTM A569 - Steel, Sheet and Strip, Carbon (0.15 Maximum Percent), Hot-Rolled, Commercial Quality.
 5. ANSI/IEEE C2 - National Electrical Safety Code.
 6. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 7. ANSI/NFPA 70 - National Electrical Code.
 8. ASTM A48 - Gray Iron Castings.
 9. ASTM A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strips.
 10. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
 11. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
 12. NEMA TC 6 - PVC and ABS Plastic Utilities Duct for Underground Installation.
 13. NEMA TC 8 - Extra-Strength PVC Plastic Utilities Duct for Underground Installation.
 14. NEMA TC 9 - Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.
 15. NEMA TC 10 - PVC and ABS Plastic Communications Duct and Fittings for Underground Installation.
 16. NEMA TC 14 - Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings.

1.8 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of duct bank prior to excavation for rough-in.
- C. Duct bank routing is shown in approximate locations unless dimensions are indicated. Route as required to complete duct system.
- D. Manhole and can plaza locations are shown in approximate locations unless dimensions are indicated. Locate as required to complete duct bank system.

PART 2 - PRODUCTS

2.1 CONDUIT

- A. Comply with Division 26 Section Conduits.

2.2 ACCESSORIES

- A. Underground Warning Tape: 4 inch wide plastic tape, detectable type, colored in accordance with American Public Works Association Uniform Color Code with suitable warning legend describing buried electrical lines.

2.3 CONCRETE

- A. Concrete shall be as required by *Item P-610*, ~~other divisions of these specifications, but in no case shall concrete be less than 3000 psi.~~
- A. Reinforced precast concrete, as specified in Division 03.
- B. Construction: Modular sections with tongue-and-groove joints.
- C. Reinforcing: AASHTO Classification H-20.

2.4 CAST-IN-PLACE MANHOLE ACCESSORIES

- A. Frames and Covers: ASTM A48; Class 30B gray cast iron, 30 inch size, machine finished with flat bearing surfaces. Provide cover marked ELECTRIC to indicate utility.
- B. Cable Pulling Irons: Use galvanized rod and hardware.
- C. Cable Rack Inserts: Minimum load rating of 800 pounds (365 kg).

- D. Cable Rack Mounting: All cables in manholes shall be properly supported on cable supports a minimum of every 36". Provide new cable supports in existing manholes as required for proper support of both the new and existing cables. Supports shall be fastened to manhole wall with approved concrete anchors.
- E. Cable Racks: Shall be nonmetallic saddle type that is nonconductive and will never rust or corrode. Cable saddle rack shall be at least 32" long, 3" wide, incorporate three cable saddles that are 5" deep with a 3" throat opening and four elongated mounting holes. At least one spare hook shall be available at each cable rack position for future use.
- F. Manhole Steps: Ladder: Aluminum rung with top hook to engage manhole step. Provide one ladder for each manhole.
- G. Sump Covers: ASTM A48; Class 30B gray cast iron with hinged lift assist.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that excavation, base material installation, and compaction is completed.

3.2 PREPARATION

- A. Prepare excavation in accordance with manhole manufacturer's instructions.

3.3 DUCT BANK INSTALLATION

- A. Install duct in accordance with manufacturer's instructions.
- B. Install duct to locate top of duct bank at depths as indicated on drawings.
- C. Install ducts with minimum slope of 4 inches per 100 feet. Slope away from building entrances.
- D. Cut duct square using saw or pipe cutter; de-burr cut ends.
- E. Insert duct to shoulder of fittings; fasten securely.
- F. Join nonmetallic duct using adhesive as recommended by manufacturer.
- G. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

- H. Install no more than equivalent of three 90-degree bends between pull points.
- I. Provide suitable fittings to accommodate expansion and deflection where required.
- J. Stagger duct joints vertically in concrete encasement 6 inches minimum.
- K. Use suitable separators and chairs installed not greater than 4 feet on centers.
- L. Band ducts together before placing concrete.
- M. Securely anchor duct to prevent movement during concrete placement.
- N. Place concrete under provisions of Division 03. Use mineral pigment to color concrete red.
- O. Provide minimum 3 inch concrete cover at bottom, top, and sides of duct bank.
- P. Provide suitable pull string in each empty duct except sleeves and nipples.
- Q. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.
- R. Backfill trenches under provisions of Division 02.
- S. Interface installation of underground warning tape with backfilling. Install tape 6 inches below finished surface.
- T. All excavation for underground feeders shall be performed in accordance with all State of Florida standards and regulations for trench safety.
- U. Maintain a minimum of 7.5 inches center-to-center spacing between all raceways.
- V. Fill medium shall be compacted to eliminate air pockets and to assure uniform heat dissipation. Concrete shall be carefully spaded to eliminate voids. All trenches shall be free of cans, bottles, scrap lumber, trash and obstructions prior to back filling.
- W. All iron, steel, galvanized steel and similar metallic items (not intended to be a grounding electrode) installed underground or within 12 inches of the earth shall be protected by a 12-mil thick layer of asphaltum coating. Apply coating in strict accordance with the manufacturer's instructions. Apply to clean dry surfaces. Asphaltum coating shall be applied in two applications/coats minimum. Observe the manufacturer's minimum cure time between applications/coats. Each application of the coating shall be given ample time to dry and harden before the next application is applied. Touch up areas damaged during installation, wrench marks, tooling, bonding clamps, exothermic welds, etc. Apply the proper consistency of asphaltum coating uniformly. The finished coating shall be free from sags, holidays, and smears. Asphaltum coating shall be Carboline Bitumastic 50 or Sumter Coatings Coal Black Asphaltum 100N8507 or accepted equivalent.
- X. Where steel conduit is threaded in the field the threads shall be coated with an approved electrically conductive, corrosion resistant compound in accordance with NEC Section 300.6(A). Use TNB KOPR_SHIELD or accepted equivalent.

3.4 PRECAST MANHOLE INSTALLATION

- A. Install and seal precast sections in accordance with manufacturer's instructions.
- B. Install manholes plumb.
- C. Use precast neck and shaft sections to bring manhole cover to finished elevation.
- D. Attach cable racks to inserts after manhole installation is complete.
- E. Install drains in manholes and connect to site drainage system 4-inch pipe terminating in 1/3 cu. yd. crushed gravel bed under provisions of Division 22.
- F. Damp proof exterior surfaces, joints, and interruptions of manholes after concrete has cured 28 days, under provisions of Division 07.

3.5 COUNTERPOISE

- A. Install counterpoise ground over all sections of duct banks.
- B. No. 2 bare stranded copper counterpoise shall be run 6 inches above all duct banks. Provide one counterpoise conductor for duct banks 12 inches wide or less. Provide two counterpoise conductors above outside edge of duct banks over 12 inches wide. Counterpoise shall run to building and be grounded at each building service ground.

3.6 COORDINATION

- A. Coordinate duct bank routing (and manhole locations) with all underground utilities and building structure. Modify location/routing shown on drawings as required to facilitate installation.

3.7 CONDUIT

- A. Install plastic conduit in concrete envelope with rigid steel sweeping elbows with largest possible factory radius for all changes in direction.
- B. Minimum bend in conduits 2" and larger shall be equal to or greater than ten (10) times the internal diameter of the conduit. Provide larger radius as necessary to achieve acceptable pulling tension or as required by cable installers.

3.8 CONDUCTORS

- A. All duct bank and manhole systems shall completely isolate Normal Utility Power and Emergency Power Systems into two separate systems.

- B. Attach cables to nonmetallic cable racks on manhole walls in a neat and orderly way.
- C. Wire other than current carrying conductors such as control or signal wiring shall be run in a separate conduit within the duct bank. Secure wires separately at the maximum distance within the manhole from all current carrying conductors.
- D. Slack cable shall be provided in manholes by routing the cables by the longest path possible through the manholes.
- E. All cables will be secured to cable racks with nylon cable ties, no tie wire, tape or substitutes will be allowed.
- F. No metal objects such as unistrut, tie wire or angle iron that can rust and become sharp objects will be allowed in manhole.
- G. Cable splicing in manholes will not be allowed without prior written permission from owner. Submittals for all cable splicing products will be required before permission is given.
- H. All conductors shall be pulled in conduits by industry approved cable pulling "tuggers" equipment. The use of construction equipment such as fork lifts, tractors and other vehicles will not be allowed. All conductors will be routed and protected by using the proper pulleys and sheaves.

PART 4 - METHOD OF MEASUREMENT

4.1 METHOD OF MEASUREMENT

- A. The items described in Specification 26 05 43 are incidental to other pay items and shall not be measured for payment.

PART 5 - BASIS OF PAYMENT

5.1 BASIS OF PAYMENT

- A. No direct payment shall be made for the work described in Specification 26 05 43. The work described in Specification 26 05 43 is incidental to other items and shall be paid for in the respective bid item of which it is a component part.

ORLANDO INTERNATIONAL AIRPORT
BP-S196: TERM C, PH 1X -
AIRFIELD CIVIL, APRON & TAXIWAY PAVING

UNDERGROUND DUCTS AND RACEWAYS
FOR ELECTRICAL SYSTEMS
SECTION 26 05 43

END OF SECTION 26 05 43

SECTION 26 57 01 – SOUTH REMAIN OVERNIGHT (RON) ELECTRICAL DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Contractual Conditions and other Division 01 Specification sections apply to this section.

1.2 SUMMARY

- A. This section includes the requirements for the South Remain Overnight (RON) Electrical Distribution System.

1.3 DESCRIPTION

- A. Provide and install all equipment, labor, material and accessories, and mounting hardware for a complete and operating system as described within the Division 26 Specification Sections.
- B. Furnish, perform, or provide all labor including planning, purchasing, transporting, storing, installing, testing, cutting and patching, trenching, excavating, backfilling, coordination, field verification, equipment (installation and safety), supplies, and materials necessary for the installation of complete electrical systems (as described or implied by these specifications and the applicable drawings) in strict accordance with applicable codes, which may not be repeated in these specifications, but are expected to be common knowledge of qualified Bidders.
- C. All work shall comply with all applicable codes as a minimum and with the additional requirements called for in these Contract Documents.
- D. Only trained and licensed personnel shall perform work. No Work shall be performed which violates applicable Codes, even if called for in the Contract Documents.
- E. Coordinate requirements with Utility Company and all applicable GOAA Testing, Certification and repair contractors prior to bid. Bid to include all work required.
- F. Make connections of all items in the Work using electric power including wire, conduit, circuit protection, disconnects and accessories. Securing of rough-in drawings and connection information for equipment involved shall also be included under this division. See other divisions for specifications for electrically operated equipment.

- G. The Contractor shall provide and install panic hardware on all RON electrical distribution structures doors. All electrical room doors shall open in the direction of egress and shall include applicable life safety signage, exit lighting and emergency lighting.

1.4 QUALITY ASSURANCE

- A. Install Work in locations shown or described in the Contract Documents, unless prevented by Project conditions.
- B. Install all equipment so that all Code and Manufacturer recommended working and servicing clearances are maintained. Properly arrange and install all equipment within designated spaces. If a departure from the Contract Documents is necessary, submit to the OAR for approval detailed drawings of the proposed changes with written reasons for the changes. No change shall be implemented without the issuance of a change order or other directive permitted by the General Conditions.
- C. The Contractor shall verify finish dimensions at the project site in preference to using dimensions noted on Contract Documents.

1.5 INVESTIGATION OF SITE

- A. Investigate the site and existing conditions thoroughly before bidding. Advise OAR of discrepancies or questions noted.
- B. During the course of the site visit, electrical bidder shall become familiar with all aspects of the proposed work and existing field conditions of the work. No compensation or reimbursement for additional expenses for failure to investigate the existing facilities will be authorized. This shall include rerouting around existing obstructions.
- C. Submission of a proposal will be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered will not be recognized.
- D. Existing conditions and utilities indicated are taken from existing construction documents, surveys, and field investigations. Unforeseen conditions can be anticipated and existing conditions shown on drawings may differ from the actual existing installation with the result being that new work may not be field located exactly as shown on the drawings. Notify OAR if deviations are found.
- E. All existing electrical is not shown. The Contractor shall become familiar with all existing conditions prior to bidding, and include in his bid the removal of all electrical equipment, wire, conduit, devices, fixtures, etc. that is abandoned due to renovation.

- F. Protect all existing electrical raceways within concrete slabs, below concrete slabs, overhead raceways, equipment, etc. from damage due to renovation. Repair or replacement of utilities or other property damaged by operations in conjunction with the work will be at no cost to the Owner.
- G. Occupied existing buildings must remain in operation while work is being performed. Schedule work for a minimum outage to Owner. Notify the OAR appropriately for any shutdown of existing systems.
- H. The 26 XX XX series of specification are applicable to the South RON Electrical Distribution System.

1.6 CONTRACT DOCUMENTS

- A. The drawings are diagrammatic and are not intended to include every detail of construction, materials, methods, and equipment. They indicate the result to be achieved by an assemblage of various systems. Coordinate equipment locations with Architectural and Structural drawings. Layout equipment before installation so that all trades may install equipment in spaces available. Coordinate installation in a neat and workmanlike manner.
- B. Contractor shall provide 1/4" scale coordination drawings for all electrical, mechanical and communications rooms during the shop drawing submittal phase, utilizing detailed dimensions from equipment actually submitted (all disciplines) and field-measured/verified existing conditions. These drawings are also required for any room where conduits equal to or greater than 1-1/4" in size, equipment (panels, HVAC, disconnects, comm. racks) or other large objects are being installed. Drawings shall show all electrical, mechanical, plumbing, fire protection, structural, etc. coordinated so that problems are discovered/prevented prior to installation. Claims during construction for additional funding in rooms where properly coordinated drawings were not submitted will not be considered.
- C. Wiring arrangements for equipment shown on the drawings are intended to be diagrammatic and do not show all required conductors and functional connections. All such items incidental to a complete and operating system shall be provided.
- D. Submit specific shop drawings which indicate the fabrication, assembly, installation, and erection of particular systems' components. Drawings that are part of the Contract Documents shall not be considered a substitute for required shop drawings, field installation drawings, code requirements, or applicable standards.
- E. Locations indicated for outlets, switches, and equipment are approximate and shall be coordinated with the Contract Documents. Where instructions or notes are insufficient to locate the item, notify the OAR.

1.7 MATERIALS AND EQUIPMENT

- A. Unless otherwise noted, all material shall be new and UL listed or labeled. In lieu of UL listing or labeling, a statement or data demonstrating compliance with contract documents from a nationally recognized testing agency shall be submitted to the OAR.
- B. Where multiple items of the same equipment or materials are required, they shall be the product of the same Manufacturer.
- C. Prior to placing equipment orders, verify the physical size of specified equipment to fit spaces allotted on the drawings and with NEC working clearances. Internal access for proposed equipment substitutions shall be provided. The required 1/4" scale drawings shall show that this coordination has taken place.
- D. Electrical equipment shall be protected from the weather, during shipment, storage, and construction per manufacturer's recommendations. Should any apparatus be subjected to possible damage by water, it shall be thoroughly dried and put through a dielectric test, at the expense of the Contractor, to ascertain the suitability of the apparatus, or it shall be replaced without additional cost to the Owner.
- E. Inspect all electrical equipment and materials prior to installation. Damaged equipment and materials shall not be installed or placed in service. Replace or repair and test damaged equipment in compliance with industry standards at no additional cost to the Owner. Equipment required for the test shall be provided by the Contractor.
- F. Material and equipment shall be provided complete and shall function up to the specified capacity/function. Should any material or equipment as a part or as a whole fail to meet performance requirements, replacements shall be made to bring performance up to specified requirements. Damages to finish by such replacements, alterations, or repairs shall be restored to prior conditions, at no additional cost to the Owner.
- G. Where tamperproof screws are specified or required, Phillips head or Allen head devices shall not be accepted. For each type used, provide OAR with three tools. OAR will designate the specific hardware design to correspond with existing devices elsewhere in the building to limit special tool requirements.
- H. Communications backboards shall be 3/4" A/B grade, Class A, flame spread, painted with light gray fire retardant paint. Neatly mask off a minimum of one (1) plywood manufacturer's pre-printed certified fire rating stamp per section of board prior to application of paint. Remove masking after paint has cured. Plywood shall comply with the requirements of Low Emitting Materials for composite wood.

1.8 COORDINATION

- A. Provide all required coordination and supervision where work connects to or is affected by work of others, and comply with all requirements affecting this Division. Work required under other divisions, specifications or drawings to be performed by this Division shall be coordinated with the Contractor and such work performed at no additional cost to Owner.
- B. The electrical subcontractor shall be provided with a set of Contract Documents for all areas of Electrical Work.
- C. Installation studies shall be made to coordinate the electrical work with other trades. Work shall be preplanned. Unresolved conflicts shall be referred to the OAR prior to installation of the equipment.
- D. Coordination drawings shall be prepared prior to the start of work. Drawings shall show the actual physical dimension required for the installation to assure proper integration of equipment with building systems and NEC required clearances. Location of conduit racking, etc., shall be provided. Coordination drawings shall be provided for all areas. Comply with the requirements of Division 01.
- E. Secure approved shop drawings from all required disciplines and verify final electrical characteristics before roughing power feeds to any equipment. When electrical data on approved shop drawings differs from that shown or called for in the Construction Documents, make adjustments to the wiring, disconnects, and branch circuit protection to match that required for the equipment installed. Adjustments to contract value will not be considered due to lack of coordination.
- F. Damage from interference caused by inadequate coordination shall be corrected at no additional cost to the Owner.
- G. Coordinate the exact location of stub-ups, etc. with OAR and Designer (and receive their approval) prior to rough-in. Locations indicated in Contract Documents are only approximate locations.
- H. The Contract Documents describe specific sizes of switches, breakers, fuses, conduits, conductors, motor starters and other items of wiring equipment. These sizes are based on specific items of power consuming equipment (heaters, lights, motors for fans, compressors, pumps, etc.). Coordinate the requirements of each load with each load's respective circuitry shown and with each load's requirements as noted on its nameplate data and manufacturer's published electrical criteria. Adjust circuit breaker, fuse, conduit, and conductor sizes to meet the actual requirements of the equipment being provided and installed and change from single point to multiple points of connection (or vice versa) to meet equipment requirements. Changes shall be made at no additional cost to the Owner.

1.9 PROVISION FOR OPENINGS

- A. Locate openings required for work. Provide sleeves, guards or other approved methods to allow passage of items installed.
- B. Coordinate with roofing Contractor on installation of electrical items which penetrate the roof. Roof penetrations shall be installed so as to not void roof warranty.
- C. Where work pierces waterproofing, it shall maintain the integrity of the waterproofing. Coordinate roofing materials which pierce roof for compatibility with membrane or other roof types with Contractor.

1.10 CONCRETE PADS

- A. Furnish and install reinforced concrete pads for transformers, switchgear, generators, motor control centers, and other free-standing equipment. Unless otherwise noted, pads shall be ~~four (4)~~ **three (3)** inches high and shall exceed dimensions of equipment being set on them, including future sections, by three (3) inches each side, except when equipment is flush against a wall where the side against the wall shall be flush with the equipment. Pads shall be reinforced with W1.4 x 1.4 6 x 6 welded wire mesh. Chamfer top edges 1/2". Trowel all surfaces smooth. ~~Provide 3000 psi concrete.~~ **Concrete shall comply with P-610.**

1.11 SURFACE MOUNTED EQUIPMENT

- A. Surface mounted fixtures, outlets, cabinets, conduit, panels, etc. shall have finish or shall be painted as directed by designer. Paint shall be in accordance with applicable sections and/or divisions of these specifications.
- B. Maintain 1/4" air space between equipment and wall.

1.12 CUTTING AND PATCHING

- A. Reference Division 01 - General Requirements.
- B. New Construction:
 - 1. Cutting of work in place shall be cut, drilled, patched and refinished by trade responsible for initial installation.
 - 2. Backfill new grades to match adjacent undisturbed surface.

1.13 INSTALLATION

- A. Erect equipment to minimize interference and delays with the execution of the Work.

- B. Take care in erection and installation of equipment and materials to avoid marring finishes or surfaces. Any damage shall be repaired or replaced as determined by the designer/OAR at no additional cost to the Owner.
- C. Equipment requiring electrical service shall not be energized or placed in service until OAR is notified and is present or have waived their right to be present. Where equipment to be placed in service involves service or connection from another Contractor or the OAR, notify the OAR in writing as appropriate when the equipment will be ready.
- D. Equipment supports shall be secured and supported from structural members unless written approval is granted by OAR.
- E. Plywood material shall not be used as a backboard for mounting panel boards, disconnects, motor starters, and dry type transformers. Provide "cast in place" type inserts or install expansion type anchor bolts. Electrical equipment shall not be mounted directly to dry wall for support without additional channels as anchors. Channels shall be anchored to the floor and structure above. Panelboards and terminal cabinets shall be provided with structural framing located within drywall partitions.
- F. Inserts, pipe sleeves, supports, and anchorage of electrical equipment shall be provided. Where items are to be set or embedded in concrete or masonry, the items shall be furnished and layout made for setting or embedment thereof so as to cause no delay.
- G. Conduit or piping systems that contain water or liquid of any kind shall not be installed over the top of any electrical equipment, transformers, racks, cabinets, or enclosures without prior written approval from the OAR.

1.14 AS-BUILT DOCUMENTS

- A. As-Built Documents: As-built Documents include Drawings, Shop Drawings, Specifications, Addenda, Change Orders, and other modifications permitted by the General Conditions.
- B. Comply with all requirements of Division 01.
- C. Verify aspects of redlined as-builts for accuracy. As-Built Documents shall show all components including but not limited to:
 - 1. All raceways 1-1/4" and above, cable tray systems, and grouped raceway racking as installed, including dimensions from fixed building lines such as column lines.
 - 2. All site underground raceways and duct banks indicating burial depths and distances from fixed building lines or global tracking coordinates.

3. Underground pull boxes and manholes including elevations. Detail manhole and pull boxes, conduit terminations (butterfly layout) including conduit sizes, designated systems and cabling description.
 4. General conduit routing from receptacle to receptacle, fixture to fixture, device to device. (Exact routing is not required for raceways 1" and smaller.)
 7. Junction box splices shall be shown in exact location and clearly noted referring to the written authorization by the OAR.
 8. Any combining of circuits (which is only allowed by specific permission).
 9. Any circuit number changes.
 10. All conductors and cables, conductors and cable sizes, raceway sizes, etc. not shown on contract documents and any changes from the documents.
 11. Any switchboard, panelboard, motor control center, relay panel, or dimming control panel schedule changes, including load changes.
 12. Exact quantity of conductors and cables shall be shown for all raceway systems.
 13. Exact location of all driven grounding electrodes including burial depths and dimensions from fixed building lines. Location of all grounding system busbars.
 14. Riser diagrams exactly as installed.
 15. Motor control devices, terminal cabinets, equipment racks, disconnects and switches and surge protection devices.
 16. Changes to the equipment schedules (i.e., symbol legends, light fixture schedule, etc.) to agree with items actually furnished.
 17. Changes to plan notes to agree with items actually furnished, actual installation methods, etc. respectfully.
 18. Cross-out all items, circuitry, devices, etc. not applicable.
- D. As-Built red line information shall not compromise the clarity of the Contract Documents and Shop Drawings. Major components such as grouped raceway assemblies, cable tray systems, larger conduits, duct banks, racking, elevations, dimensions, etc. shall be shown on a clean architectural base plan(s) separate from the Contract Electrical Documents, as required to clearly delineate work. Obtain electronic base plan file from OAR.

1.15 "OBSERVATION OF WORK" REPORT

- A. Reference the General Conditions.
- B. Items noted by designer/OAR during construction and before final acceptance which do not comply with the Contract Documents will be listed in an "Observation of Work" report which will be sent to the Contractor for action. Correct all deficiencies in a prompt concise manner. After completion of the outstanding items, provide a written confirmation report for each item. The report shall indicate each item noted, and method of correction. Enter the date on which the item was corrected, and return the signed reports so items can be rechecked. Failure to correct the deficiencies in a prompt concise manner or failure to return the signed reports shall be cause for disallowing the requests for payment.

- C. The electrical project superintendent shall be present at all required observation of work reviews as project progresses. Provide the OAR with equipment for access and review of all Work in place, as well as personnel fully familiar with all aspects of the work. Provide access to all electrical components such as junction boxes, panelboards, switchboards, devices and fixtures for review by the designer/OAR.
- D. Prior to start of Substantial Completion inspection, provide access to and prepare all electrical equipment and related components complete and ready for review by designer/OAR including compliance with Division 1.
- E. Items noted after acceptance during one-year guarantee period shall be checked by the Contractor in the same manner as above. The signed reports are to be returned by him when the items have been corrected.

1.16 SYSTEMS WARRANTY

- A. Reference the General Conditions.
- B. Warranty shall be by the Contractor to the Owner and shall cover a period of one year from the date of the Substantial Completion. Warranty shall not include light bulbs/lamps in service beyond one month from date of substantial completion of the System.
 - 1. Explain the provisions of warranty to the Owner at the "Demonstration of Completed System" meeting to be scheduled with the OAR upon project completion.
- C. Where items of equipment or materials carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material.
- D. Where extended Guarantees are called for herein, furnish three copies to be inserted in Operation and Maintenance Manuals.
- E. All preventative maintenance and normal service will be performed by the Owner's maintenance personnel after final acceptance of the work which shall not alter the Contractor's warranty.

1.17 WASTE MATERIALS DISPOSAL

- A. Include in base bid the transport and disposal or recycling of all waste materials generated by this project in accordance with all rules, regulations and applicable guidelines. Comply fully with Florida Statute 403.7186 regarding mercury containing devices and lamps. Lamps, ballasts and other materials shall be transported and disposed of in accordance with all DEP and EPA guidelines applicable at time of disposal. Provide OAR with written certification of approved disposal.

1.18 PROHIBITION OF ASBESTOS AND PCB

- A. Prior to the Final Review field visit the Contractor shall certify in writing that the equipment and materials installed in this Project under this Division 26 contain no asbestos or PCB. Additionally, all manufacturers shall provide a statement with their submittal that indicates that their product contains no asbestos or PCB. This statement shall be signed by a duly authorized agent of the manufacturer.

PART 2 – PRODUCTS

- A. Products are described in the 26 XX XX series specifications and as detailed in the plans.

PART 3 – EXECUTION

- A. Furnish and install all components necessary for a complete South Ron Electrical distribution system as shown in the contract documents. Major items of system are listed below:
1. Two 2,500 ampere, 480 volt, three phase 4 wire electrical services and distribution systems at the South RON Distribution Building.
 2. Extension of these circuits, to include all cable, raceway, counterpoise, concrete and all incidentals to the South RON Island 1 and South RON Island 2.
 3. Fabrication of eight power pedestals, four on each island.
 4. #2 AWG bare solid copper counterpoise over all RON power ducts.
 5. All grounding and bonding, ground rods, ground loops etc.
 6. Furnish and install miscellaneous feeders and branch circuits.
- B. All electrical, mechanical and other associated work shown on the RON contract documents is included in this scope of work with the following exceptions:
1. 2W4" communication duct bank is paid for as a linear foot under the L-110 pay item.
 2. #2 AWG bare solid copper counterpoise over the L-110 2W4" communication duct bank is paid for as a linear foot under the L-108 pay item.
 3. A1 and A2 manholes are paid for as each under the L-115 pay item.
 4. High mast poles are paid for as each under the 26 56 30.
- C. Install all items in accordance with NFPA requirements and all manufacturer's recommendations and instructions.

PART 4 - METHOD OF MEASUREMENT

- A. Except for the pay items listed above, this item shall be paid for as lump sum; in place, ready for operation, and accepted by the OAR. The RON complex item shall include the installation of all incidentals and appurtenances as detailed in the Contract Documents.

PART 5 - BASIS OF PAYMENT

- A. Pay item 26 57 01-5.1, South RON Electrical Distribution System is a lump sum pay item to furnish and install all electrical service equipment, distribution equipment, feeders, branch circuits, power outlets, overcurrent protection, raceway, cables, grounding, bonding and components as shown on the Contract Documents and needed for complete and proper installation of the South RON facility. Item includes all transportation, coordination, materials, labor, supervision, bollards, 30' x 30' x 1' & 30' x 60' x 1' concrete pads, reinforcing and all incidentals required to furnish and install all the complete system as shown in the Contract Documents. All work as shown in the Contract Documents shall be completed to the satisfaction of the OAR.

This price shall include all concrete, rebar, markers, tags, sealants, adhesives, gravel, sodding, excavation, backfill, dewatering, incidentals and appurtenances, etc., necessary for the complete installation of the item to the satisfaction of the OAR and OUC. This price shall be full compensation for furnishing all materials and for all preparation, assembly and installation of these materials, and for all appurtenances necessary to complete these items. Any incidental work items not specifically identified and not provided by others shall be part of the Contractor's work effort and included as part of the pay item with no separate identification and payment.

Item 26 27 01-5.1 South RON Electrical Distribution System - Lump Sum (LS)

END OF SECTION 26 57 01

ORLANDO INTERNATIONAL AIRPORT
BP-S196: TERM C, PH 1X -
AIRFIELD CIVIL, APRON & TAXIWAY PAVING

SOUTH RON ELECTRICAL
DISTRIBUTION SYSTEM
SECTION 26 57 01

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SECTION 33 52 47 – FUEL SYSTEM VALVES AND EQUIPMENT

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 including sustainability requirements, apply to this Section.

1.2 SUMMARY

- A. This Section covers the aircraft fueling system valves, valve pits, and related appurtenances which are in contact with jet fuel.
- B. All items, materials, and components specified herein shall be suitable for use within an aviation jet fuel system with a maximum operating condition of 275 psig, 0°F to 100°F, and having a specific gravity of 0.81.

1.3 REFERENCED STANDARDS

- A. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- B. American Society for Testing and Materials (ASTM):
 - 1. A216 – Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding for High-Temperature Service.
- C. American Society of Mechanical Engineers (ASME):
 - 1. B16.34 - Valves - Flanged, Threaded and Welding End.
- D. American Petroleum Institute (API):
 - 1. SPEC 6D - Specification for Pipeline and Piping Valves.
 - 2. SPEC 6FA - Specification for Fire Test for Valves.
 - 3. STD 607 - Fire Tests for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats.

1.4 SUBMITTALS

- A. Submit as specified in SECTION 33 52 43.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualification: Firms regularly engaged in manufacture of the valves or equipment of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Ball Valves:
 - 1. Worcester Controls.
 - 2. Bray/Flow-Tek.
 - 3. WKM.
 - 4. Watts.
 - 5. Jamesbury.
 - 6. Velan.
 - 7. Approved equal.
- B. Butterfly Valves:
 - 1. Bray.
 - 2. Keystone.
 - 3. Dezurik.
 - 4. WKM.
 - 5. Cameron.
 - 6. Approved equal.
- C. Double Block and Bleed (DBB) Plug Valves:
 - 1. General Twin Seal (Cameron).
 - 2. Dan-Ex (Western Valve).
 - 3. Approved equal.
- D. Hydrant Valve:
 - 1. Eaton.
- E. Hydrant Fuel Pit Assembly:
 - 1. Cavotec Dabico, Inc.
- F. Low-Point Drain Pit Assemblies:
 - 1. Cavotec Dabico, Inc.
- G. High-Point Vent Pit Assemblies:
 - 1. Cavotec Dabico, Inc.
- H. Block Valve Pit Assemblies:
 - 1. Cavotec Dabico, Inc.
- I. Dry Disconnect Adapters:
 - 1. OPW.
 - 2. Approved equal.
- J. Pressure Gauges:
 - 1. Ashcroft (Model 1009).
 - 2. Wika.
 - 3. Approved equal.

2.2 BALL VALVES

- A. Valve body shall be of carbon steel with 316 stainless steel ball and stem. Construction shall be in compliance with ASME B16.34.
- B. Valve shall be rated for 275-psig working pressure.
- C. Valves 1-1/2-inch size and smaller shall be of two-piece, end-entry construction, with socket weld end connections unless indicated or specified otherwise.
- D. Valves in pits or vaults 2-inch size and larger shall be of two-piece split body construction, with flanged end connections unless indicated otherwise.
- E. Seals and/or seats shall be reinforced TFE. Graphite stem seal to meet API-607 fire safe.
- F. Provide with a vinyl-coated, stainless steel locking handle suitable for padlocking. Valves 6-inch size and larger shall be provided with a closed case gear operator.
- G. Valves shall be certified "fire safe" per API-607.
- H. Provide spring return actuator where shown.

2.3 BUTTERFLY VALVES

- A. Valves shall be metal-lined, single-flanged type, drilled and tapped full lug body.
- B. Valves shall be certified "fire safe" per API-607.
- C. Valve shall be suitable for 275-psig working pressure, bubble-tight at differential pressure of 275 psig, and a maximum shutoff pressure of 300 psig.
- D. Valve body shall be compatible to ANSI Class 150 with a face-to-face dimension or laying length in accordance with API-609.
- E. The disc shall be "double offset" and shall be capable of bi-directional flow and shall be suitable for dead-end service in both directions.
- F. Valve body shall be carbon steel, shaft material of stainless steel, disc shall be 316 stainless steel, with 316 stainless steel pins for attachment to the shaft. Valve shall have adjustable top packing for the shaft. Top of shaft shall be keyed to allow installation of operator at two positions 90 degrees apart. Valve seat shall be 316 stainless steel with TFE insert material.
- G. Valves shall be suitable for installation between 150-pound raised-face flanges.
- H. Operators shall be as follows:
 - 1. Valve sizes 6 inches and smaller shall have a 10-position, spring-loaded, squeeze trigger handle with locking device.
 - 2. Valve sizes 8 inches and larger shall have a weatherproof, self-locking, worm gear operator.

2.4 DOUBLE BLOCK AND BLEED (DBB) PLUG VALVES

- A. Valve body shall be steel with reduced port configuration and chrome-plated bore.

Valve plug shall be chrome or nickel plated. Valve port openings shall be approximately 70% free area of pipe size installed in.

- B. The valve assembly shall include a manual bleed valve and a thermal relief valve discharging upstream of valve throat.
- C. Slip seals and valve O-rings shall be Viton.
- D. Valve shall be fire tested and qualified to API 6FA. Valve shall be rated for 275-psig working pressure.
- E. Gear operators the provision for locking shall be provided for valves 6 inches and larger. Where shown provide extension to valve vault access cover.
- F. Provide General Twin Seal Valve Model C8811 or approved equal.

2.5 HYDRANT VALVE

- A. Valve shall be Eaton, Model-60654.
- B. Valve shall be cast ductile-iron body, epoxy coated with 4 inch, 150-pound ANSI inlet flange. Outlet adapter shall conform to API Bulletin 1584, 3rd edition. Provide dust cap and retention chain.
- C. Valve shall have an air-operated pilot valve, to open and close valve.

2.6 HYDRANT FUEL PIT ASSEMBLY

- A. General Requirements: Assembly to be complete with shutoff valve, hydrant pit valve, strainer, and piping accessories to be installed in a concrete pavement apron, suitable for interfacing the fixed fuel system components with the hydrant fueling vehicle. Pit shall be on the Florida Department of Environmental Protection approved equipment list.
- B. Performance: Designed to permit a fueling flow rate of 1,000 gpm. Liquid to be jet fuel with a specific gravity of 0.81 ± 0.05 .
- C. Construction:
 - 1. Pits shall be side entry.
 - 2. Body shall be one-piece molded fiberglass, with built-in concrete anchors.
 - 3. Pit shall have sealed interior pipe entry consisting of a pipe sleeve with anchor ring integrally molded into the fiberglass pit wall, and inner and outer sleeve seals. Inner sleeve seal shall have a test port to provide testing capability of institutional space. Sleeve seals shall be Buna-N.
 - 4. Cover: Cast aluminum double-hinged assembly, 30-pound, lay flat, one-hand lift weight, 90-degree minimum door opening, water resistant, removable.
 - 5. Provide deep-dish hand hole in cover to permit opening by gloved hand.
 - 6. Cover assembly to be tested at 1,000 psi over 200-square-inch footprint with a maximum acceptable full-load deflection of 0.100-inch, and cover deflection rebound data shall result in a maximum of 0.010-inch after a 740-psi test load

has been applied and released. Covers must be free of visual shrink porosity cavity areas, weldments, filler, and paint. A previous independent certified testing laboratory report for the cover assembly shall accompany the Submittal data for the service pit. Weight-bearing flange surfaces of both the pit and cover shall be machined flat to a total indicator reading of ± 0.010 -inch for flatness to assure uniform weight distribution.

7. Entire cover assembly and pit as installed shall be capable of accommodating wheel loads of any aircraft in commercial service.
8. Product identification shall be in raised letters in the cover door. Identification shall be "FUEL."

2.7 HIGH-POINT VENT/LOW-POINT DRAIN PIT ASSEMBLIES

- A. General Requirements: One-piece molded fiberglass pit assembly complete with valves and piping accessories. Pit shall be on the Florida Department of Environmental Protection approved equipment list.
- B. Performance: Designed to incorporate low-point drain or high-point vent piping as detailed and as required to facilitate draining water or venting air and/or fuel from buried fuel piping.
- C. Construction:
 1. Pits shall be nominal 24-inch-diameter with 38-inch-deep skirt.
 2. Body shall be one-piece molded fiberglass, with built-in concrete anchors.
 3. Pit shall have a sealed interior pipe entry consisting of a pipe sleeve with anchor ring integrally molded into the fiberglass pit wall, and inner and outer sleeve seals. Inner sleeve seal shall have a test port to provide testing capability of institutional space. Sleeve seals shall be Buna-N.
 4. Cover: Cast-aluminum ring and hinged door, 30-pound, lay flat, one-hand lift weight, 90-degree minimum door opening, water resistant, removable.
 5. Provide deep-dish hand hole in cover to permit opening by gloved hand.
 6. Cover assembly to be tested at 1,000 psi over 200-square-inch footprint with a maximum acceptable full-load deflection of 0.100-inch, and cover deflection rebound data shall be given at a maximum of 0.010-inch after test load has been applied and released. Covers must be free of visual shrink porosity cavity areas, weldments, fillers, and paint. A previous independent certified testing laboratory report for the cover assembly shall accompany the Submittal data for the service pit. Weight-bearing flange surfaces of both the pit and cover shall be machined flat to a total indicator reading of $+0.010$ -inch for flatness to assure uniform weight distribution.
 7. Entire cover assembly and pit as installed shall be capable of accommodating wheel loads of any aircraft in commercial service.
 8. The words "FUEL LOW POINT DRAIN" or "FUEL HIGH POINT VENT," as applicable, shall be in raised letters in the cover door.

9. A stainless steel tag with "Fuel Low Point Drain" or "Fuel High Point Vent," as applicable, shall be permanently affixed to the riser.

2.8 DRY DISCONNECT ADAPTER

- A. Shall be a Kamvalock dry disconnect adapter with dust cap, size as indicated.
- B. Construction of adaptor and cap shall be aluminum.

2.9 PRESSURE GAUGES

- A. Per ASME B40.1.
- B. All pressure gauges shall be silicon-filled type and shall have all internal parts immersed.
- C. Gauges shall have 4-1/2-inch dials, 1/2-inch NPT lower stem, 316SS tube/socket and stainless steel case, and shall be mounted to the pipe by means of the instrument valves specified.
- D. Gauge range shall be as indicated on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect valve for cleanliness, corrosion, and operability. Remove special packing materials, such as blocks used to prevent disc movement during shipping and handling.
- B. Actuate valve through an open-close and close-open cycle. Examine functionally significant features, such as guides, and seats made accessible by such actuation. Following examination, return the valve's closure member to the shipping position.
- C. Examine threads or flanges on both the valve and the mating pipe for form (i.e., out-of-round or indentation) and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, defects, and damage.
- E. Prior to valve installation, examine the pipe for cleanliness and proper alignment.
- F. Replace defective valves with new valves.

3.2 VALVE AND EQUIPMENT INSTALLATION

- A. Install where indicated on the Drawings and in accordance with manufacturer's recommendations.
- B. Replace any and all valves and equipment that prove defective during testing. Arrange all valves during installation such that operating handles and controls are accessible, have sufficient clearance, and in the correct orientation for Owner's operation.

- C. Provide spool pieces or spacers in the piping as necessary to ensure valve parts and operators have sufficient operating clearances.
- D. Modify and relocate block valve pit BV-10 as shown the drawings and as specified.

3.3 CLEANING AND PROTECTION

- A. Clean all fabricated assemblies and all equipment items thoroughly before operating or testing.
- B. Protect equipment from damage, deterioration, paint or coating spills or spots, corrosion, or harm from any source.

3.4 SETTING AND ALIGNING EQUIPMENT

- A. Set and align all Equipment supplied under this section in accordance with manufacturer's recommendations.
- B. Set true and level all Equipment at the locations shown. Demonstrate adequate leveling of installed Equipment.
- C. Retighten all bolted and threaded connections after installation.

3.5 PIT ASSEMBLIES

- A. Although the pit assemblies have been specified as assemblies, certain components may be shipped loose. Contractor shall account for all loose components and assemble.
- B. Contractor shall establish and coordinate with all parties the dimension required between the top connection point of the hydrant pit valve and the hydrant pit lid/cover.

3.6 TESTING, STARTUP, AND COMMISSIONING

- A. Before equipment installations will be accepted, the equipment shall be tested and demonstrated to be correctly connected and installed.
- B. Adjustments and Calibration shall be performed on all equipment specified herein:
 - 1. Contractor shall adjust all valves for the flows, level settings, and pressure settings indicated and specified.
 - 2. Set rate of closure of valves to eliminate surges and shocks in the systems as installed.
 - 3. Final adjustments shall be made during system operation prior to final start-up.
 - 4. Adjust all items at start-up, including flow rates, pressure settings, meter settings, and other variables as required by Owner's Authorized Representative on the job.
- C. All testing and checkout procedures of the manufacturer shall be carried out completely.
- D. All tested equipment found to be defective or inoperable to any extent is to be

reported to Owner immediately.

- E. Any operating difficulty or defective item as a result of Contractor's work shall be repaired or replaced and put into proper operation by Contractor immediately.
- F. Protect all equipment and surrounding areas from damage resulting from testing operations. Clean up any spills or leakage from testing.
- G. Commissioning activities will include, but are not limited to, the following:
 - 1. Emergency Fuel Shutoff (EFSO) System Testing.
 - a. Prior to initial fuel receipt, verify that each EFSO pushbutton will trigger local and remote alarms and close the control valves as intended.
 - b. Verify that resetting each EFSO and clearing the alarm will return the valves to normal operation.
 - 2. Piping System
 - a. Ensure that all piping weld integrity and coating inspections have been performed per the applicable specifications.
 - b. Evacuate all accumulated water from piping low point drains, valve cavities, and equipment drains.
 - c. Verify all bolted connections are tightness tested to required torque using a calibrated torque wrench.
 - d. Verify that all pressure gauges are properly located and installed.
 - e. Ensure that piping's cathodic protection system is tested and operational.
 - f. Ensure that pipe marking, and identification is provided as specified.
 - g. Verify the correct installation of pipe supports.
 - h. Verify the Leak Detection system is operational and functioning as designed.
 - 3. Hydrant System Performance Testing
 - a. Prior to acceptance, the Contractor must demonstrate the following:
 - b. Operation of all pressure and flow devices to automatically start and stop the fueling pumps at the indicated pressures and flow rates. The operating sequence shall be repeated with each of the pumps being selected as lead pump.
 - c. System's ability to deliver fuel to multiple fueling points at specified flow rates.
 - d. Control valve surge shutdown and pressure control features.
 - 4. Upon completion of commissioning activities, all performance testing will be summarized in a Commissioning Report for submittal to the Owner's Authorized Representative.
- H. Upon completion of work, the Contractor shall provide the services, for a period of not less than two - eight hour working days, of qualified technicians, certified by the manufacturer(s) as being experienced in the various aspects of the installations, to

instruct representatives of the Owner and the Airlines in the operation and maintenance of the system. Upon completion of work, the Contractor shall provide the services, for a period of not less than two - eight hour working days, of qualified technicians, certified by the manufacturer(s) as being experienced in the various aspects of the installations, to instruct representatives of the Owner and the Airlines in the operation and maintenance of the system.

- I. Make modifications to existing block valve pits and described on the contract drawings.

PART 4 – METHOD OF MEASUREMENT

4.1 METHOD OF MEASUREMENT

Method of Measurement for hydrant pit assemblies shall be per each assembly installed in place, completed and accepted. All pits, pipe, fittings, valves, lids, embedment, backfill and compaction, supports, concrete pads, and any ancillary items necessary for installation shall be included in the contract unit price.

Method of Measurement for high-point vent pit assemblies shall be per each assembly installed in place, completed and accepted. All pits, pipe, fittings, valves, lids, embedment, backfill and compaction, supports, concrete pads, and any ancillary items necessary for installation shall be included in the contract unit price.

Method of Measurement for low-point drain pit assemblies shall be per each assembly installed in place, completed and accepted. All pits, pipe, fittings, valves, lids, embedment, backfill and compaction, supports, concrete pads, and any ancillary items necessary for installation shall be included in the contract unit price.

Method of Measurement for block valve pits shall be per each assembly installed in place, completed and accepted. All pits, pipe, fittings, valves, lids, embedment, backfill and compaction, supports, concrete pads, and any ancillary items necessary for installation shall be included in the contract unit price.

Method of Measurement for modifications and relocation of existing BV-10 shall be per valve pit being modified and relocated as shown on the drawings and including all modifications and work required to relocate and make operational relocated BV-10. All demolition, detailed relocation plan by manufacturer's representative, careful excavation around pit and relocation of pit, backfilling and compaction, relocation of existing duct bank and re-establishing electrical connections to devices in the pit, pipe, fittings, equipment, supports, and ancillary and incidental items necessary to complete the modifications and relocation indicated shall be included in the contract unit price.

PART 5 – BASIS OF PAYMENT

5.1 METHOD OF MEASUREMENT

These contract prices shall fully compensate the Contractor for furnishing all material and for all preparation, excavation, and installation of these items, and for all labor, equipment, tools and incidentals necessary to complete the item.

ORLANDO INTERNATIONAL AIRPORT
BP-S196: TERM C, PH 1X –
AIRFIELD CIVIL, APRON & TAXIWAY PAVING

FUEL SYSTEM VALVES AND
EQUIPMENT
SECTION 33 52 47

Bid Item 33 52 47-1	Hydrant Pit Assembly	per Each
Bid Item 33 52 47-2	Hight Point Vent Pit Assembly	per Each
Bid Item 33 52 47-3	Low Point Drain Pit Assembly	per Each
Bid Item 33 52 47-4	Block Valve Pits	per Each
Bid Item 33 52 47-5	Modifications and Relocation of Existing Block Valve Pit BV-10	per Each

END OF SECTION 33 52 47

BID SCHEDULE

Bid Item Number	Item Description and Bid Price Per Unit (In Words)	Bid Price Per Unit (In Numbers)	Est Qty	Unit	Total Amount Per Item Qty
AIRFIELD CIVIL, ELECTRICAL AND FUELING WORKS					
C-102-5.1	Temporary Air and Water Pollution, Soil Erosion,				
	<i>Bid Price Per Unit In Words</i>	Dollars _____ Cents _____	\$ _____	1	LS \$ _____
			<i>In Numbers</i>		
C-106-4.1	Temporary Fence (without Jersey Barrier)				
	<i>Bid Price Per Unit In Words</i>	Dollars _____ Cents _____	\$ _____	220	LF \$ _____
			<i>In Numbers</i>		
C-106-4.2	Temporary Fence (with Jersey Barrier)				
	<i>Bid Price Per Unit In Words</i>	Dollars _____ Cents _____	\$ _____	1,030	LF \$ _____
			<i>In Numbers</i>		
C-106-4.4	Miscellaneous Maintenance of Traffic and Safety				
	<i>Bid Price Per Unit In Words</i>	Dollars _____ Cents _____	\$ _____	1	LS \$ _____
			<i>In Numbers</i>		
C-106-4.5	Guardrail				
	<i>Bid Price Per Unit In Words</i>	Dollars _____ Cents _____	\$ _____	480	LF \$ _____
			<i>In Numbers</i>		
C-106-4.6	Bollard				
	<i>Bid Price Per Unit In Words</i>	Dollars _____ Cents _____	\$ _____	16	EA \$ _____
			<i>In Numbers</i>		
P-100-5.1	Construction Survey				
	<i>Bid Price Per Unit In Words</i>	Dollars _____ Cents _____	\$ _____	1	LS \$ _____
			<i>In Numbers</i>		

BID SCHEDULE

Bid Item Number	Item Description and Bid Price Per Unit (In Words)	Bid Price Per Unit (In Numbers)	Est Qty	Unit	Total Amount Per Item Qty
P-152-4.3	Subgrade Preparation				
	Dollars _____ Cents _____	\$ _____	18,920	SY	\$ _____
	<i>Bid Price Per Unit In Words</i>	<i>In Numbers</i>			
P-211-5.1	6" Lime Rock Base Course				
	Dollars _____ Cents _____	\$ _____	17,430	SY	\$ _____
	<i>Bid Price Per Unit In Words</i>	<i>In Numbers</i>			
P-211-5.4	24" Lime Rock Base Course				
	Dollars _____ Cents _____	\$ _____	3,570	SY	\$ _____
	<i>Bid Price Per Unit In Words</i>	<i>In Numbers</i>			
P-306-8.1	6" Lean Concrete Base Course				
	Dollars _____ Cents _____	\$ _____	17,430	SY	\$ _____
	<i>Bid Price Per Unit In Words</i>	<i>In Numbers</i>			
P-501-8.1	18" Aircraft Rated Concrete Pavement				
	Dollars _____ Cents _____	\$ _____	7,770	SY	\$ _____
	<i>Bid Price Per Unit In Words</i>	<i>In Numbers</i>			
P-501-8.2	12" Non-Aircraft Rated Concrete Pavement				
	Dollars _____ Cents _____	\$ _____	9,660	SY	\$ _____
	<i>Bid Price Per Unit In Words</i>	<i>In Numbers</i>			
P-501-8.3	6" Raised Sidewalk Concrete Pavement				
	Dollars _____ Cents _____	\$ _____	3,880	SY	\$ _____
	<i>Bid Price Per Unit In Words</i>	<i>In Numbers</i>			
P-501-8.4	Raise Existing Structures to Grade				
	Dollars _____ Cents _____	\$ _____	48	EA	\$ _____
	<i>Bid Price Per Unit In Words</i>	<i>In Numbers</i>			

BID SCHEDULE

Bid Item Number	Item Description and Bid Price Per Unit (In Words)	Bid Price Per Unit (In Numbers)	Est Qty	Unit	Total Amount Per Item Qty
P-501-8.5	Hurricane Tie-Downs				
		Dollars _____ Cents _____ \$ _____	16	EA	\$ _____
	<i>Bid Price Per Unit In Words</i>		<i>In Numbers</i>		
P-620-5.2	Markings – White				
		Dollars _____ Cents _____ \$ _____	2,130	SF	\$ _____
	<i>Bid Price Per Unit In Words</i>		<i>In Numbers</i>		
P-620-5.3	Markings - Red				
		Dollars _____ Cents _____ \$ _____	2,130	SF	\$ _____
	<i>Bid Price Per Unit In Words</i>		<i>In Numbers</i>		
P-620-5.4	Markings - Black				
		Dollars _____ Cents _____ \$ _____	3,850	SF	\$ _____
	<i>Bid Price Per Unit In Words</i>		<i>In Numbers</i>		
T-901-5.1	Seeding				
		Dollars _____ Cents _____ \$ _____	2	AC	\$ _____
	<i>Bid Price Per Unit In Words</i>		<i>In Numbers</i>		
T-904-5.1	Sodding				
		Dollars _____ Cents _____ \$ _____	550	SY	\$ _____
	<i>Bid Price Per Unit In Words</i>		<i>In Numbers</i>		
T-905-5.2	Topsoil (Furnished from Off the Site)				
		Dollars _____ Cents _____ \$ _____	660	CY	\$ _____
	<i>Bid Price Per Unit In Words</i>		<i>In Numbers</i>		
SUB-TOTAL OF ALL AIRFIELD BID ITEMS					
		Dollars _____ Cents _____ \$ _____			
Subtotal of all Bid items for MCO Term C BP-S196 (Written in Words)					
			<i>In Numbers</i>		

BID SCHEDULE

Bid Item Number	Item Description and Bid Price Per Unit (In Words)	Bid Price Per Unit (In Numbers)	Est Qty	Unit	Total Amount Per Item Qty
	Owner's Allowance				
	Two Hundred Fifty Thousand <i>Bid Price Per Unit In Words</i>	Dollars <u>Zero</u> Cents	\$ <u>250,000.00</u> <i>In Numbers</i>	<u>1</u>	ALLOW \$ <u>250,000.00</u>

TOTAL BID AMOUNT MCO STC TERM C BP-S196
(Written in Words)

Total Bid Amount in Words _____ Dollars _____ Cents \$ _____
In Numbers

NOTE: Basis of payment will be in accordance with the technical

Name of Bidder: _____
(Typed or Printed)

Signature of Bidder: _____
(Same as Bid Form)

Title: _____

Date: _____

SECTION 08 44 13 - GLAZED CURTAIN WALLS

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 including sustainability requirements, apply to this Section.

1.2 SUMMARY

- A. Provide labor, materials, equipment and related items for work of this Section. Provide listed items, and those not specifically mentioned but necessary for a complete installation.
 - 1. Extruded aluminum frames for exterior curtain walls, punched windows and skylights.
 - 2. Extruded aluminum interior trim for curtain walls and punched windows.
 - 3. Glass and glazing for systems provided under this Section.
 - 4. Aluminum sheet panels and parapet caps.
 - 5. Anchorage to building structure, including bracing of primary building structure if required for support of forces applied by work of this Section, and patching of fireproofing at anchors.
 - 6. Sealants within work of this Section and at boundaries with work of other sections.
 - 7. Thermal insulation at spandrel glass and other opaque materials within work of this Section.
 - 8. Safing insulation and smoke seal at floor and roof edges, at work within this Section.
 - 9. NFRC certification of all transparent glazing systems supplied under this Section.
 - 10. Preconstruction testing.
 - 11. Four performance mock-ups.
 - 12. Visual mock-ups.
 - 13. Source quality control testing.
 - 14. Field quality control testing.
 - 15. Florida Product Approval: systems specified in this Section, and specific products listed in this Section, are acceptable contingent on their having current Florida Product Approval, and their conformance to specified requirements.
- B. Coordinate with work of other sections.
 - 1. Section 01 25 00 Substitution Procedures.
 - 2. Section 01 43 39 Visual Mock-up Requirements.
 - 3. Section 01 74 19 LEED V4 Construction Waste Management and Disposal.
 - 4. Section 01 74 23 Final Cleaning.
 - 5. Section 01 81 13.14 Sustainable Design Requirements – LEED V4 BD+C.

6. Section 07 95 13.16 Exterior Expansion Joint Cover Assemblies.
7. Section 07 42 13.23 Metal Composite Material Wall Panels.
8. Section 08 41 13 Aluminum-Framed Entrances and Storefronts.
9. Section 08 42 29.23 Sliding Automatic Entrances.
10. Section 08 71 13 Automatic Door Operators.
11. Section 08 80 00 Glazing.

1.3 REFERENCES

- A. Except as otherwise specified, comply with listed references. Where the building code incorporates a different edition of a reference, the building code governs.
- B. Aluminum Association
 1. Aluminum Design Manual 2010.
 2. Aluminum Standards and Data 2013.
- C. American Institute of Steel Construction (AISC): Specification for Structural Steel Buildings ANSI/AISC 360-10.
- D. American Iron and Steel Institute (AISI), S100-2007 North American Specification for the Design of Cold-Formed Steel Structural Members.
- E. American Society of Civil Engineers (ASCE)
 1. ANSI/ASCE 8-02 Specification for the Design of Cold-Formed Stainless Steel Structural Members.
 2. ASCE/SEI 7-10 Minimum Design Loads for Buildings and Other Structures.
- F. American Welding Society (AWS) D1.1/D1.1M-04 Structural Welding Code--Steel.
- G. American Concrete Institute (ACI) 318-11 Building Code Requirements for Structural Concrete.
- H. American National Standards Institute (ANSI) Z97.1-2009 Safety Glazing Material Used in Buildings-Safety Performance Specifications and Methods of Test.
- I. Glass Association of North America (GANA) Glazing Manual 2008.
- J. United States General Services Administration TT-P-645B 1990 Primer, Paint, Zinc-Molybdate, Alkyd Type.
- K. American Architectural Manufacturers Association (AAMA)
 1. AAMA 501.1-05 Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.
 2. AAMA 2603-15 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 3. AAMA 2605-13 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
 4. AAMA TIR A9-14 Metal Curtain Wall Fasteners.
- L. ASTM International
 1. A36/A36M-08 Standard Specification for Carbon Structural Steel.

2. A123/A123M-15 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. A500/A500M-13 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
4. A501/A501M-14 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
5. A653/A653M-08 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
6. B449-93(2015) Standard Specification for Chromates on Aluminum.
7. C509-00 Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
8. C794-01 Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
9. C864-05 Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
10. C1036-01 Standard Specification for Flat Glass.
11. C1048-97b Standard Specification for Heat-Treated Glass--Kind HS, Kind FT Coated and Uncoated Glass.
12. C1087-00(2011) Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
13. C1115-00 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.
14. C1172-14 Standard Specification for Laminated Architectural Flat Glass.
15. C1248-08(2012) Test Method for Staining of Porous Substrate by Joint Sealants.
16. C1376-15 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Glass.
17. C1401-14 Standard Guide for Structural Sealant Glazing.
18. C1521-13 Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
19. D2244-15a Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
20. D4214-07(2015) Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
21. E283-04 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
22. E330-02 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
23. E331-00(2009) Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

24. E783-02(2010) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
 25. E1105-15 Standard Test Method for Field Determination of Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference.
 26. E1300-04e1 Standard Practice for Determining Load Resistance of Glass in Buildings.
 27. E2188-10 Standard Test Method for Insulating Glass Unit Performance.
 28. E2189-10e1 Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
 29. E2190-10 Standard Specification for Insulating Glass Unit Performance and Evaluation.
 30. E2203-02 Standard Specification for Dense Thermoplastic Elastomers Used for Compression Seals, Gaskets, Setting Blocks, Spacers and Accessories.
- M. International Firestop Council: Recommended IFC Guidelines for Evaluating Firestop Systems Engineering Judgments (EJ's), February 2007.
- N. Insulating Glass Certification Council (IGCC) Certified Products Directory February 2016.
- O. National Fenestration Rating Council (NFRC)
1. ANSI/NFRC 100-2014 Procedure for Determining Fenestration Product U-Factors.
 2. ANSI/NFRC 200-2014 Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- P. Comply with the referenced codes, or where required by this Section exceed the codes. Nothing in this Section shall be construed as allowing or requiring noncompliance with codes.
1. 2014 Florida Building Code.
 2. 2014 Florida Energy Conservation Code.
 3. 2016 Code of the City of Orlando, Florida, amendments to the 2014 Florida Building Code.

1.4 SYSTEM DESIGN AND PERFORMANCE

- A. Contract Documents define design intent and performance requirements. Details show preferred profiles. Provide final design.
- B. Unless otherwise defined by Contract Documents, appearance of exposed elements, including width and depth, shall be consistent throughout project.
- C. Unless otherwise defined by Contract Documents, overall thickness of each glass type, and component thicknesses of multiple layer glass types, shall be consistent throughout project.
- D. Provide anchor adjustment capability for full range of specified tolerances for building structure. Minimum required adjustment is 0.5 inch (12.7 mm) in all directions at connections to wind girts, and one inch (25.4 mm) in all directions at all other locations.

- E. Provide internal gutters and weep system to collect and drain water leakage and condensation to the exterior. Coordinate gutter and weep systems with other sections.
 - 1. Unitized curtain walls shall have continuous spliced gutters at horizontal stack joints, with sealed end caps at termination conditions. Provide two continuous lines of weatherstrips at entire perimeter of each unit, in the planes of the outboard and inboard boundaries of stack gutters.
 - 2. Stick built curtain walls and punched windows shall have an isolated gutter cavity at each glass perimeter, so that leakage is confined to and weeped from the opening of leakage origin.
 - 3. Curtain walls that have two-piece interlocking vertical mullions shall have continuous subsills at starter conditions that collect and drain water to the outdoor side.
 - 4. At skylights, provide internal gutters for control of water leakage. Provide continuous condensation gutters at glass perimeters. Condensation gutter intersections shall have sealed overlaps. Gutters shall convey water leakage and condensation to lowest point and drain water to exterior.
- F. Glazing details shall permit glass replacement after initial construction, shall permit reuse of original gaskets, shall permit replacement glass of same nominal size as original glass, and shall not require cutting of framing members or removal of interior finishes. Vision glass in conventional frames shall be replaceable from interior. Spandrel glass shall be replaceable from exterior. Silicone supported vision glass shall be replaceable from exterior and/or interior.
- G. Requirements of this Section apply equally to performance mock-ups, test specimens, and actual building. Variations in criteria over the surface of building, such as wind pressure, are taken into account in testing requirements. Test parameters and pass/fail criteria required for specific test conditions of mock-ups and specimens also apply to the actual building, without reduction or adjustment, for specified conditions and for equivalent conditions of equal or lesser severity.

1.5 MOVEMENTS

- A. Net joint size is nominal joint size plus and minus fabrication tolerance and field tolerance. Assumed combined fabrication and field tolerance for joint design shall not be less than 0.1875 inch (4.8 mm). Provide movement joints with net sizes that allow for specified movements due to temperature change, story drift, and building structure live load deflection without exceeding movement capacities of joints or materials that seal them. Design for full values of all movements occurring simultaneously. No reductions shall be applied to individual movements or to combinations of movements.
- B. Joint Movement Capacities
 - 1. Sealant capacity in tension and compression shall be values published by the manufacturer, but not more than 50 percent of net joint size. Sealant capacity in shear shall be the value published by the manufacturer, but not more than 100 percent of net joint size.

2. A stack is a horizontal composed of interlocking frames. Stack closing capacity is the amount of movement relative to net joint size that would cause the frames to be in contact.
 3. Stack opening capacity is maximum amount of movement relative to net joint size that maintains weather seals and structural integrity. Opening capacity shall be based on at least 0.375 inch (9.5 mm) overlap of metal parts after movement has occurred.
 4. Where movements reduce joint size, movement capacity is (a) sealant capacity, (b) stack closing capacity or (c) the smaller value if both are applicable.
 5. Where movements increase joint size, movement capacity is (a) sealant capacity, (b) stack opening capacity, or (c) the smaller value if both are applicable.
 6. Where movements affect glass bite and edge clearance, bite shall not be less than 0.375 inch (9.5 mm) and edge clearance shall not be less than 0.25 inch (6.4 mm) after movement has occurred. Requirements for nominal bite are in Part 3 of this Section.
- C. Thermal component of joint movement shall be based on minimum material temperature increase of 100 Fahrenheit degrees (55.6 Centigrade degrees) and decrease of 70 Fahrenheit degrees (38.9 Centigrade degrees) relative to nominal condition. Assume entire cross section of framing member has uniform temperature. Assume temperature of supporting structure does not change.
- D. Story Drift
1. Design story drift is $H/400$ for airside and landside.
 2. At the GTF pedestrian bridge, north/south drift between pedestrian bridge level and roof is 0.7 inch. East/west drift is negligible.
 3. At the GTF within grids T5 to T8 and N1 to N4, drift between pedestrian bridge level and roof is 0.5 inch.
 4. Cladding shall be designed for floor-to-floor relative displacement in any direction equal to story drift, except for GTF pedestrian bridge where drift is north/south only.
 5. At any floor, design story drift shall be assumed to occur while floors immediately above and below are not displaced. For design story drift, glass shall not crack. Glass or other materials shall not fall to the indoor or outdoor side. There shall be no failure of, or damage to, framing members, anchors or non-glass infill materials. No structural component, trim component, or elastomeric gasket shall disengage, partially or completely. Weather sealants and structural sealants shall not fail adhesively or cohesively.
- E. Structure Vertical Deflection
1. At airside and landside clerestories below the Boulevard skylight, design curtain wall top connection for 2.0 inches up and down structure movement. At the base of clerestory curtain walls, structure movement is 0.5 inch up and down, except 1.25 inch up and down between grid lines L13 and L15.
 2. Airside design differential structure vertical deflection between successive floors, and between floor and roof, is $L/360$, not to exceed 0.5 inch.

3. Landside Structure Vertical Deflection
 - a. At north and south elevations between grids L11 and L12, and between grids L16 and L17, design differential structure vertical deflection between successive floors is 0.5 inch. Design top connection at roof for 1.5 inch up and down structure movement.
 - b. For punched windows at north and south elevations, support weight of windows on steel stud frames, not on beams or floor edges. Design vertical movement of steel stud frames is 3.0 inches downward relative to floor edges. Design vertical movement of steel stud frames is 2.0 inches downward and 3.0 inches upward relative to roof edges.
 - c. At the east elevation along grid 17, design differential structure vertical deflection is 0.5 inch. Design top connection at roof for 1.5 inch up and down structure movement.
 - d. At curtain walls that are parallel to grids N1 and S1, between grids L17 and L18, design differential structure vertical deflection between successive floors is 0.5 inch. Design top connection at Boulevard skylight for 2.0 inches up and down structure movement.
 - e. At the sloping Prow curtain wall, design differential structure vertical deflection between successive floors is 0.5 inch. Design top connection at Boulevard skylight for 2.0 inches up and down structure movement.
 - f. At landside west elevation between grids N1 and S1, design differential structure vertical deflection is 0.5 inch. Design top connection at Boulevard skylight for 2.0 inches up and down structure movement.
 - g. At vestibule curtain walls, design differential structure vertical deflection is zero.
 4. GTF Structure Vertical Deflection
 - a. Live load deflection of pedestrian bridge level beams at grids N1 and S1 is 0.4 inch.
 - b. Live load deflection of pedestrian bridge roof beams at grids N1 and S1 is 0.5 inch.
 - c. Live load deflection of floor and roof edges at west elevation along grid T5, between grids N1 and N4, is 0.4 inch.
 5. Deflection at a given floor or roof shall be assumed to occur while floors immediately above and/or below do not deflect.
 6. Cladding shall be designed so that movement due to structure vertical deflection, plus curtain wall thermal movement and tolerances, does not exceed joint movement capacities defined in this Section.
- F. Wind Girt Deflections
1. At steel stud frames, wind girt deflection is $L/360$ inward and outward for design wind pressures.
 2. At curtain walls, wind girt deflection is $L/240$ inward and outward for design wind pressures.
 3. Wind girt vertical deflection is 1.0 inch up and down.

1.6 THERMAL PERFORMANCE

- A. Winter Design Conditions: For conditions listed below, condensation formation on indoor surfaces (including surfaces covered by insulation) is acceptable only if resulting water would be contained and drained to exterior without wetting insulation, and without wetting indoor surfaces visible to building occupants.
1. Night
 2. Outdoor air temperature: 32 °F (0.0 °C).
 3. Wind speed 12.3 mph (5.5 m/s).
 4. Indoor air temperature: 70 °F (21.1 °C).
 5. Indoor relative humidity: 60 percent (50 percent nominal plus 10 percent tolerance).
- B. U-Values
1. Overall U-factors for walls based on an area-weighted analysis shall not exceed values in the Energy Model Report for transparent and opaque areas.
 2. Overall U-factors for skylights based on an area-weighted analysis shall not exceed values in the Energy Model Report.
 3. Determine U-factors with THERM software for winter design conditions specified in this Section. Use glass and metal areas that apply to this project, not the model sizes of NFRC 100. U-factors determined in this way will not match the values determined for NFRC certification.
- C. Solar Heat Gain Coefficients shall not exceed values in the Energy Model Report for walls and skylights.
- D. Surface Temperature and U-factor Determination by Analysis
1. Submit surface temperature and dew point analysis performed with THERM software, showing compliance with specified thermal performance. Analytical models shall include adjacent materials, including metal and concrete, regardless of whether those materials are included in this Section. Exterior film coefficient shall be 4.579 Btu/h ft² F, and the radiation model shall be set to Black Body Radiation. Interior film coefficient (convection only) shall be 0.579 Btu/h ft² F, and the radiation model shall be set to Automatic Enclosure Model. For sloped glazing, comply with instructions for skylights in the THERM NFRC Simulation Manual. Identify temperatures for all surfaces, not just surfaces exposed to view. Analyze all details, by direct analysis or by comparison to representative details for which analysis is submitted. Required data includes:
 - a. Identification of dew point temperature for specified indoor air temperature and indoor relative humidity.
 - b. Color infrared plot with color legend.
 - c. Isothermal plot with maximum temperature set at dew point.
 - d. Locations of, and values for, coldest indoor surface temperatures at glass, metal, gaskets, sealants.
 - e. Tabulation identifying solid materials, conductivities and emissivities.
 - f. Tabulation identifying cavity dimensions, temperatures and emissivities.

- g. Tabulation identifying boundary condition temperatures and film coefficients.
 - h. Tabulation of all shop drawing details, listing each detail that is analyzed correlated with other details whose performance is implied by comparison to the analyzed detail.
 - i. Computation of overall U-factors based on area-weighted averages of THERM U-factor results.
- E. Outdoor Surface Temperatures: For a surface temperature range of 32 °F (0.0 °C) to 160 °F (71 °C), there shall be no failure as defined under "WARRANTY" in this Section.

1.7 NFRC CERTIFICATION

- A. Obtain NFRC Certification for transparent areas of all glazed systems supplied under this Section, using the "certified product" option or the "certified project" option.
- B. Certification shall include ratings for U-factor, Solar Heat Gain Coefficient, and Visible Transmittance.
- C. Certification shall include ratings for Air Leakage and Condensation Resistance.
- D. Submit Certification Label Certificate for each certified system.

1.8 AIR AND WATER LEAKAGE

- A. Air leakage test shall conform to ASTM E283 (laboratory) and ASTM E783 (field), modified to include measurement of exfiltration. Differential static test pressure shall be 6.24 PSF (299 Pa). Air infiltration and exfiltration of fixed wall area shall not exceed 0.06 CFM/ft² (1.10 m³/hr-m²) of projected exterior surface.
- B. Water Leakage
 - 1. Condensation is acceptable during water leakage tests. Water leakage is acceptable only if all of the following conditions are satisfied: (a) water is contained and drained to exterior; (b) there is no wetting of a surface that would be visible to building occupants; (c) there would be no staining or other damage to completed building or its furnishings. This definition of water leakage governs over other definitions in referenced documents.
 - 2. Static water leakage test shall conform to ASTM E331 (laboratory) and ASTM E1105 Procedure A (field). Differential test pressure shall be 12 PSF (574 Pa). There shall be no unacceptable water leakage as defined in this Section.
 - 3. Dynamic water leakage test shall conform to AAMA 501.1 except as otherwise specified in this Section. Differential test pressure shall be 12 PSF (574 Pa). There shall be no unacceptable water leakage as defined in this Section.
 - 4. Completed portions of the building are required to pass chamber tests and hose tests as specified in Part 3 of this Section. There shall be no unacceptable leakage as defined in this Section.

1.9 LOADS

- A. Wind Pressures
 - 1. Cladding design wind pressures as determined by wind tunnel tests are shown on Drawings. Except as specified in this Section, these pressures shall not be reduced for any reason.

2. For surfaces not addressed by wind tunnel study, wind pressures shall be to ASCE/SEI 7-10, Chapter 30, Part 3: Buildings With $h > 60$ ft. using the data below, but not less than values required by Structural Drawings.
 - a. Basic wind speed: 150 mph (67.0 m/sec).
 - b. Risk category: III.
 - c. Exposure category: C.
 - d. Directionality factor: 1.0.
 - e. Internal pressure coefficient: plus and minus 0.18.
 - f. Width of Landside wall zone 5: to Code, but not less than 60 feet.
 - g. Width of Airside wall zone 5: to Code, but not less than 12 feet.
 - h. Width of GTF wall zone 5: to Code, but not less than 8 feet.
 - i. Width of roof zones 2 and 3 at skylights: to Code, but not less than 8 feet.
 - j. Landside building height to Code, but not less than: areas 1 to 4 and 9 to 12, 105 feet; areas 5 to 8, 125 feet.
 - k. Airside building height to Code, but not less than: areas 14 to 17, 24 and 25, 115 feet; areas 13, 18 to 23, and 26 to 33, 72 feet.
 - l. GTF building height to Code, but not less than 75 feet.
 3. Lateral wind pressures on vertical fins and fork extrusions are shown in the wind tunnel report. Pressures on fins and fork extrusions occur simultaneously with pressures on adjacent wall surfaces. Do not reduce simultaneous pressures.
 4. Design wind pressures for computation of deflections are 1.0 times ASD pressures. Except as specified in this Section, do not reduce pressures for computation of deflections for any reason, even if such a reduction is permitted by code.
 5. Wind pressures act perpendicular to flat surfaces, regardless of surface orientation. Wind pressures act perpendicular to tangents of curved surfaces.
 6. For framing at corners and at other edges formed by intersecting planes that supports load from both faces, design for three cases.
 - a. Apply 85 percent of outward pressures at both faces simultaneously.
 - b. Apply 95 percent of inward pressures at both faces simultaneously.
 - c. Apply 75 percent of outward pressure (and separately inward pressure) on one face simultaneously with 75 percent of inward pressure (and separately outward pressure) on the other face.
 - d. These reductions do not apply to glass, and do not apply to near-edge framing that supports load only from one face.
 7. Air-permeable cladding has an outer surface with unsealed joints, open joints or openings that permit air flow, and an inner surface that is sealed against air flow. Both surfaces shall be designed for full design wind pressures.
- B. Seismic Loads: Design of cladding for seismic loads is not required.
- C. Concentrated Load: 200 pounds on skylight frames.

- D. System shall be designed to support its own weight in combination with other specified pressures and loads.
- E. Load combinations shall comply with the more stringent of code and ASCE/SEI 7.

1.10 STRUCTURAL CRITERIA

- A. At pressures and loads from zero to 150 percent of design values:
 - 1. Framing member residual deflection after pressure or load is removed shall not exceed 1/1000 times distance between supports or 2/1000 times cantilever length.
 - 2. At anchors, framing member deflection relative to building structure shall not exceed 0.187 inch (4.7 mm), nor 0.125 inch (3.2 mm) after pressure or load is removed.
 - 3. Upon reversal of pressure or load direction, relative movement between two components that are fastened or clamped together shall not exceed 0.187 inch (4.7 mm).
 - 4. There shall be no disengagement, failure or gross permanent distortion of any component, including glass and gaskets.
- B. At 50 percent of design pressures, glass maximum deflection relative to supported glass edges shall not exceed one inch (25.4 mm).
- C. At 100 percent of design pressures and loads:
 - 1. Net deflection perpendicular to enclosure surface for framing members shall not exceed: within one glass opening, 1/175 times length of glass edge, not to exceed 0.75 inch (19mm); 1/175 times distance between supports for spans less than 162 inches (4115 mm); 1/240 times distance between supports plus 0.25 inch (6.35 mm) for spans exceeding 162 inches; 2/175 times cantilever length, not to exceed 0.375 inch (9.5 mm).
 - 2. Net deflection of framing members parallel to enclosure surface shall not exceed smaller of: 0.125 inch (3.2 mm) due to dead load; 1/360 times distance between supports, not to exceed 0.375 inch (9.5 mm) for wind and seismic load (includes vertical members at corners).
 - 3. Net deflection parallel and perpendicular to enclosure surface for framing members at perimeter sealant joints shall not exceed smallest of: values specified above; 50 percent of nominal joint width, regardless of whether sealant is in tension, compression or shear; movement capacity of sealant.
 - 4. Maximum deflection of a metal panel, with or without stiffeners, shall not exceed 0.01 times the shorter panel dimension.
 - 5. Interior window sill trim shall not deflect more than 0.125 inch (3.2 mm) when subjected to a concentrated force of 25 pounds (111 N) at any point. Residual deflection after force is removed shall not exceed 0.062 inch (1.6 mm).

1.11 STRUCTURAL DESIGN METHOD

- A. Except as otherwise specified, allowable stress design (ASD) and load and resistance factor design (LRFD) are acceptable.

- B. For allowable stress design, allowable stress shall not be increased by 1/3 or any other value for individual loads or load combinations, regardless of whether such an increase is permitted by code or other references.
- C. Allowable stress design (ASD) shall be used for structural silicone.

1.12 COMPONENT DESIGN AND PERFORMANCE

A. Framing Members

1. Glass, sealants and interior finishes shall not be assumed to contribute to framing member strength, stiffness or lateral stability.
2. Compression flanges of flexural members shall be assumed to receive effective lateral bracing only from (a) anchors to building structure and (b) intersecting members that restrain the compression flange against lateral movement or twisting. Points of contraflexure shall not be regarded as lateral braces or as end points of an unbraced length; unbraced length shall be the distance between effective lateral braces.
3. Only true tubes shall be analyzed as tubes for determination of allowable stress (ASD) or factored limit state stress (LRFD). True tubes have a continuous boundary of solid metal (no joints) enclosing a hollow cavity.
4. Flexural strength for lateral-torsional buckling of an individual open (non-tubular) shape, or two or more open shapes that are constrained between brace points to deflect and rotate together, may be determined by the Direct Strength Method using finite strip analysis with the material specifications in Part 1 of this Section. Determine critical stress with CUFSM software. For multiple shapes, determine moment and stress in each shape based on relative flexural stiffness of additive (not composite) sections. Determine separate critical stresses for front and back flanges in compression. Multiple open shapes that are not constrained to move together shall be designed as independent beams.
5. Where a framing member reaction is resisted by a continuous element, maximum assumed effective length of resisting element shall be four times the bearing length, but not more than one foot (305 mm).
6. Splice joints that permit movement shall be assumed to have zero moment capacity.
7. Where a framing member runs continuously past a deflecting support, combined deflection of member and support shall not exceed specified limits.
8. Thermal breaks shall be assumed to have no ability to transfer shear stress for composite action of flexural members. Elements joined by a thermal break shall be assumed to act separately.

B. Fasteners

1. General Requirements
 - a. Tension shall be taken as sum of direct tension plus tension due to prying.
 - b. Allowable shear shall be reduced for a fastener with nominal diameter "d" that is not slip-critical, is loaded in shear (with or without tension), and passes through a shim stack or other filler with total thickness "t." For nominal diameter less than 0.25 inch, minimum reduction shall be zero percent for t=d, varying linearly to 100 percent for t=2d. For nominal

- diameter 0.25 inch or greater, minimum reduction shall be 15 percent for $t=0.25$, varying linearly to 100 percent for $t=2d$. Such reduction shall be in addition to other applicable reductions. An acceptable alternative method is to assume that shims provide no resistance to fastener bending, compute fastener bending stress with cross sectional properties based on root diameter, add bending stress to tension stress, and evaluate tension/shear interaction. Allowable stress for bending shall be the same as allowable stress for tension.
- c. Unless otherwise specified, combined tension and shear shall be evaluated according to an interaction formula in which each term equals the square of actual force divided by the square of allowable force. Sum of terms shall not exceed 1.0.
2. Steel Bolts and Screws
 - a. For allowable stress design, capacities of carbon steel and stainless steel bolts and screws shall be based on the more stringent of code and AAMA TIR-A9 Metal Curtain Wall Fasteners.
 - b. For stainless steel fasteners, design shall be based on yield stress of 30 ksi (207 N/mm²) and ultimate tensile stress of 75 ksi (517 N/mm²). Approval to use greater strength may be requested by submitting manufacturer's data sheets and certifications.
 3. Cast-in and Post-Installed Anchors in Concrete and Concrete Masonry Units
 - a. For evaluation of anchor capacity, comply with the most stringent of: ACI 318; ICC-ES Report; manufacturer design rules. It is acceptable to determine anchor capacity with software provided by the manufacturer. Assume cracked concrete.
 - b. Products that self-drill are not acceptable. Screws in plugs and powder actuated fasteners are not acceptable. Acceptable products that self-thread are identified in Part 2 of this Section.
 4. Aluminum fastener capacities shall comply with Aluminum Design Manual.
- C. Weatherproofing sealants shall not experience adhesive or cohesive failure. Sealants shall withstand movements up to the limits prescribed by manufacturers. Exposed sealant surface shall not crack or bubble. Sealant and primers shall not stain adjacent materials. Sealants shall be used only if manufacturers' adhesion, compatibility and stain tests yield favorable results. Sealants shall not be placed against edge of laminated glass interlayer.
- D. Structural Silicone
1. Wind pressure shall be supported in tension or shear, but not tension and shear simultaneously.
 2. Stress in structural silicone due to dead load shall not exceed 1.0 psi (6.89 kPa).
 3. Stress in structural silicone due to all loads shall not exceed 20 psi (0.138 MPa) at design pressures and loads. There shall be no load reduction for load combinations.
 4. Structural silicone shall not be applied to edges of insulating glass or to edges of laminated glass.

5. A glass or panel unit shall not be attached by structural silicone on both sides of a movement joint.
6. Ultimate tensile strength of structural silicone and the substrates to which it adheres for static loading at 160 degrees F (71 degrees C) shall be at least 60 psi (0.414 MPa).
7. Where a mock-up is tested to 1.5 times design pressures and loads, structural silicone and related structural components shall not fail.
8. On the building, structural silicone shall not experience adhesive or cohesive failure.
9. If structural silicone products other than those specified are proposed, perform preconstruction testing as required by this Section.

E. Glass

1. Wind pressure shall be treated as short duration load, and gravity loads shall be treated as long duration load, as defined by ASTM E1300.
2. Probability of glass breakage upon first application of design pressures shall not exceed 8/1000 for vertical glass, and 1/1000 for sloped and horizontal glass. Glass strength shall comply with code and ASTM E1300.
3. Provide heat treated glass. Annealed glass is not acceptable.
4. Where insulating glass is supported by structural silicone, tensile stress at narrowest point of secondary seal shall not exceed 20 psi (0.138 MPa) at design pressure. If secondary seal products other than those specified are proposed, perform preconstruction testing as required in this Section. Glass lamination, coating and ceramic frit shall withstand specified design and test pressures without failure.
5. Glass provided for performance mock-ups shall be identical (including strength) to glass provided for corresponding zone on building. Mock-up glass is required to support up to 1.5 times design pressures without breakage. It is recognized that any one glass plate can break at any pressure. A limited amount of breakage of mock-up glass is acceptable, provided that replacement glass with the same nominal strength eventually passes all tests. If glass in a specific mock-up opening breaks twice during attempts to complete one test, or 3 times for any combination of tests, the mock-up fails, redesign of the framing and/or glazing system is required, and testing must be repeated from the beginning of the test sequence.
6. Insulating glass shall be qualified to ASTM E2190.
7. Insulating glass in vision and spandrel areas shall not experience fogging, wetting or staining within the sealed space, spacer corrosion, spacer migration, adhesive or cohesive failure of primary or secondary edge seal.
8. Insulating glass shall not experience decrease in the air space dimension due to chemical reaction of desiccant with entrapped air.
9. Glass lamination shall not delaminate, stain or discolor.
10. Glass coating shall not crack, peel, stain or discolor.
11. Glass shall not experience spontaneous breakage.

12. Glass maximum deflection relative to supported edges at 50 percent of specified design pressures shall not exceed one inch. Glass deflection at 1.5 times design pressures shall be limited to prevent disengagement from frame.
 13. Spandrel glass opacifier shall not crack, peel, wrinkle, delaminate, stain or discolor.
- F. Snap-engaged components shall be secured against migration, and shall not serve any structural function, such as retention of glass or panels. Joints in continuous snap covers and other continuous trim shall have splice sleeves of same material and finish as cover or trim. Snap-engaged metal components shall not disengage when subjected to a concentrated force of 10 pounds (44.5 N) or during mock-up structural tests. Snap-engaged plastic components are not permitted, except as nonstructural thermal improvement for interior trim.
- G. Fins and Fork Extrusions: Fins and fork extrusions that project to the outdoor side of vertical mullions may have snap engagements, but must be fastened with screws to prevent vertical migration and disengagement. The attachments shall allow removal and reinstallation of the extrusions without causing damage.
- H. Skylights
1. Provide internal gutters for control of water leakage. Provide continuous condensation gutters at glass perimeters. Condensation gutter intersections shall have sealed overlaps. Gutters shall convey water leakage and condensation to lowest point and drain water to exterior.
 2. Provide continuous bearing of exterior glass retainers on rafters and cross bars.
 3. Provide continuous recessed pockets for wet seals at glass perimeters.
 4. Structural silicone shall adhere to glass indoor surface, not to glass edge.
- I. Thermal Breaks
1. Dead load of glass and panels shall not be carried through thermal breaks.
 2. Pour-and-debridge thermal breaks in sill or gutter shall be capped with sealant, including six inch (15.2 cm) vertical sealant return at jambs.
 3. Thermal breaks shall not split, crack or fracture. Thermal breaks shall not experience shrinkage or other deformation to the extent that frames are distorted or water leakage occurs. Extruded aluminum frames with integral thermal breaks shall conform to specified tolerances for one-piece aluminum extrusions.

1.13 PRECONSTRUCTION TESTING

- A. Structural Silicone and Insulating Glass Secondary Seal
1. If structural silicone products or insulating glass secondary seal products other than those specified are proposed, perform tensile tests. Provide test specimens and pay laboratory fees. Pay fees and expenses for one observer to witness tests. Prior to scheduling tests, submit technical data for proposed silicones and request approval to proceed with tests.
 - a. Specimens shall consist of a single line of silicone with dimensions 2.0x0.5x0.5 inch bonded to two glass rectangles. Proposed spacer material shall be in contact with one 2.0x0.5 inch surface. Fully cure specimens at room temperature. Immerse specimens in water for 7 days.

- b. Test minimum of 3 specimens each at 75 +/- 5 degrees F (24 +/- 3 degrees C) and 160 +/- 5 degrees F (71 +/- 3 degrees C). Increase tensile stress in silicone to 60 psi (0.414 MPa) in one minute or less. Maintain 60 psi for minimum of one minute.
 - c. Specimens shall not experience adhesive or cohesive failure, partial or total. All specimens must pass.
 - d. Submit laboratory report for approval.
- B. Adhesion, Compatibility and Stain Tests
 1. Provide to sealant manufacturers samples of all substrates that are in contact with sealant, regardless of whether adhesion must be achieved.
 2. For substrates that must support adhesion, submit for record sealant manufacturers' reports of adhesion tests conducted in accordance with ASTM C794. Report shall specifically acknowledge suitability for structural silicone application where applicable.
 3. For substrates that are in contact with sealant, submit for record sealant manufacturers' reports of compatibility tests for sealants and primers conducted in accordance with ASTM C1087.
 4. For concrete, masonry and other porous materials submit for record sealant manufacturers' reports of stain test performed in accordance with ASTM C1248.
- C. Spandrel Shadow Box
 1. Spandrel shadow box assembly shall demonstrate by test that appearance is not affected by formation of residue on indoor glass surface.
 2. Construct two identical test specimens, each consisting of a full size spandrel glass unit in its aluminum frame, mounted in a test chamber with the same back-up materials intended for the building. Glass, glazing materials, aluminum finish, insulation, backup material, and backup finish shall be identical to production material, except that glass shall be uncoated. Store one specimen indoors; this is the control. Subject the second specimen to a cycled test.
 3. Test shall consist of alternate heating and cooling. Mount thermocouples on center of outdoor glass surface, at center of air space midway between glass and backup, and on center of back-up surface. Heat source shall be infrared lamps mounted on a rack in a rectangular grid. With specimen and light rack standing vertically and parallel to each other, turn on lamps and adjust distance to specimen so that air space temperature stabilizes at 200 degrees F plus or minus 10 degrees F (93 degrees C plus or minus 6 degrees C). Maintain stabilized temperature for minimum one hour. Record thermocouple readings. Turn lamps off and allow specimen to cool until glass temperature is 80 degrees F (27 degrees C) or cooler. Record thermocouple readings. Turn lamps on and repeat for 300 cycles. Examine specimen at 50 cycle intervals and record any residue on indoor glass surface or change in outdoor appearance. At 100 cycle intervals, photograph specimen and control side by side, indoors with artificial light and outdoors with sunlight. After 300 cycles, remove specimens from chamber; record and photograph any residue on indoor glass surface or on aluminum frame.

4. The specimen passes only if there is no visible change in outdoor appearance and no residue forms on the indoor glass surface. If specimen fails, revise glass type and/or spandrel details and retest.

1.14 INFORMATIONAL SUBMITTALS: Provide the following submittals for information only. Promptly provide additional information and clarifications upon request.

- A. Provide scope drawings with bid packages. Quality and content of scope drawings shall be same as required for shop drawing submittals. Scope drawings shall include partial elevations, partial plans, wall sections, and details listed below.
 1. Curtain wall and punched window mullions at vision and spandrel, typical, inside corner, outside corner, and jamb.
 2. Curtain wall and punched window horizontals at vision and spandrel, starter sill, intermediate, head with movement joint and stack.
 3. Parapet cap.
 4. Curtain wall and punched window fixed and expansion anchors.
 5. Curtain wall vertical fins and fork extrusions.
 6. Single pitch and Boulevard skylights, GTF pedestrian bridge skylight: rafters, crossbars, ridge, valley, curbs, anchors.
- B. Prior to submitting documents for approval, submit itemized list of deviations from Contract Documents. Identify specification page and paragraph, or architectural drawing sheet, elevation, plan, section or detail for each item. If there are no deviations, provide written statement of full compliance with architectural drawings and specifications. Failure to provide an itemized list of deviations or statement of full compliance shall, at reviewers' discretion, be cause for return of submittals without review.
- C. Submit with structural calculations scale drawings of aluminum extrusions, with sufficient dimensions to permit verification of section properties.
- D. Submit with shop drawings scale drawings of gaskets and weatherstrips, with dimensions and identification of materials.
- E. Submit full size dimensioned drawing of insulating glass edge with identification of primary and secondary seals.
- F. Submit sealant manufacturers' test reports confirming sealant adhesion, compatibility and absence of staining, and acceptability for structural silicone application, based on test specimens submitted for this project. Submit application and quality control procedures for sealants.
- G. Submit reports for quality control uniform pressure tests of shop applied structural silicone.
- H. Submit reports for field hose tests and chamber tests.
- I. Submit reports for field adhesion tests of weatherproofing sealants.
- J. Submit reports for adhesion tests of field applied structural silicone.
- K. Submit reports for field tests of internal gutters.
- L. Submit qualification of insulating glass to ASTM E2190.

- M. Submit NFRC Certification Label Certificate for transparent area of each glazing system supplied under this Section.
 - N. Submit laboratory test reports for shadow box spandrel assembly.
 - O. Submit reports for tests of shop assembled units for resistance to water leakage with static air pressure.
 - P. Submit quality control heat soak test reports for tempered glass, as required in Source Quality Control.
 - Q. Submit off-line quality control color measurement data for heat-treated coated visual mock-up glass and production glass, as required in Source Quality Control.
 - R. Submit roll wave and millidiopter data for heat-treated visual mock-up glass and production glass, as required in Source Quality Control.
 - S. Submit bow and warp data for heat-treated visual mock-up glass and production glass, as required in Source Quality Control.
 - T. Sustainable Design Submittals: Provide informational submittals to Section 01 8113.14 "Sustainable Design Requirements – LEED V4 BD+C."
- 1.15 ACTION SUBMITTALS: Action submittals shall be complete and in required form. Resubmittals shall include requested corrections and shall respond to previous comments. Each revised sheet shall bear a revision date and number. Revisions shall be flagged with conspicuous revision symbols and numbers. Failure of submittals to be complete, in the proper form, responsive to comments, or identify revisions shall be cause for disapproval and return of documents without review. Failure of review comments to note a noncompliance with plans and specifications shall not relieve the Contractor from his obligation to comply. Failure of review comments to note a noncompliance on a given submittal shall not preclude a directive to comply on future submittals.
- A. Submit shop drawings showing materials in place on building. Drawings shall include elevations, floor plans, sections and full size details. Details shall be fully drawn (not outlined) and annotated. Provide scaled drawings with scale identified. Paper drawings shall be printed to correct scale on 24x36 inch paper. Electronic drawings shall be formatted to print to correct scale on 24x36 inch paper. Drawings shall include the following information.
 - 1. Joinery and internal seals.
 - 2. Glass and metal thicknesses.
 - 3. Metal alloy, temper and finish.
 - 4. Glass strength, tint, coating, frit pattern, and frit color.
 - 5. Fastener alloy, strength, finish, diameter, length and spacing.
 - 6. Glazing materials identification.
 - 7. Sealants identification by product name and color.
 - 8. Relative layout of walls, beams, columns and slabs with dimensions noted.
 - 9. Dimensioned position of glass edge relative to metal daylight.
 - 10. Provisions for movements; details for movement joints in maximum open and closed positions.
 - 11. Gutter and weep system.

12. Locations of, and details for, embedded anchors.
 13. Identification of, and details for, thermal insulation, safing insulation and smoke seal.
 14. Weld information and weld symbols conforming to AWS conventions.
 15. Glazing details applicable to replacement glass, with outline of procedure for glass replacement.
 16. Provisions for adjustment of anchors relative to tolerances of building structure; details for anchors in maximum up/out and in/down positions.
 17. Florida Product Approval report numbers.
- B. Submit structural calculations prepared in compliance with referenced documents and this Section. Calculations shall be legible and shall be cross-referenced to shop drawings to make calculations readily understandable and reviewable. Test reports are not an acceptable substitute for calculations. Calculations shall include:
1. Table of contents.
 2. Sequentially numbered pages.
 3. Calculation of design loads.
 4. Input and output for analyses performed by software.
 5. Analysis of framing members and metal panels.
 6. Analysis of anchors, including anchors embedded in concrete.
 7. Section property computations for framing members.
 8. Analysis of stress in structural silicone.
 9. Seal and signature of professional engineer licensed in Florida. Provide seal and signature on first page of every submittal, not just on a final or record submittal.
- C. Perimeter Fire Containment Engineering Judgments
1. Submit a separate Engineering Judgment for each unique perimeter fire containment condition on this project.
 2. Engineering Judgments shall comply with International Firestop Council (IFC) Guidelines, and shall be provided by a firestop manufacturer's qualified technical personnel, a Fire Protection Engineer, or an independent testing agency that provides listing services for firestop systems.
 3. In addition to compliance with IFC Guidelines, Engineering Judgments shall be cross-referenced to specific shop drawing details for this project.
- D. Submit glass strength analysis for compliance with ASTM E1300. For cold-bent glass, point-supported glass, and other glass that is beyond the scope of ASTM E1300, submit finite element analysis. Stress induced by cold-bending shall be treated as long-duration stress. Stresses determined by finite element analysis shall not exceed allowable stresses for glass surfaces and glass edges in the appendices of ASTM E1300.
- E. Submit shop drawings and structural calculations for performance mock-ups. The required content is the same as for actual building.

- F. Submit laboratory reports for performance mock-ups, including as-built shop drawings.
- G. Submit request to waive reglazing demonstration on mock-ups (Contractor option).
- H. Submit request to perform tensile test on substitute structural silicone or insulating glass secondary seal silicone (if Contractor makes a substitution request). Submit laboratory report if test is performed.
- I. Submit surface temperature and dew point analysis performed with THERM software, and computation of overall U-factors.
- J. Sustainable Design Documentation Submittals: Refer to Section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C."
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following: Leadership Extraction Practices for Recycled Content.
 - 2. Product Data: Documentation for Low Emitting Materials.
 - a. Low Emitting Materials for Paints and Coatings.
 - b. Low emitting Materials for Adhesives and Sealants.
 - 3. Product Certificates: Provide the following:
 - a. Environmental Product Declarations (EPD's).
 - b. Corporate Sustainability Reporting (CSR's).
- K. Samples
 - 1. Submit for approval 3 sets of labeled samples of each type and color of metal finish, on 12 inch (305 mm) long sections of extrusion shapes and 12 inch (305 mm) squares of sheet aluminum. Samples shall show extremes of color and texture variation. Samples will be reviewed for color and texture only. Compliance with other requirements is the responsibility of the Contractor.
 - 2. Submit for approval 3 sets of labeled 12 inch (305 mm) square samples of each type of glass. Provide at project site visual mock-up using full size glass, for evaluation of color range and distortion of reflected image.
 - 3. Submit on request samples that show fabrication techniques and workmanship for component parts.
 - 4. Provide production material conforming to approved samples.

1.16 QUALIFICATIONS

- A. Aluminum Fabricator: Company specializing in fabrication of architectural aluminum extrusions and sheet with minimum 10 years of experience. Engineer who does structural design shall have minimum 10 years of experience designing architectural aluminum.
- B. Glass Supplier and Fabricator: Companies specializing in manufacture of flat glass and fabrication of architectural glass with minimum 10 years of experience.
- C. Gasket Supplier: Company specializing in manufacture of products specified in this Section with minimum 10 years of experience.
- D. Sealant Supplier: Company specializing in manufacture of products specified in this Section with minimum 10 years of experience.

- E. Installer: Company specializing in performing work of this Section with minimum 10 years of experience.

1.17 MOCK-UPS

A. Performance Mock-ups

1. Provide labor and materials to build and test **two** performance mock-ups as shown on Drawings.
 - a. Mock-up #1: **West elevation at Boarding Pier for Gate 251 (Area 36 between grid lines Y27-Y28)**, approximate dimensions 16 feet wide by 29 feet high, no corner return.
 - b. Mock-up #2: **West elevation at building (Area 36 between grid lines Y24 and Y25), approximate dimensions 16 feet wide by 28 feet high**, no corner return.
 - ~~c. Mock-up #3: Skylight at curtain wall corner, south and east elevations at grids L17 and S7.5, approximate dimensions south elevation 20 feet wide by 26 feet high, east elevation 20 feet wide by 26 feet high, projected roof area 20 feet by 16 feet.~~
 - ~~d. Mock-up #4: GTF pedestrian bridge north elevation curtain wall and skylight, approximate width 16 feet (starting at grid line T3 and extending four glass bays to the east), approximate height of curtain wall 30 feet (starting at elevation 121'-8", extending upward three glass openings plus the sloping skylight gutter), approximate length of skylight along slope 20 feet (starting at gutter and extending three glass openings up the slope).~~
2. Mock-ups shall accurately represent project conditions including joint sizes, anchors, materials, finishes and seals, except there shall be no indoor seal at boundaries of test specimen and chamber, even if a seal is intended for the actual building. Install sufficient thermal insulation and safing insulation to demonstrate details of installation.
3. Each mock-up shall be glazed with one consistent set of gaskets. Use of multiple gasket profiles and/or thicknesses at Contractor's discretion is not permitted.
4. Prior to tests, remove and reglaze selected glass units, using the details and procedures intended for glass replacement on the actual building. Reglazed units must satisfy test criteria. Contractor may submit for approval request to waive this requirement for glass supported by structural silicone.
5. Provide at least one extra glass unit for each type and size on mock-ups. Glass that breaks during testing shall be replaced with the same type glass. If glass in a specific mock-up opening breaks twice during attempts to complete one test, or 3 times for any combination of tests, the mock-up fails, redesign of the framing and/or glazing system is required, and testing must be repeated from the beginning of the test sequence.
6. Construct mock-ups in accordance with approved shop drawings. Deviations from or additions to details shown on drawings are subject to approval.
7. Pay laboratory fees. Coordinate chamber availability, shipping schedules and mock-up construction schedules with laboratory.
8. Minimum Content of Laboratory Reports for Performance Mock-ups

- a. For air infiltration and exfiltration tests: numerical value of air flow readings; allowable values.
 - b. For water tests that result in leakage: schematic elevation with identification of leak locations; descriptions of leaks.
 - c. For structural tests: schematic elevation with identification of gage locations; explanation of gage reference surface (chamber steel or test specimen component); numerical data for maximum deflection and residual deflection; allowable values.
 - d. As-built shop drawings of test specimen.
9. If failures occur, revise and retest mock-ups. Modifications shall be realistic in terms of project conditions, shall maintain standards of quality and durability, and are subject to approval.
10. If failures necessitate retests, pay fees and expenses for Architect and consultant to witness retests.
11. Mock-ups are subject to observation by Owner, Architect and their consultants during construction and testing. Provide notification at least two weeks before beginning construction of mock-ups. 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.
12. The testing laboratory shall not perform any of the following functions.
- a. Act as consultant to a contractor for this project.
 - b. Modify Contract Document requirements.
 - c. Modify mock-up configuration.
 - d. Dismantle mock-ups until notified that no further testing is required.
13. Undocumented tests are not permitted. All test results and all remedial work shall be documented in the laboratory report.
14. Mock-up Design Pressures
- a. Mock-up #1: 40 psf outward and 45 psf inward.
 - b. Mock-up #2: 30 psf inward and outward.
 - c. Mock-up #3: 40 psf inward and outward.
 - d. Mock-up #4: 45 psf inward and outward.
15. Maximum test pressures are 1.5 times design pressures.
- B. Performance Mock-up Tests
1. Testing Sequence
 - a. Uniform air pressure at 50% of inward design pressure, 10 second hold.
 - b. Air leakage inward and outward.
 - c. Resistance to water leakage with static pressure.
 - d. Resistance to water leakage with dynamic pressure; this may require multiple steps with wind generator at different locations.

- e. Structural tests at 50% and 100% of inward design pressure, 10 second holds.
 - f. Structural tests at 50% and 100% of outward design pressure, 10 second holds.
 - g. Repeat resistance to water leakage with static pressure. If this test results in failure, after corrections are made repeat structural tests at 50% and 100% inward design pressure, and 50% and 100% outward design pressure, then repeat this test.
 - h. Structural tests at 75% and 150% of inward design pressure, 10 second holds.
 - i. Structural tests at 75% and 150% of outward design pressure, 10 second holds.
2. For air leakage tests, inward chamber air leakage shall be accurately determined, not estimated. Outward chamber air leakage may be assumed to be the same as inward leakage.
 3. For water leakage tests, there shall be no unacceptable water leakage as defined in this Section.
 4. Where test sequence or test failure requires successive water leakage tests, the only means used to drain water from internal cavities shall be gravity drainage through weep system for a minimum of 15 minutes. Air pressure, removal of parts or other means of draining water shall not be used.
 5. For dynamic water tests, wind generator shall have a minimum of three blades, and minimum propeller diameter of 12 feet (3.7 m). Width of area tested shall not exceed two times propeller diameter. Perform separate test for each two-diameter segment, or fraction thereof. For a mock-up with two vertical faces meeting at an outside corner, perform separate tests on each face with the engine centerline perpendicular to the glass planes.
 6. Structural tests shall conform to ASTM E330. Pressures shall be held for at least 10 seconds. Deflection gages shall be set to zero prior to each application of pressure. Deflection gage readings shall be recorded after each application of pressure. Specified deflection and set limitations apply to one application of pressure, not to cumulative effects of two or more loadings.
- C. Glass Visual Mock-ups
1. Comply with applicable requirements of Section 01 43 39 Visual Mock-up Requirements.
 2. Provide at project site visual mock-ups using full size glass, for evaluation of color and appearance of reflected image. Samples shall have production size (maximum), thickness, tint, coatings and heat treatment. For transparent spandrels, provide production backup surface. Provide color, roll wave, millidiopter and bow/warp data for mock-up glass. Color, roll wave, millidiopter and bow/warp data for approved mock-up glass shall be used as a pass/fail benchmark for production glass, subject to limitations in Source Quality Control of this Section.
 3. Mount each sample in a separate frame, in a nominally vertical position. Each frame shall have provision for rotation about horizontal and vertical axes.

Frame mounted samples shall be in an open area that is not shaded from sunlight. Outdoor surfaces of samples shall face southeast, south or southwest. Rotate samples as needed for design team to evaluate glass appearance for a variety of lighting conditions.

4. Provide zebra board with diagonal stripes of alternating black and white color. Width of stripes shall be 4 to 6 inches (10 to 15 cm) and shall be uniform. Provide unobstructed viewing area of at least 50 feet (15 m) between glass and zebra board. Bottom edge of zebra board shall be level with bottom edge of glass. Dimensions of zebra board shall be at least 8 feet wide by 8 feet high (2.4 m by 2.4 m). Position zebra board as needed for design team to evaluate reflected image. Maintain viewing area, samples and zebra board in unobstructed condition throughout construction.
 5. Design team shall evaluate glass samples for color and appearance of reflected image. Accepted glass samples shall be retained as a standard for production material. Provide additional samples if requested by design team.
- D. Visual Mock-ups: Provide visual mock-ups as shown on Drawings, to Section 01 43 39 Visual Mock-up Requirements.
- E. Protect materials in transit and stored materials from damage.
- F. Replace damaged materials.

1.18 SEQUENCING

- A. Coordinate with requirements of material and personnel hoists. Defer installation at obstructed areas, and install materials when obstructions are removed.

1.19 WARRANTY

- A. Provide written warranty agreeing to repair or replace defective materials and workmanship during warranty period. Defective materials and workmanship include, but are not limited to:
1. Water leakage.
 2. Air leakage exceeding specified limits.
 3. Structural failure.
 4. Sealant (including structural silicone) loss of adhesion, loss of cohesion, cracking or discoloration.
 5. Disengagement of gaskets, weatherstrips, trim or other components.
 6. Deterioration or discoloration of metal finish.
 7. Glass breakage including: secondary breakage caused by falling glass; spontaneous breakage of heat treated glass.
 8. Failure of insulating glass edge seal as evidenced by frost, condensation, water, dust, corrosion or coating damage within sealed air space.
 9. Insulating glass spacer migration.
 10. Delamination or discoloration of laminated glass or panels.
 11. Cracking, peeling or discoloration of glass coating.
 12. Delamination, cracking, wrinkling, peeling, discoloration or staining of glass opacifier.

13. Loss of glass bite due to shifting of glass.
 14. Loss of glass bearing on setting blocks due to shifting of glass and/or blocks.
 15. Collapse of thermal insulation or safing insulation.
- B. Warranty does not include damage caused by vandalism, or natural conditions exceeding the performance requirements. Warranty and its enforcement shall not deprive Owner of other action, right or remedy.
- C. Warranty period for entire system shall be 5 years from date of substantial completion. System warranty includes materials and labor.
- D. Certain materials are required to have special warranties. Special warranties shall not limit or reduce requirements of system warranty. Special warranties may originate, in part or in whole, with manufacturers or fabricators and pass through Contractor to Owner. Warranties as written or interpreted by manufacturers or fabricators shall not limit or reduce special warranty requirements of this Section.
1. Insulating glass that experiences failure of edge seal as defined in this Section shall be replaced at no charge (material only) for minimum 10 year period beginning on date of manufacture.
 2. Insulating glass that has a structural edge seal (a seal that transfers load from outer glass ply to inner glass ply) that experiences adhesive or cohesive failure of the structural bond between glass substrates shall be replaced at no charge (material only) for a minimum 10 year period beginning on date of manufacture.
 3. Glass whose coating cracks, peels or discolors shall be replaced at no charge (material only) for minimum 10 year period beginning on date of manufacture.
 4. Laminated glass that delaminates shall be replaced at no charge (material only) for minimum 10 year period beginning on date of manufacture.
 5. Spandrel glass and ceramic silk-screened glass whose opacifier delaminates, cracks, peels, discolors, or stains shall be replaced at no charge (material only) for minimum 10 year period beginning on date of manufacture.
 6. Paint that cracks, peels, fades in excess of specified limits or chalks in excess of specified limits shall be replaced at no charge (material and labor) for minimum 5 year period beginning on date of application.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel
1. Hot rolled shapes and plates shall conform to ASTM A36/A36M.
 2. Tubing shall conform to ASTM A500 or A501.
 3. Stainless steel bars and sheet shall be 300 series alloy. Minimum thickness is: 0.062 inch (1.5 mm) for frames; 0.031 inch (0.79 mm) for trim covers; 0.012 inch (0.30 mm) for concealed flashing; 0.015 inch (0.38 mm) for exposed flashing.
 4. Non-tubular cold formed carbon steel with thickness 0.168 inch (4.27 mm) or less shall conform to ASTM A653/A653M.
- B. Aluminum

1. Acceptable alloy and temper combinations for extrusions subject to fabrication, finish and structural requirements are: 6063-T5; 6063-T6; 6061-T6. Other alloys of the 6xxx series and other tempers may be submitted for approval. Nominal wall thickness of 0.125 inch (3.2 mm) or greater is acceptable for structural extrusions; wall thickness less than 0.125 inch (3.2 mm) may be acceptable and is subject to approval. Minimum nominal wall thickness for nonstructural trim is 0.062 inch (1.6 mm).
2. Acceptable alloy and temper combinations for sheet and plate subject to fabrication, finish and structural requirements are: 3003-H14; 5005-H14. Other alloys of the 3xxx, 5xxx and 6xxx series and other tempers may be submitted for approval. Minimum nominal thickness is 0.04 inch (1.02 mm) for flashing and 0.125 inch (3.2 mm) for parapet caps and all other applications.

C. Glass

1. Glass shall conform, as a minimum, to the following standards.
 - a. Flat glass shall conform to ASTM C1036, quality q3.
 - b. Heat-treated flat glass shall conform to ASTM C1048, except that surface compression of heat strengthened glass shall be 4000 to 7000 psi (27.6 to 48.3 MPa) for 6 mm thickness, 5000 to 8000 psi (34.5 to 55.2 MPa) for 8 mm and 10 mm thicknesses. Direction of roll wave shall be consistent for the entire project.
 - c. Tempered and laminated glass shall conform to ANSI Z97.1.
 - d. Coated glass shall conform to ASTM C1376.
 - e. Laminated glass shall conform to ASTM C1172.
2. Provide safety glazing as required by code.
3. Provide heat strengthened vision and spandrel glass. Provide fully tempered glass only where safety glass is mandatory, where design pressures exceed capacity of heat strengthened glass, and where required by this Section. Annealed glass is not acceptable.
4. Glass Edge Treatment: Heat treated glass shall have seamed edges.
5. Insulating glass shall have double edge seals. Primary seal shall be extruded polyisobutylene continuously bonded to glass surfaces and stainless steel spacer, including corners. Minimum width of primary seal shall be 0.062 inch (1.6 mm). Secondary seal shall be Momentive IGS 3723 or Dow Corning 982. Secondary seal shall completely cover spacer with no gaps or voids, and shall be continuously bonded to both plates of glass. Unfilled spaces between primary and secondary seals shall not exceed one inch long by 3/32 inch wide. At least 50 percent of spacer internal volume shall contain desiccant. All desiccant may be at two sides of a unit. Where insulating glass is supported by structural silicone, secondary seal shall be designed to transfer specified pressures from outdoor glass to indoor glass. Insulating glass shall be qualified to ASTM E2190. Each unit shall be labeled to IGCC Certified Products Directory minimum label requirements, and to Florida Building Code Section 2406.3. Each insulating unit shall have an STC rating of 39 or greater.
6. Laminated glass shall consist of two layers of heat strengthened glass with equal thickness. Tempered glass is acceptable only if design requirements

exceed capacity of heat strengthened glass. Minimum interlayer nominal thickness shall be 0.060 inch (1.52 mm).

- a. Basis of design at vision glass: Kuraray SentryGlas.
- b. Basis of design at spandrel glass: Eastman Saflex.

7. Heat treated glass shall be subjected to quality control measures to minimize inclusions that could result in spontaneous breakage. Such inclusions are defined as material defects by this Section. Installed heat treated glass that experiences spontaneous breakage shall be replaced (material and labor) under warranty provisions. Perform heat soak test on all tempered glass as required in Source Quality Control of this Section.
8. Spandrel glass and ceramic silk-screened glass shall be opacified with ceramic frit.
9. Each glass unit shall be identified in accordance with Florida Building Code Section 2403.1. Safety glazing shall be identified in accordance with Florida Building Code Section 2406.3.

D. Glass Schedule

1. Silk Screen Frit Density, Color and Dot Diameter
 - a. Frit #1 density: 20%, basis of design Viracon V-175 High Opacity White, 1/16 inch diameter.
 - b. Frit #2 density: 40%, basis of design Viracon V-175 High Opacity White at vertical glass, V-903 Subdued Gray at skylight glass, 1/16 inch diameter.
 - c. Frit #3 density: 60%, basis of design Viracon V-903 Subdued Gray, 1/8 inch diameter.
2. Insulating Glass Spacer: black stainless steel.
3. Glass Heat Treatment: All glass is heat treated. Annealed glass is not acceptable. Provide heat strengthened glass, except provide fully tempered glass only where required for safety or performance. Perform heat treatment before low-e coating is applied.
4. Glass Type GL-1 basis of design: Insulating, laminated, all glass layers PPG Starphire 6 mm (minimum) thickness, monolithic outdoor, Viracon VNE 13-63, 13.2 mm air space, laminated indoor, two layers of Starphire, 1.52 mm clear SentryGlas interlayer.
5. Glass Type GL-2 basis of design: Insulating, laminated, all glass layers PPG Starphire 6 mm (minimum) thickness, monolithic outdoor, Viracon VNE 13-63, frit #2 V-175 High Opacity White on surface #2, 13.2 mm air space, laminated indoor, two layers of Starphire, 1.52 mm clear SentryGlas interlayer.
6. Glass Type GL-3 basis of design: Insulating, laminated, all glass layers clear 6 mm (minimum) thickness, monolithic outdoor, Viracon VNE 1-63, 13.2 mm air space, laminated indoor, two layers of clear glass, 1.52 mm clear SentryGlas interlayer.
7. Glass Type GL-4 basis of design: Insulating, laminated, all glass layers clear 6 mm (minimum) thickness, monolithic outdoor, Viracon VNE 1-63, no frit zero to

8 feet, frit #1 V-175 High Opacity White on surface #2 above 8 feet, 13.2 mm air space, laminated indoor, two layers of clear glass, 1.52 mm clear SentryGlas interlayer.

8. Glass Type GL-4A basis of design: Laminated, both glass layers clear 6 mm (minimum) thickness, 1.52 mm clear SentryGlas interlayer.
9. Glass Type GL-5 basis of design: Insulating, laminated, all glass layers clear 6 mm (minimum) thickness, monolithic outdoor, Viracon VNE 1-63, frit #2 V-175 High Opacity White on surface #2, 13.2 mm air space, laminated indoor, two layers of clear glass, 1.52 mm clear SentryGlas interlayer.
10. Glass Type GL-6 basis of design: Insulating, laminated, all glass layers clear 6 mm (minimum) thickness, monolithic outdoor, Viracon VNE 1-63, frit #2 V-903 Subdued Gray on surface #2, 13.2 mm air space, laminated indoor, two layers of clear glass, 1.52 mm clear SentryGlas interlayer, VLT 36%.
11. Glass Type GL-7 basis of design: Insulating, laminated, all glass layers 6 mm (minimum) thickness, monolithic outdoor Optigray, Viracon VNE 30-63, frit #3 V-903 Subdued Gray on surface #2, 13.2 mm air space, laminated indoor, 1.52 mm clear SentryGlas interlayer, outboard layer Optigray, inboard layer clear glass, VLT 12%.
12. Glass Type GL-8 basis of design: Insulating, laminated, all glass layers 6 mm (minimum) thickness, monolithic outdoor Gray, Viracon VNE 3-63, frit #3 V903 Subdued Gray on surface #2, 13.2 mm air space, laminated indoor, 1.52 mm clear SentryGlas interlayer, outboard layer Gray, inboard layer clear glass, VLT 6%.
13. Glass Type GL-9 basis of design: Insulating, laminated, all glass layers PPG Starphire 6 mm (minimum) thickness, monolithic outdoor Viracon VNE 13-63, Frit #2 V-175 High Opacity White on surface #2, 13.2 mm air space, laminated indoor, two layers of Starphire, 1.52 mm clear PVB interlayer, Medium Gray Viraspan full surface frit on surface #6.
14. Glass Type GL-10 basis of design: Insulating, laminated, all glass layers PPG Starphire 6 mm (minimum) thickness, monolithic outdoor Viracon VNE 13-63, 13.2 mm air space, laminated indoor, two layers of Starphire, 1.52 mm clear PVB interlayer, Medium Gray Viraspan full surface frit on surface #6.
15. Glass Type GL-11 basis of design: Insulating, laminated, all glass layers clear 6 mm (minimum) thickness, monolithic outdoor Viracon VNE 1-63, Frit #2 V-175 High Opacity White on surface #2, 13.2 mm air space, laminated indoor, two layers of clear glass, 1.52 mm clear PVB interlayer, Medium Gray Viraspan full surface frit on surface #6.
16. Glass Type GL-12 basis of design: Insulating, laminated, all glass layers PPG Starphire 6 mm (minimum) thickness, monolithic outdoor Viracon VNE 13-63, frit #2 V-903 Subdued Gray on surface #2, 13.2 mm air space, laminated indoor, two layers of Starphire, 1.52 mm clear SentryGlas interlayer, VLT 40%.

E. Glazing System

1. Gasket system shall consist of a dense gasket against one glass face, and a cellular gasket against the other glass face, or dense gaskets against both glass faces. Refer to Glazing Materials and Glazing regarding injection molded corners and sealing of gasket corner joints.

2. Structural silicone system shall consist of structural silicone at interior glass face, and an exterior silicone weather seal. Where glass is not supported by structural silicone, provide gasket system; either or both gaskets may be replaced by a recessed backer and silicone seal. Refer to FABRICATION regarding shop assembly of four-side structural silicone system.
3. Weight of each glass unit shall rest on setting blocks that are supported by a metal frame. Stacking of glass units over a shared dead load support is not acceptable.

F. Elastomers

1. Gaskets, weatherstrips, glazing blocks and other elastomeric components shall conform to the following standards.
 - a. Cellular neoprene and EPDM: ASTM C509, test for resistance to flame propagation not required.
 - b. Dense neoprene and EPDM: ASTM C864.
 - c. Dense silicone: ASTM C1115, Type C for glazing, Type T for expansion joints.
 - d. Dense thermoplastic rubber: ASTM E2203.
 - e. Straightness tolerance for extended legs of wiper gaskets is 0.062 inch in a one foot gage length (1.5 mm in 30 cm). Waviness or rippling exceeding this tolerance is not acceptable.
2. Gaskets and Weatherstrips Except at Structural Silicone
 - a. Cellular gaskets shall be extruded black neoprene or EPDM with hardness of 40 +/- 5 durometer. Design cellular gaskets to provide 20% to 35% compression.
 - b. Dense gaskets shall be black extrusions with Shore A hardness of 75 +/- 5 for hollow profiles and 60 +/- 5 for solid profiles. Gaskets shall be silicone, neoprene, EPDM or thermoplastic rubber.
 - c. Provide glazing gaskets with injection-molded corners where gaskets can be installed to metal frame before glass is set.
 - d. Compression gaskets shall be designed to produce a force against the glass surface of 4 to 10 pounds per linear inch (0.70 to 1.75 N/mm).
3. Glazing gaskets, sealant backers, and glass spacer pads in contact with structural silicone shall be black extruded dense silicone.
4. Gaskets that maintain glass face clearance while serving as a backer for a silicone weather seal may have a friction fit. All other gaskets and weatherstrips, including backers for structural silicone, shall have a continuous spline or a continuous groove that engages a matching groove or leg on the aluminum frame.
5. Expansion Joints at Walls
 - a. Provide continuous aluminum extrusions with pockets to receive continuous elastomeric snap-in primary and secondary gaskets. Basis of design is Balco type FCVS Silicone.

- b. Primary gasket shall be extruded dense silicone or thermoplastic. Secondary gasket shall be extruded dense EPDM or thermoplastic.
 - c. Minimum rated movement capacity is 50 percent of nominal joint width in compression, and 50 percent of nominal joint width in tension.
 - d. Provide primary gasket color as selected by Architect.
6. Setting Blocks
- a. Setting blocks shall be dense extruded silicone with hardness of 85 +/- 5 durometer Shore A. Minimum length is 0.1 inch for each square foot (27 mm for each square meter) of glass area, but not less than 4 inches (102 mm). Minimum width is glass unit thickness. Setting blocks shall be equidistant from glass centerline, with block centerlines between glass eighth points and quarter points. Distance from vertical glass edge to nearest edge of setting block shall not be less than 6 inches (152 mm) where glass width is at least 32 inches (813 mm).
 - b. Shims used in conjunction with setting blocks shall be of the same material, hardness, length and width as the blocks.
 - c. Setting blocks and chairs shall be secured against migration.
7. Side Blocks
- a. Provide side blocks at both jambs, between midheight and top corner of glass. Blocks shall be 55 +/- 5 durometer Shore A dense silicone. Block width shall be 0.125 inch (3 mm) less than nominal glass edge clearance.
 - b. Side blocks are not required where glass is continuously sealed with silicone at two or more edges.
- G. Glazing Tape: Saint-Gobain Performance Plastics V2100 Thermalbond Tape is acceptable as a glass spacer pad when used in conjunction with structural silicone, subject to compatibility tests.
- H. Anchors in Concrete and Masonry
- 1. Anchors embedded in concrete and masonry shall be prime painted or hot dip galvanized rolled steel, or hot dip galvanized cold formed steel.
 - 2. Strength of embedded anchors shall be developed by integral projections, welded deformed bars, or headed studs.
 - 3. At masonry, through bolts are acceptable provided that bearing plates are used at both masonry surfaces. Expansion bolts are acceptable provided they are designed for use in masonry.
 - 4. Expansion bolts are acceptable in concrete.
 - 5. Hilti Kwik HUS-EZ and Powers Wedge-Bolt are acceptable in concrete.
 - 6. Fasteners that are self-drilling are not acceptable. Screws in plugs and powder actuated fasteners are not acceptable.
- I. Fasteners
- 1. Fastener requirements are applicable to screws, bolts, nuts, washers, rivets and pins.
 - 2. Stainless steel 300 series fasteners are required at the following locations, and are acceptable at all locations.

- a. Locations with exposure to outdoor air.
 - b. Joinery of aluminum frames, regardless of exposure.
 - c. Glazing pockets.
 - d. Internal cavities that act as gutters, or that potentially contain water resulting from leakage or condensation.
3. Carbon steel and 400 series stainless steel fasteners with zinc plating, cadmium plating or Stalgard coating are acceptable at locations where 300 series stainless steel is not required. Mill finish carbon steel and mill finish 400 series stainless steel fasteners are not acceptable.
 4. Aluminum bolts are acceptable for fastening aluminum parts. Provide alloy and temper 2024-T4, 6061-T6, or 7075-T73. Finish for exposed aluminum fasteners shall be the same as for the aluminum parts being fastened.
 5. Provide helical spring washer, nylon patch, or liquid thread lock at all bolted connections.
 6. Powder actuated fasteners are not acceptable.
- J. Shims
1. Separate surfaces designed for relative movement with friction reducing pads. Pads shall have minimum 0.062 inch (1.6 mm) thickness, shall reduce friction to permit movement, shall be resistant to wear, and shall be positively retained in position (open ended slots are not acceptable). Pads shall not be subjected to heat damage from welding or cutting, or to excessive pressure from overtightening of bolts.
 2. Shims that transfer shear forces (tending to slide one shim against another) shall be steel plates, set in a staggered pattern and fillet welded to each other and to adjacent steel surfaces. Shims and welds shall be structurally designed to support applied loads.
 3. Plastic shims are acceptable at static connections for which shims transfer only compressive forces.
 4. Wood shims are not acceptable.
- K. Provide weep hole filters if needed to comply with performance requirements. Weep hole filters shall be 20 to 45 pores per inch PVC coated open cell urethane foam.
- L. Sealants: Listed products are acceptable subject to tests. Provide colors as selected by Architect.
1. Sealants required for non-structural exposed outdoor seals at perimeters of metal panels and stone panels, and acceptable for other non-structural seals.
 - a. Momentive Silpruf NB.
 - b. Dow Corning 756 SMS.
 2. Sealants acceptable for non-structural seals at locations other than perimeters of metal panels and stone panels.
 - a. Momentive Silpruf, Silpruf LM.
 - b. Dow Corning 790, 791, 795.
 - c. Tremco Spectrem 1 and Spectrem 2.

3. Sealants acceptable for shop-applied structural seals.
 - a. Momentive UltraGlaze SSG4400, SSG4600.
 - b. Dow Corning 983.
 - c. Tremco Proglaze II.
4. Sealants acceptable for shop-applied and field-applied structural seals.
 - a. Momentive Silpruf, UltraGlaze SSG4000.
 - b. Dow Corning 795, 995.
5. Oil base sealants are not acceptable.
6. Sealant back-up materials shall be polyethylene foam, urethane foam or extruded silicone as recommended by sealant manufacturer. Back-up shall not absorb water, and shall not emit gas, even if punctured.
7. Coordinate with other sections to assure compatibility of intersecting sealants.

M. Thermal Breaks

1. Thermal breaks that are integral to extruded aluminum frames shall be continuous polyamide nylon 66 or continuous polyurethane. Minimum separation of outdoor and indoor metal shall be 0.37 inch (9.5 mm); increase separation as required to comply with specified thermal performance.
 - a. Polyamide nylon 66 shall be reinforced with minimum 25 percent glass fibers and shall be mechanically locked to extrusions with closely spaced crimps.
 - b. Polyurethane shall be poured into a cavity of a single extrusion. The extrusion shall be debridged after the polyurethane hardens. The cavity shall have closely spaced indentations to mechanically lock the polyurethane against slippage in the cavity.
2. Thermal breaks that are fastened and clamped between two layers of metal shall be rigid PVC or one of the materials specified for glazing gaskets in this Section.

N. Thermal Insulation

1. Insulate spandrels and other nonvision areas with Thermafiber FireSpan 90, Roxul CurtainRock 80, or approved equal having 3.0 inch (76 mm) minimum nominal thickness. Minimum R-value for insulation alone shall be 12.6 (ft²·h·°F)/Btu (2.2 {m²·K}/W). Provide FSP or FSK adhered vapor barrier consisting of minimum 0.0005 inch (12.7 micron) aluminum foil, fiberglass scrim, and polyethylene film or Kraft paper. Locate foil surface flush with innermost surface of vertical framing members. Butt joints are acceptable provided that both pieces of insulation are attached to, and are in contact with, continuous steel reinforcement located on the outboard side of insulation. Each piece of insulation shall be retained at a minimum of two opposite edges.
2. Framing Covers
 - a. Apply above and below safin insulation, for full height of insulated openings, minimum 2.0 inch (51 mm) thick and minimum 8 inch (203 mm) wide strips of insulation (framing covers) against vertical framing members, with minimum 1.0 inch overlaps of adjacent insulation.

- b. Each framing cover shall be retained at a minimum of two points with steel impaling pins (see "Attachment of Insulation"), steel fasteners with washers, or Thermafiber Impasse Spiral Anchors.
 - c. Framing covers shall also be placed against any intermediate horizontal or vertical framing members within an insulated opening, where the framing would otherwise be unprotected from fire on the indoor side.
3. Attachment of Insulation
- a. Steel impaling pins are acceptable. Pins may be welded to steel framing or to steel sheet. Pins may have integral bases that are fastened with steel screws. Attachment of pins with adhesive is not acceptable.
 - b. Thermafiber Impasse Hangers are acceptable. Hangers shall be fastened to framing with steel screws.
 - c. Attachment of insulation with tape or adhesive is not acceptable.
 - d. Maintain 1.0 inch (25 mm) nominal air space between insulation and glass.
4. Provide continuous horizontal metal brace against outboard surface of thermal insulation, at the level of safing insulation. Fasten brace to vertical frames. Brace shall have sufficient stiffness to prevent bowing of thermal insulation.
5. Seal edges, joints, punctures and tears in vapor barrier with aluminum foil tape. Tape insulation to framing before placement of framing covers. Apply tape over clinch shields, washers, spiral anchors and other hardware at penetrations of foil backing. Apply tape at perimeters of framing covers.
- O. Safing Insulation and Smoke Seal
- 1. Fill void at floor and roof edges with Thermafiber Safing Insulation, Roxul Safe, or approved equal. Thickness shall be four inches (102 mm) minimum top to bottom. Cut safing insulation wider than opening to provide compression fit recommended by manufacturer.
 - 2. Completely coat top surface of safing insulation with 3M FireDam Spray 200, SpecSeal AS200 Elastomeric Spray, Hilti CP 672 Firestop Joint Spray or approved equal. Coating shall overlap floor and wall a minimum of 0.5 inch (13 mm). Provide minimum wet thickness 0.125 inch (3 mm). Comply with manufacturer requirements for temperature and condition of substrates at time of installation.
 - 3. The smoke-sealed joint shall be tested to UL 2079 for air leakage. The L-rating shall not exceed 5 cfm per linear foot (0.00775 m³/s m) of joint at 0.30 inch of water (7.47 Pa) for ambient temperature and elevated temperature tests.
 - 4. Where safing and smoke seal are interrupted at a stairwell, shear wall, or any other condition that prevents continuity, provide vertical safing, and smoke seal on the protected side, to close gaps between horizontal lines of safing at successive floors. Where needed to maintain continuity, provide safing and smoke seal between exterior wall and beams, columns and other structure surfaces where floor slabs are interrupted or do not occur.
 - 5. Place safing insulation, and if needed additional strips of safing insulation, horizontally and vertically as needed to protect anchors from exposure to fire at

the floor below the anchor. Provide at least two inch insulation cover for anchor components.

P. Primers

1. Coat aluminum surfaces in contact with masonry, concrete or steel with prime paint or bituminous paint.
2. Prime paint carbon steel parts of anchors, embedded anchors, reinforcement and supports. After field welding, remove weld slag and touch up primed surface.
3. Provide minimum dry film thickness of one mil (0.0254 mm) for paint and 30 mils (0.762 mm) for bituminous paint. Prime paint shall conform to GSA specification TT-P-645B 1990.

Q. Flashing

1. Acceptable materials are stainless steel sheet and aluminum sheet. Aluminum is required to have a shop-applied bituminous coating where it contacts dissimilar materials.
2. Provide sealed lap joints, end dams and transitions to gutters.

R. Delivery Time for Replacement Glass: After completion of construction, delivery time for replacement glass shall not exceed 16 weeks.

2.2 FABRICATION

- A. Perform fabrication and assembly as much as possible in the shop.
- B. Exposed work shall have continuous lines. Joints in exposed work shall be accurately fitted and rigidly secured.
- C. Welding shall be in accordance with recommendations of the American Welding Society and shall be done with electrodes and by methods recommended by suppliers of alloys being welded. Welds behind finished surfaces shall be done so as to minimize distortion. Discoloration of a finished surface due to welding or any other process is unacceptable. Weld spatter and welding oxides on finished surfaces shall be removed by descaling and/or grinding.
- D. Weld beads on exposed surfaces shall be ground and finished to match and blend with finish on adjacent metal. Grinding and polishing of nonferrous metal shall be done only with clean wheels and compounds free from iron and iron compounds. Soldering and/or brazing are not acceptable.
- E. Provide exposed fasteners only where shown on approved shop drawings. Exposed fastener heads shall be finished to match fastened material.
- F. Provide specified finishes on exposed surfaces. Provide specified galvanized finish or shop-applied prime paint on concealed steel.
- G. Systems with glass supported at all edges by structural silicone shall be unitized and shall be fully assembled, including silicone and glass, in the shop.

2.3 TOLERANCES

- A. Tolerances in the Aluminum Association Aluminum Standards and Data are applicable to finished, fabricated and assembled materials, except that flatness tolerance for aluminum sheet panels shall be half of standard sheet tolerance. Maintain stricter tolerances where required for proper fit of components.

- B. Fabrication tolerances for frames of shop-assembled and shop-glazed window and skylight frames are:
1. Overall length and width: 0.062 inch (1.6 mm).
 2. Deviation from square: 0.125 inch (3.2 mm).
 3. Open gap at nominal hairline joint: 0.062 inch (1.6 mm) maximum.
 4. Offset (in/out) between adjacent nominally flush surfaces: 0.031 inch (0.8 mm).

2.4 PAINTED ALUMINUM FINISH

A. General Requirements

1. Paint shall be supplied by a licensed formulator.
2. Application of shop-applied finish shall be performed under specifications issued by licensed formulator, by an applicator approved by formulator.
3. Color shall match approved samples. Samples shall show extremes of color range.
4. Pretreatment of metal surfaces shall be done in accordance with procedures recommended by formulator.
5. VOC's shall be captured and converted to water vapor by an oxidizer.
6. Touch-up of painted aluminum is permitted only with written permission from the Architect. Unless touch-up is authorized, replace damaged material with new material. Touch-up shall be done with PPG Corafon ADS air dry two-coat system.
7. Provide colors as selected by Architect.

B. Outdoor Surfaces

1. Painted aluminum finish shall be factory oven cured four coat finish based on Kynar 500 or Hylar 5000 Fluoropolymer resin.
2. Formulation shall have at least 70% Kynar 500 or Hylar 5000 resin in residual solids.
3. Pigmented organic coatings for extrusions, structural shapes, sheet or plate, spray applied in the factory, shall meet requirements of AAMA 2605.
4. Warranty
 - a. Color changes shall not exceed 5 Delta E units as defined by ASTM D2244 for specified special warranty period.
 - b. Chalking shall not exceed a number 8 rating as defined by ASTM D4214 for specified special warranty period.
 - c. Paint film shall not crack or peel during specified special warranty period.

C. Indoor Surfaces

1. Specified finish for outdoor surfaces is acceptable for indoor surfaces.
2. Where outdoor and indoor parts can be finished separately, factory oven cured acrylic or polyester paint is acceptable for indoor surfaces.
3. Acrylic and polyester pigmented organic coatings for extrusions, structural shapes, sheet or plate, spray applied in the factory, shall meet requirements of AAMA 2603.

2.5 ALUMINUM FINISH AT STRUCTURAL SILICONE

- A. Mill finish is not acceptable at structural silicone bonding surfaces.
- B. Aluminum surface to which structural silicone will be adhered shall have a finish that demonstrates by test the ability to satisfy specified requirements. Subject to testing, acceptable finishes are:
 - 1. Paint conforming to AAMA 2605 or AAMA 2603.
 - 2. Alodine conversion coating conforming to ASTM B449 Class 1.

2.6 STEEL FINISHES

- A. Cold formed carbon steel with thickness 0.168 inch (4.27 mm) or less shall be hot dip galvanized to meet or exceed requirements of classification G90 of ASTM A653/A653M.
- B. Cold formed carbon steel with thickness exceeding 0.168 inch (4.27 mm) and hot rolled steel shall be prime painted in conformance with GSA Specification TT-P-645B, or hot dip galvanized in conformance with ASTM A123/A123M.
- C. Corrosion of galvanized steel surfaces is not acceptable in any amount, including "storage stain" and "white rust." Store galvanized steel in a dry indoor environment. Protect galvanized steel during shipping, storage, handling and fabrication from conditions that promote corrosion.
- D. Stainless steel exposed surfaces shall have number 8 polished finish.

2.7 SOURCE QUALITY CONTROL

- A. Glass
 - 1. Heat Soak Test: Perform heat soak test on all tempered glass. Hold glass at 550 ± 18 degrees F (290 ± 10 degrees C) for minimum 2 hours. Record quantity and sizes tested, dwell time and quantity of breaks (if any). Submit records in electronic pdf format for information only.
 - 2. Color Measurement
 - a. Measure color of coated glass with spectrophotometers. Measure color from the uncoated side.
 - b. Perform continuous on-line color measurement across the entire glass surface on the coating line. Perform off-line quality control checks on a minimum of one unit every four hours and at each product change on the heat treating line.
 - c. The color target shall be established by the coater.
 - d. Color variation shall not exceed 4.5 Delta E*ab units as defined by ASTM C1376, except the target shall be as defined in this Section, not units installed on a building. Remove from production any non-conforming glass.
 - e. Record all off-line quality control check data and submit it in electronic pdf format for information only.
 - 3. Distortion Measurement of Heat-Treated Glass
 - a. Measurement device shall be Osprey LiteSentry.

- b. Measure all coated and uncoated heat-treated glass at the end of the heat treatment line, in a horizontal position with glass supported on rollers.
 - c. Roll wave peak to valley distortion for leading edge, central area, and trailing edge shall not exceed the highest values for units used on an approved visual mock-up, or 0.003 inch for central area, and 0.008 inch for leading and trailing edges, whichever is less.
 - d. For measurements taken over at least 90 percent of the area of each unit, distortion shall not exceed the highest value for units used on an approved visual mock-up, or ± 120 millidiopters, whichever is less.
 - e. Remove from production non-conforming glass.
 - f. Record all roll wave and millidiopter data, and submit it in electronic pdf format for information only.
4. Bow and Warp Tolerance for Heat-Treated Glass
- a. Bow and warp shall not exceed one half of the values listed in ASTM C1048.
 - b. Measure at least one unit per hour.
 - c. Record bow and warp data, and submit it in electronic pdf format for information only.
- B. Test shop applied structural silicone by applying outward design pressure for at least 30 seconds. Test minimum 10 percent of units, using random selection throughout production. Record date of test, results and identification marking of unit tested. Mark each unit so that structural silicone batch numbers and date of application can be traced. Submit test data for information only.
- C. Perform specified water leakage test with static pressure on minimum 2 percent of shop assembled curtain wall units, using random selection throughout production. Record date of test, results and identification marking of unit tested. Submit test data for information only.
- D. Inspect materials and workmanship to assure compliance with Contract Documents. Provide access to storage and manufacturing facilities for observation by Owner and Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that structure and site conditions are ready to receive work of this Section.
- B. Perform layout based on established benchmarks.

3.2 INSTALLATION

- A. Install materials in accordance with approved shop drawings and Florida Product Approval reports. Provide labor, material, equipment and supervision necessary for complete installation.
- B. Field Tolerances
 - 1. Provide anchor adjustment capability for full range of specified tolerances for building structure, but not less than one inch (25 mm) in all directions, except 0.5 inch (12 mm) in all directions at connections to wind girts.

2. Work of this Section shall be within the following tolerances.
 3. Deviation from plumb, level or dimensioned angle shall not exceed 0.125 inch per 12 feet (3.2 mm per 3658 mm) of length of any member, 0.25 inch (6.4 mm) in any total run in any line.
 4. Deviation from theoretical position in plan or elevation, including deviation from plumb, level or dimensioned angle, shall not exceed 0.375 inch (9.5 mm) total at any location. Change in deviation shall not exceed 0.125 inch for any 12 foot (3.2 mm per 3658 mm) run in any direction.
 5. Maximum offset from true alignment between two metal components placed end to end shall not exceed 0.062 inch (1.6 mm).
 6. Open gap at nominal hairline joint between metal components shall not exceed 0.062 inch (1.6 mm).
 7. Variation of width of reveal formed by overlapping metal components shall not exceed plus or minus one half of nominal reveal width, or 0.125 inch, whichever is less.
 8. Maximum offset between glass framing members at corners of glazing pocket shall not exceed 0.031 inch (0.8 mm).
- C. Anchorage
1. Anchor component parts by bolting and welding. Install captured slip pads between moving parts.
 2. Provide noncorrosive separators between dissimilar materials.
 3. Remove weld slag and apply prime paint over welds. Prime paint exposed portions of embedded anchors. Touch up shop applied primer that is damaged by welding or other causes.
 4. Where slots or oversize holes are provided for adjustment only, secure connection after final adjustment. Interlocking serrations in extruded aluminum brackets and washers are acceptable. Steel weld washers with 0.25 inch (6 mm) minimum thickness are acceptable with steel brackets. Special washers or nuts that rely on friction and/or surface indentation of fastened part are not acceptable.
 5. Remove temporary shims and fasteners. Leave expansion joints free to move as designed.
- D. Clean surfaces to be sealed. Cleaning solvent shall be isopropyl alcohol. Install backers, primers and sealant in accordance with shop drawings, test results and manufacturer recommendations. Dry tool sealants as separate operation after application. Immediately remove masking.
- E. Install thermal insulation, vapor barrier, and safing insulation with specified supports. Install smoke seal. Surfaces to which smoke seal is applied shall be clean, dry and free from frost and dust. Maintain temperature required for application and drying of smoke seal.
- 3.3 GLAZING
- A. Inspect frame for proper dimensions and squareness. Adjust frame and/or glass size as required to meet specified requirements.

- B. Clean glazing pocket before setting glass. Cleaning solvent shall be isopropyl alcohol. Setting blocks shall be equidistant from glass centerline, with block centerlines between glass eighth points and quarter points. Distance from vertical glass edge to nearest edge of setting block shall not be less than 6 inches (152 mm) where glass width is at least 32 inches (813 mm). Side blocks shall be located between midheight and top corner of glass. Side blocks, setting blocks and chairs shall be positively retained in position.
- C. Install gaskets with injection molded corners where indicated on shop drawings. Where gasket joints occur, tightly butt ends and seal with compatible sealant. Gasket joints shall not occur at locations other than corners.
- D. Inspect glass before installation. Do not install glass that does not conform to this Section. Replace glass that is broken or damaged.
- E. Except as otherwise specified, comply with GANA Glazing Manual. Provide minimum nominal glass bite of 0.5 inch (12.7 mm), but not less than glass bite required for structural silicone. Where joint movement will result in variable glass bite, increase nominal bite to provide 0.375 inch (9.5 mm) minimum bite and 0.25 inch (6.4 mm) minimum edge clearance after worst combination of movements. Design for full values of all movements occurring simultaneously. Provide minimum nominal glass face clearance of 0.187 inch (4.8 mm).
- F. Remove and replace stops and apply sealants as required for complete glass installation.
- G. Defer glazing of openings that are obstructed during construction. Glaze such openings when obstructions are removed.
- H. Clean, prime and mask at structural silicone joints during same day on which silicone is applied.
- I. Temporarily clamp glass during cure of structural silicone. After sufficient cure, remove clamps and fill gaps in silicone.
- J. Mask glass and aluminum during application of structural silicone. Remove masking immediately after tooling sealant.
- K. Structural silicone shall not be applied to edges of insulating glass units, or to edges of laminated glass units. Sealants used as weather seals shall not be placed against edge of laminated glass interlayer.

3.4 FIELD QUALITY CONTROL

- A. Provide site supervision and Field Quality Control requirements for the Installer. Provide Field Quality Control staff having adequate prior experience with all specific products and materials to complete the specified systems and to integrate specified systems with adjacent construction. BECxA shall provide an initial BECx checklist. Installers for work of this Section shall provide completed BECx checklist with weekly updates verifying all specific locations of the work, specific locations of repairs and descriptions of repairs. BECx checklist shall be completed in its entirety by installers of work of this Section and shall be submitted to the Contractor, Architect, Owner and BECxA on a consistent weekly basis.
- B. Hose Tests

1. Perform field hose tests for resistance to water leakage prior to installation of interior finishes and interior sealant joints. Test areas shall be selected by Architect. Area of each test area shall be at least 400 ft² (37 m²). There shall be no unacceptable water leakage as defined in this Section. Provide powered scaffold, hose, water supply and manpower to perform at least 23 successful tests, plus any unsuccessful tests. Water testing shall be conducted early in construction schedule. Construction sequence shall include provisions for timely completion of test areas. Remedial measures shall maintain standards of quality and durability and are subject to approval.
2. Test Areas
 - a. Airside vertical curtain walls, **three** locations, **two** at hold rooms or retail, one at a boarding pier, ~~one at the Hub clerestory.~~
 - ~~b. Airside Boulevard skylight, two locations, one at the ridge, one at a roof edge. Interior scaffolding is required for observers.~~
 - ~~c. Landside vertical curtain walls, six locations, one at the east elevation, one at the north elevation between grids L11 and L12, one at the south elevation between grids L16 and L17, one at the west elevation between grids N1 and S1, one at north Boulevard clerestory, one at south Boulevard clerestory. Interior scaffolding is required for observers.~~
 - ~~d. Landside punched windows, two locations, one at the north elevation consisting of two windows each at Departures Level and Domestic Arrivals Bridge Level, and one at the south elevation consisting of two windows each at Domestic Arrivals Bridge Level and Arrivals Level.~~
 - ~~e. Landside Boulevard skylight, four locations, one at the ridge and three at roof edges. Interior scaffolding is required for observers.~~
 - ~~f. Landside single pitch skylight, four locations including high edge and low edge, one each at north and south skylights between grids L16 and L17, one each at north and south skylights between grids L11 and L12. Interior scaffolding is required for observers.~~
 - ~~g. GTF vertical curtain wall, one location, pedestrian bridge north elevation, pedestrian bridge level to skylight gutter.~~
 - ~~h. GTF skylight, two locations, one at the ridge, one extending upward along the slope from the gutter.~~
 - i. Do not use the same areas for hose tests and chamber tests.
 - ~~j. Test areas include boundaries with work of other sections. Coordinate test requirements with other sections.~~
3. Conduct test with Monarch Type B-25 #6.030 brass nozzle and 3/4 inch diameter hose. Water pressure to nozzle shall be in the range 30 to 35 psi. Working upward from bottom of test area, direct water at 5 foot long segments of glazing seals, frame joints and perimeter joints, moving slowly back and forth on each segment for minimum of 5 minutes. Where a framing member is between two glass units and its width does not exceed 4 inches, both lines of glazing seal may be tested as one segment by centering the spray on one glazing seal while moving in one direction, and centering the spray on the other glazing seal while moving in the opposite direction. Sustained spraying at one

point while the nozzle remains stationary is acceptable. Tip of nozzle shall be 12 inches from specimen exterior surface. Nozzle shall generally be perpendicular to specimen surface, but shall be tilted to any angle that maximizes exposure of a given joint to water flow rate and kinetic energy. Continuously check for leakage on indoor side. If necessary to pinpoint leak sources, perform additional testing. Repeated testing of joints is acceptable. The use of masking to pinpoint leaks is acceptable.

4. Provide scaffolding, ladders or lifts to allow close observation of all portions of test specimens.
5. Check completed areas below test area, and report any leaks that occur. A test that results in leakage at a completed area below a designated test area is a failure.
6. Submit, for information only, reports that contain dates of tests, elevation drawings of test areas with locations relative to grid lines (including any lower areas where leaks occur), and location of each leak.

C. Chamber Tests

1. Perform field chamber tests for resistance to water leakage prior to installation of interior finishes and interior sealant joints. Test areas shall be selected by Architect. Area of each test area shall be at least 400 ft² (37 m²). Where the area of a single test is limited by the size of the water spray rack, it is acceptable to test in several steps by moving the spray rack to successive positions on a grid pattern, moving from low edge to high edge. There shall be no unacceptable water leakage as defined in this Section. Provide powered scaffold, hose, water supply, water spray rack, pressurized chamber on indoor side with access hatch, manometer, air blower and manpower to perform at least six successful tests, plus any unsuccessful tests. Water testing shall be conducted early in construction schedule. Construction sequence shall include provisions for timely completion of test areas. Remedial measures shall maintain standards of quality and durability and are subject to approval.
2. Test Areas
 - a. Airside vertical curtain walls, four locations, three at hold rooms or retail, one at a boarding pier.
 - b. Landside vertical walls, two locations, one at the east elevation, one at the north elevation between grids L16 and L17.
 - c. GTF vertical curtain wall, one location at pedestrian bridge, extending two glass openings upward from pedestrian bridge level.
 - d. Do not use the same areas for hose tests and chamber tests.
 - e. Test areas include boundaries with work of other sections. Coordinate test requirements with other sections.
3. Chambers shall be free-standing and shall be at least 3 feet deep to allow observers to stand inside during tests. Provide ladders or lifts inside chambers to allow close inspection of full height of specimens. Chambers that require observers to view specimens through clear or translucent windows or membranes are not acceptable.

4. Conduct tests to ASTM E1105 except as modified by this Section, using Procedure "A" uniform pressure difference. Test pressure and pass/fail criteria shall be as required by this Section, without any adjustment or reduction.
 5. Check completed areas below test area, and report any leaks that occur. A test that results in leakage at a completed area below a designated test area is a failure.
 6. Submit, for information only, reports that contain dates of tests, elevation drawings of test areas with locations relative to grid lines (including any lower areas where leaks occur), and location of each leak.
- D. Perform adhesion testing of weatherproofing sealants. Use Destructive Procedure Tail Method "A" and frequency of testing as defined by ASTM C1521. Adhesive failure is not acceptable as the sealant is stretched a predetermined amount. The standard requires stretching of sealant to two times its rated movement capacity. If sealant manufacturer recommends more than two times, use manufacturer recommendation. Submit reports for information only, using the form in ASTM C1521.
- E. Perform field adhesion tests on each floor on at least 10 percent of glass openings with field applied structural silicone. Use Destructive Hand Pull Tab Method "A" as defined in ASTM C1401, Appendix X2. Adhesive failure is not acceptable, regardless of percent elongation. Sealant shall be pulled until cohesive tearing occurs. For any opening that fails test, replace structural silicone at entire glass perimeter, and perform test on all openings within 20 feet of failed opening. For any floor with two or more failures, perform test on 100 percent of openings. Submit, for information only, reports that contain locations of tests and information required by ASTM C1401.
- F. Test internal gutters on each floor by temporarily plugging weep holes and filling with water. After minimum of fifteen minutes, inspect for water leakage. Correct deficiencies and retest until successful tests are achieved. Remove weep hole plugs. Test each type of internal gutter at minimum of 2 widely separated locations on each floor. For any gutter that fails test, perform test on all similar gutters within 50 feet of failed gutter. For any floor with 4 or more failures of a given gutter type, perform test on 100 percent of gutters of that type. Submit, for information only, reports that contain dates of tests, elevation drawings of test areas with locations relative to grid lines, and results.

3.5 PROTECTION, CLEANING AND WASTE DISPOSAL

- A. Protect materials against damage and contamination. Clean surfaces during and at conclusion of construction to Section 01 7423 Final Cleaning.
- B. Periodically remove from the site debris, excess materials and unused tools and equipment. At conclusion of construction, leave premises in clean condition. Manage and dispose of wastes to Section 01 7419 LEED V4 Construction Waste Management and Disposal.

END OF SECTION 08 44 13

ORLANDO INTERNATIONAL AIRPORT
BP-S195, TERM C, PH1X - ASC

FINISH KEY
SECTION 09 00 01

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	05 5813	MCC1	Metal Column Cover	Manufacturer: Gordon, Inc. Product: e-Connect System Color: Match paint P1 Finish: Powder coat, Gloss Top Trim: Aluminum 5052-H34 0.063" Thick	Location: GTF , ASC Contact Information: Clint Husband 303.697.9498 ClintHusband@comcast.net
	05 7500	DM1	Decorative Formed Metal	Manufacturer: Rigidized Metals Product: 304 Stainless Steel Finish: Brushed No.4 Thickness: 20ga Installation: Horizontal	Location: RAC/GTF , ASC Base and Trim Contact Information: Cindy Sawyer 303.257.3639 cindysawyer@rigidized.com
	05 7500	DM2	Decorative Formed Metal	Manufacturer: Rigidized Metals Product: Linen 304 Stainless Steel Finish: BA Thickness: 0.060" Installation: Vertical	Location: FIDS Enclosure, Millwork Panels, CCC Contact Information: Cindy Sawyer 303.257.3639 cindysawyer@rigidized.com
	06 4116	HW1	Casework Hardware	Refer to Spec section	
	06 4116	L1	Plastic Laminate for Architectural Cabinets	Manufacturer: Lamin-Art Product: Plastic Laminate Pattern: Solid; Vellum Finish Color: 9202-E Pearl White Vertical Orientation	Location: ASC Millwork Contact Information: Constance Foster 949.201.3127 cfoster@laminart.com
	06 4116	L2	Plastic Laminate for Architectural Cabinets	Manufacturer: Nevamar Pionite Product: Plastic Laminate Pattern: Textured Color: S-7040T Spa White Taupe ST606SD	Location: Public RR vanity accessible panel Contact Information: Meghan Rawlings Jeff Lyons 407.832.5388 817.455.5331 rawlinm@wilsonart.com jeff_lyons@panolam.com
	06 4116	L3	Plastic Laminate for Architectural Cabinets	Manufacturer: LaminArt Product: Plastic Laminate Pattern: 3051-VT Natural Teak Color: Natural Teak Finish: Velva-Tex Installation: Vertical	Location: Gate Podiums Contact Information: Constance Foster 949.201.3127 cfoster@laminart.com
	06 4116	L4	Plastic Laminate for Architectural Cabinets	Manufacturer: Nevamar Product: Plastic Laminate Pattern: Textured Color: S-7040T Spa White	Location: Public RR vanity accessible panel Contact Information: Meghan Rawlings 407.832.5388 rawlinm@wilsonart.com

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	06 4116	L21	Plastic Laminate for Architectural Cabinets	Manufacturer: Wilsonart Product: Plastic Laminate Pattern:4911-38 Color: Soft Gold Mesh	Location:B.O.H. ASC Contact Information: Name: Meghan Rawlings Number: 407-832-5388 Email: rawlinm@wilsonart.com
	06 4116	L22	Plastic Laminate for Architectural Cabinets	Manufacturer: Wilson Art Product: Plastic Laminate Pattern: 4887-38 Color: Tan Soapstone Finish: Fine Velvet	Location:B.O.H. Restrooms Contact Information: Name: Megan Rawlings Number: 407-832-5388 Email: rawlinm@wilsonart.com
	06 6400	FRP1	Fiber Reinforced Paneling	Manufacturer: Marlite Product: FRP - Standard Color: P151 Lite Grey Fire Rating - Class A Texture: Pebbled	Location: Janitor's Closets
	07 1613	PW1	Polymer Modified Cement Waterproofing	Manufacturer: Sika Corporation Product: SikaTop Seal 107 Color: Grey	Location: Flooring - Restroom Chases
	07 1900	SC1	Sealed Concrete		Reference spec sections: 07 1900 Water Repellent
	08 8000	IG2	Glazing	Manufacturer: S.A. Bendheim Ltd Product: Backpainted Glass Substrate: Vitro Architectural Glass Starphire Color: To match P1 Thickness: GANA per application Edge Treatment: Flat Polished	Location: ASC, backpaint at soffit and wall locations, ASC Domestic Arrivals Bridge Elevator Cladding Contact Information: Beth Hockett 720.775.6653 beth@archsale.com
	08 8113	G5	Decorative Glazing	Manufacturer: Vitro Architectural Glass Product: Starphire Color: Clear Thickness: GANA per application	Location: Decorative Metal Railing, Sterile Corridor Glazing and wall locations Contact Information: Dan Adams 206.409.4805 Deadams@vitro.com
	09 3013	T1	Porcelain Tile	Manufacturer: Stonepeak Series: Sussex Color: Pearl Finish: Matte Size: 12"x24" Grout Joint: 1/8"; Color: Mapei 77 - Frost Installation: Wall, Vertical, Stack pattern	Location: Public Restrooms Field Tile Contact Information: Connie Mesko 303.249.4414 cmesko@crossvilleinc.com

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	09 3013	T2	Rectified Porcelain Tile	Manufacturer: Dal Tile Series: Articulo Color: Editorial White AR06 Finish: Textured Size: 12"x24" Grout Joint: 1/8"; Color: Mapei 01 - Alabaster Installation: Wall, Horizontal, Stack pattern; Re:Dwgs	Location: Public Restrooms Wet Wall Contact Information: Laura Altenbernd 407.861.4474 laura.altenbernd@daltile.com
	09 3013	T3	Porcelain Tile	Manufacturer: Iris StonePeak Series: Roads Plane 2.0 Color: White Purity (same shade and caliber to be used on project) Taj Mahal Finish: Honed Size: 30"x60" Factory Cut Grout Joint: 1/8"; Color: Mapei 94 - Straw Installation: Vertical; Re:Dwgs	Location: ASC Concourse Contact Information: Shannon Pooler 407.489.2314 spooler@specialtytile.com
	09 3013	T4	Porcelain Tile	Manufacturer: Iris StonePeak Series: Roads Plane 2.0 Color: White Purity (same shade and caliber to be used on project) Taj Mahal Finish: Honed Size: 15"x30" (Factory Cut, Match T3) Grout Joint: 1/8"; Color: Mapei 94 - Straw Installation: Vertical; Re:Dwgs	Location: ASC Concourse Contact Information: Shannon Pooler 407.489.2314 spooler@specialtytile.com
	09 3013	T5	Porcelain Mosaic Tile	Manufacturer: Specialty Tile Products Crossville Series: Granula Shades 2.0 Color: Perla / Matte Whites Pattern: 3X6 Brick Mosaic Linear Mosaic Size: 12"x24" 1"x3" Grout Joint: 1/8"; Color: Mapei 01 - Alabaster Installation: Vertical; Re:Dwgs	Location: Drinking Fountains, ASC Restroom front Contact Information: Shannon Pooler 407.489.2314 spooler@specialtytile.com

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	09 3013	T21	Porcelain Tile	<p>Manufacturer: Trinity Tile Series: Aragonite thru-color porcelain Color: Amber Size: 12" x 12" Finish: Matte Grout: Mapei, Epoxy, Navajo Brown # 35 - 1/8" wide Installation: Thin Set, Straight Bond</p>	<p>Location: Select BOH R/R Floors Contact Information: Robin Ritchey: 407.521.6655 rritchey@trinitysurfaces.com</p>
	09 3013	T22	Ceramic Tile	<p>Manufacturer: Dal Tile Specialty Tile Series: Color Story Wall Color: Calm 0036 Finish: Matte Size: 6"x 6" (nom.) Grout: Mapei, Epoxy, Biscuit #14 - 1/4" wide Notes: Provide tile trim and accessories</p>	<p>Location: BOH R/R Walls Contact Information: Laura Altenbernd Shannon Pooler 407.861.4474 407.489.2314 laura.altenbernd@daltile.com</p>
	09 3013	T23	Quarry Tile	<p>Manufacturer: Metropolitan Ceramics Color: Puritan Gray Size: 8" x 8" (nom.) Finish: Matte Grout: Mapei, Epoxy, Gray#9 - 3/8" wide Notes: Provide matching 8" cove base</p>	<p>Location: Janitor's Closet Contact Information: Robin Ritchey: 407.521.6655 rritchey@trinitysurfaces.com</p>
	09 3023	T6	Glass Mosaic Tile	<p>Manufacturer: American Glass Trend Group Collection: Mosaics / Huron Collection Karma Metropolis Color: Custom Blend (5 colors) Opal Mosaic Size: 12.67"x12.67" 12 1/4" x 11 -1/14" Grout Joint: 1/8"; Color: Mapei 94 - Straw Installation: Wall</p>	<p>Location: Public Restroom Vestibule Insert, Lavatory and Baby Changing Wall Contact Information: Shannon Pooler 407.489.2314 spooler@specialtytile.com</p>

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	09 5113	ACL2	Acoustical Panel Ceiling	a. Manufacturer and Series: Armstrong b. Style: Ultima Tegular #1951 c. Size: 24 in x 24 in x 3/4 in d. Material: Wet Formed Mineral Fiber e. Color: White f. Edge Detail: Beveled Tegular g. Grid System: Prelude XL 15/16"	Location: ASC Contact Information: Kelly Hedlund 303.349.2294 kshedlund@armstrongceilings.com
	09 5113	ACL3	Acoustical Panel Ceiling	a. Manufacturer and Series: Armstrong b. Style: Ultima Health Zone c. Size: 24 in x 24 in x 3/4 in d. Material: Wet Formed Mineral Fiber e. Color: White f. Edge Detail: Beveled Tegular g. Grid System: Clean Room – 15/16"	Location: Wet areas ASC Contact Information: Kelly Hedlund 303.349.2294 kshedlund@armstrongceilings.com
	09 5113	ACL4	Acoustical Panel Ceiling	a. Manufacturer and Series: Armstrong b. Style: Optima Tegular 3262PB c. Size: 24 in x 96 in X 1 in d. Material: Fiberglass e. Color: White f. Edge Detail: Beveled Tegular g. Grid System: Silhouette 1/8" Reveal h. Trim: Axiom, color: White; 4" Typical at Flat Cloud; Custom at Sloped Notes: All tiles to have factory edge finishes, field verify all sizes other than standard to be "Made-to-order"	Location: ASC Contact Information: Kelly Hedlund 303.349.2294 kshedlund@armstrongceilings.com
	09 5113	ACL22	Acoustical Panel Ceiling	a. Manufacturer and Series: Armstrong b. Style: Mesa #684 c. Size: 24 in x 48 in x 3/4 in d. Material: Wet Formed Mineral Fiber e. Color: White f. Edge Detail: Angled Tegular g. Grid System: Prelude XL – 15/16"	Location: BOH Office Areas Contact Information: Johnathan Elrod 407.803.3448 jelrod@armstrongceilings.com

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	09 5113	ACL23	Acoustical Panel Ceiling	a. Manufacturer and Series: Armstrong b. Style: Ceramaguard c. Pattern: 605, Unperforated d. Size: 24"x48"x5/8" e. Material: Ceramic and Mineral Fiber f. Color: White g. Edge Detail: Square Edge h. Grid System: Prelude XL, Aluminum 15/16"	Location: BOH Service Areas Contact Information: Johnathan Elrod 407.803.3448 jelrod@armstrongceilings.com
	09 5133	ACL1	Acoustical Metal Pan Ceiling	a. Manufacturer and Series: Armstrong World Industries, Inc. b. Product: Metal Works Torsion Spring 7211 c. Size: 24"x 96" d. Color: Custom to match P1 e. Finish: Polyester Paint, M15, Perforated f. Trim: 4" Typical at Cloud g. Grid System: Concealed, Slotted for Torsion Spring	Location: Public Restrooms Contact Information: Kelly Hedlund 303.349.2294 kshedlund@armstrongceilings.com
	09 6513	RB21	Resilient Base	Manufacturer: ArmstrongFlooring Commercial Product: Rubber Type: Cove Height: 4" Color: Desert	Location: BOH with Resilient Flooring Contact Information: William Wise 803.728.7077 wwise@armstrongflooring.com
	09 6513	RB22	Resilient Base	Manufacturer: Armstrong Flooring Commercial Product: Rubber Type: Cove Height: 4" Color: Flagstone	Location: BOH with Carpet Contact Information: William Wise 803.728.7077 wwise@armstrongflooring.com

ORLANDO INTERNATIONAL AIRPORT
BP-S195, TERM C, PH1X - ASC

FINISH KEY
SECTION 09 00 01

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	09 6519	RT1	Resilient Tile Flooring	Manufacturer: Patcraft Product: Admix 1347V Color: Sundial SMP 00130 Size: 36" x 36" Seam: Heat Weld, provide matching rod	Location: Public Elevators Contact Information: Jamie Wenger 303.513.6351 jamie.wenger@patcraft.com
	09 6519	RT21	Resilient Tile Flooring	Manufacturer: Armstrong Flooring Commercial Product: Striations BBT Color: Bisque Number: T3614 Size: 12" x 24" x 1/8"	Location: BOH Flooring Contact Information: Dave Price 813.285.6868 dprice@armstrong.com
	09 6519	RT24	Resilient Tile Flooring	Manufacturer: Johnsonite Series: Rubber Stair Treads and Risers Style: Square Color: 49 - Beige	Location: BOH Flooring - Stairs in Corridors Contact Information: Jan Wilhelm 440.708.5766 janet.wilhelm@tarkett.com
	09 6623	TF1	Resinous Matrix Terrazzo Flooring	Manufacturer: Terrazzo & Marble Supply Company Product: Terroxy Resin System TM16GG-327 Resin Color: Row House Tan 3806 Aggregate: 25% Georgia White #1,2; 40% China White #1,2; 25% Valders #1,2; 10% Mother of Pearl #2	Location: ASC Contact Information: Chris Anderson 714.901.1400 canderson@tmsupply.com
	09 6623	TF2	Resinous Matrix Terrazzo Flooring	Manufacturer: Terrazzo & Marble Supply Company Product: Terroxy Resin System TM16GG-442 Resin Color: White Dove 5824 Aggregate: 25% Georgia White #1,2; 40% China White #1,2; 25% Valders #1,2; 10% Mother of Pearl #2	Location: ASC Contact Information: Chris Anderson 714.901.1400 canderson@tmsupply.com
	09 6623	TF3	Resinous Matrix Terrazzo Flooring	Manufacturer: Terrazzo & Marble Supply Company Product: Terroxy Resin System TM16GG-484 Resin Color: Glacier Gray 39B-2T Aggregate: 25% Georgia White #1,2; 40% China White #1,2; 25% Valders #1,2; 10% Mother of Pearl #2	Location: ASC Contact Information: Chris Anderson 714.901.1400 canderson@tmsupply.com
	09 6623	TF4	Resinous Matrix Terrazzo Flooring	Manufacturer: Terrazzo & Marble Supply Company Product: Terroxy Resin System TM16GG-386 Resin Color: Pepper Aggregate: 25% Georgia White #1,2; 40% China White #1,2; 25% Valders #1,2; 10% Mother of Pearl #2	Location: ASC Public Restroom Vestibules Contact Information: Chris Anderson 714.901.1400 canderson@tmsupply.com

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	09 6723	RF1	Decorative Flake Polymeric Floor Coating	Manufacturer: Sherwin Williams Product: Decorative Mosaic Epoxy Coating System System: Resuflor Deco-Flake BC Color: Match Existing Notes: Apply 220 grit Aluminum Oxide	Location: ASC Public Restroom Flooring Contact Information: Herb Mimler 352.3040948 herb.e.mimler@sherwin.com
	09 6723	RSF1	Resinous Flooring - SARA	Manufacturer: Benjamin Moore Product: 2 part Resinous Epoxy Gloss Level: Semi-Gloss w/ non-slip additive Color:Jute	Location: Service Animal Relief Areas Flooring
	09 6813	CP21	Tile Carpet	Manufacturer: Shaw Commercial Flooring Pattern: Construct Tile ST104 Color: Sector 03585 Weight: 18 oz yd ² Tile Size: 24" x 24" Installation Method: Quarter Turn Notes: Apply Releasable Adhesive	Location: B.O.H. ASC Contact Information: Virna Mitchell 407.405.0422 virna.mitchell@shawinc.com
	09 6816	CP1	Sheet Carpet	Manufacturer: Mannington Collection: Great Expectations II Pattern: Deep Thoughts II Modular Color: Custom Fiber: 100% Invista Antron Type 6,6 Nylon Weight: 18ox/sq yd Size: 12' Wide Broadloom Primary Backing: 100% Synthetic Secondary Backing: Integra HP w Chemically Weldable Seams	Location: ASC Sterile Corridor Contact Information: Shannon White, IIDA District Manager Mannington Commercial Amtico e: shannon_white@mannington.com c: 720-492-3901 w: www.manningtoncommercial.com
	09 6816	CP2	Sheet Carpet	Manufacturer: Mannington Collection: Great Expectations II Pattern: Fresh Perspective Modular Color: Custom Fiber: 100% Invista Antron Type 6,6 Nylon Weight: 18ox/sq yd Size: 12' Wide Broadloom Primary Backing: 100% Synthetic Secondary Backing: Integra HP w Chemically Weldable Seams	Location: ASC Sterile Corridor Accent, ASC Holdrooms, Contact Information: Shannon White, IIDA District Manager Mannington Commercial Amtico e: shannon_white@mannington.com c: 720-492-3901 w: www.manningtoncommercial.com

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	09 6816	CP3	Sheet Carpet	Manufacturer: Mannington Collection: Great Expectations II Pattern: Fresh Perspective Modular Color: Custom Fiber: 100% Invista Antron Type 6,6 Nylon Weight: 180x/sq yd Size: 12' Wide Broadloom Primary Backing: 100% Synthetic Secondary Backing: Integra HP w Chemically Weldable Seams	Location: ASC Holdroom Accent Contact Information: Shannon White, IIDA District Manager Mannington Commercial Amtico e: shannon_white@mannington.com c: 720-492-3901 w: www.manningtoncommercial.com
	09 7513	ST1	Quartz Based Stone Wall Facing	Manufacturer: American Reserve Product: One Quartz Surfaces Color: OQ47 Patriotic Calacatta Size: As Indicated Installation: Vertical	Location: ASC Public Restrooms Millwork Pilasters Contact Information: Laura Pollard 407.861.4474 Laura.pollard@daltile.com
	09 9123	P1	Interior Paint	Manufacturer: Benjamin Moore Color: OC-17 White Dove Sheen:Eggshell Walls, Flat Ceilings	Contact Information: Constance Green 201.912.2829 connie.green@benjaminmoore.com
	09 9123	P2	Interior Paint	Manufacturer: Benjamin Moore Color: OC-17 White Dove Sheen:Eggshell	Contact Information: Constance Green 201.912.2829 connie.green@benjaminmoore.com
	09 9123	P3	Interior Paint	Manufacturer: Benjamin Moore Color: Jute AF-80 Sheen:Eggshell	Contact Information: Constance Green 201.912.2829 connie.green@benjaminmoore.com
	09 9123	P4	Interior Paint	Manufacturer: Sherwin Williams Color: Midnight SW 6264 Sheen:Eggshell	Contact Information: Joy LaChelle Babur, CSI 407.694.7994 joy.l.babur@sherwin.com
	09 9600	HPC1	High Performance Coating	Manufacturer: Benjamin Moore Product: High Performance Interior Latex Gloss Level: Semi-Gloss Color: White Dove OC-17	Location: ASC, Select HM Doors & Frames Contact Information: Constance Green 201.912.2829 connie.green@benjaminmoore.com

ORLANDO INTERNATIONAL AIRPORT
BP-S195, TERM C, PH1X - ASC

FINISH KEY
SECTION 09 00 01

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	09 9600	HPC2	High Performance Coating	Manufacturer: Benjamin Moore Product: High Performance Interior Latex Gloss Level: Semi-Gloss Color: OC-17 White Dove	Location: ASC Contact Information: Constance Green 201.912.2829 connie.green@benjaminmoore.com
	09 9600	HPC3	High Performance Coating	Manufacturer: Benjamin Moore Product: High Performance Interior Latex Gloss Level: Semi-Gloss Color: Jute AF-80	Location:ASC HM Doors & Frames UNO Contact Information: Constance Green 201.912.2829 connie.green@benjaminmoore.com
	09 9600	HPC4	High Performance Coating	Manufacturer: Benjamin Moore Product: High Performance Interior Latex Gloss Level: Semi-Gloss Color: 2138-60 Gray Cashmere	Location: ASC, Stairwell Handrails, Select HM Doors & Frames Contact Information: Constance Green 201.912.2829 connie.green@benjaminmoore.com
	09 9600	HPC5	High Performance Coating	Manufacturer: Sherwin Williams Product: 2 part Epoxy Paint Gloss Level: Semi-Gloss w/ non slip additive Color: To match P2	Location: Flooring - Glass Elevator Pit Floor Contact Information: Joy LaChelle Babur, CSI 407.694.7994 joy.l.babur@sherwin.com
	09 9600	HPC21	High Performance Coating	Manufacturer: Sherwin Williams Product: 2 part Epoxy Paint Gloss Level: Semi-Gloss w/ non slip additive Color: Pewter Cast, 7673	Location: Flooring - Mechanical Rooms - Field Floor Contact Information: Joy LaChelle Babur, CSI 407.694.7994 joy.l.babur@sherwin.com
	09 9600	HPC22	High Performance Coating	Manufacturer: Sherwin Williams Product: 2 part Epoxy Paint Gloss Level: Semi-Gloss w/ non-slip additive Color:Red Door, 2910	Location: Flooring - Mechanical Rooms- Raised Platform Contact Information: Joy LaChelle Babur, CSI 407.694.7994 joy.l.babur@sherwin.com

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	10 2113	TC1	Solid Surface Toilet Compartment	Manufacturer: Bobrick Series: Sierra Series 1090 Material: Solid Color Reinforced Composite Color: Desert Beige (SC02)	Location: Public Restrooms Contact Information: 847.760.0543 DGenerali@PrivacyPlusPartitions.com
	10 1720 10 2113	TC21	Solid Color Reinforced Composite Toilet Compartments	Manufacturer: Bobrick Product:2090, Floor Mtd., Overhead Braced Type: Sierra Color:SC02 - Desert Beige	Location: BOH Restrooms Contact Information: 847.760.0543 DGenerali@PrivacyPlusPartitions.com
	10 2600	WP1	Wall and Door Protection - Corner Guard	Material: Type 304 Stainless Steel Finish: Satin, No. 4 Wing Size: 2" x 48" with Crimped Edge Mounting: Adhesive	Location: Wall Corners, Maintenance Storage, Control Room, Tenant Storage, Non-passenger Elevator Lobby,
	10 2600	WP2	Wall and Door Protection - Stainless Steel Wainscot	Material: Type 304 Stainless Steel Sheet Finish: Directional Satin, No. 4 Diamond Plate Thickness: Minimum 0.0781 inch Mounting: Adhesive	Location: Wheelchair Storage, Baggage Carts, Lift Storage,
	10 2600	WP3	Wall and Door Protection - Corner Guard	Material: Type 304 Stainless Steel Finish: Satin, No. 4 Wing Size: 3.5" x 3.5" 90Degree angle Mounting: Flush mount	Location: ASC Public areas
	12 3623.13	LC1	Plastic Laminate Countertop	Manufacturer: Lamin-Art Product: Plastic Laminate Pattern: Solid; Vellum Finish Color: 9202-E Pearl White	Location: BOH
	12 3661.16	SSM2	Solid Surface Countertop	Manufacturer: DuPont Product: 3/4" Corian Color: Bisque	Location: Restroom Vanity Sinks (Bowls)
	12 3661.16	SSM3	Solid Surface Countertop	Manufacturer: Formica Classics Product: 1/2" Corian Color: Luna Sand (757)	Location: Information Desk Countertops
	12 3661.16	SSM21	Solid Surface Countertop	Manufacturer: DuPont Product: 1/2" Corian Color: Antarctica	Location: BOH Countertops
	12 3661.16	SSM22	Solid Surface Countertop	Manufacturer: DuPont Product: 1/2" Corian Color: Granola	Location: BOH Restroom Countertops

Revision	SPEC. SECTION	KEY	ITEM	DESCRIPTION	REMARKS
	12 3661.19	QC1	Quartz Agglomerate Countertop	Manufacturer: One Quartz Surfaces Product: At One With Nature Color: White Ice NQ90 Thickness: 2cm; mitered corners Finish: Polished	Location: ASC Gate Podiums Contact Information: Laura Pollard 407.861.4474 Laura.pollard@daltile.com
	12 3661.19	QC2	Quartz Agglomerate Countertop	Manufacturer: One Quartz Surfaces Product: At One With Nature Color: Mesa Dune NQ89 Thickness: 2cm; mitered corners Finish: Polished	Location: ASC Public Restrooms Countertops Contact Information: Laura Pollard 407.861.4474 Laura.pollard@daltile.com
	12 3661.19	QC3	Quartz Agglomerate Countertop	Manufacturer: American Reserve Product: One Quartz Surfaces Color: OQ47 Patriotic Calacatta Size: As Indicated Installation: Vertical	Location: ASC Public Restrooms Millwork Contact Information: Laura Pollard 407.861.4474 Laura.pollard@daltile.com
	14 2100	ECF1	Custom Elevator Cab Finishes	Manufacturer: GAGE Architectural Products Product: Gagecarve C1001 Miami (Nickel) Color: Nickel Thickness: 3.18 - 4.06mm Finish: Anodized	Location: ASC Solid Elevators; Central Panel Contact Information: Karen Sandmire 608.269.7447 ksandmire@gagecorp.net
	14 2400	ECF3	Service Elevator Flooring and Wall Panels	Material: Aluminum Sheet Finish: Directional Satin, No. 4 Diamond Plate Thickness: Minimum 0.125 inch Mounting: Adhesive	Location: ASC Service Elevator Flooring and Wall Panels
	14 2100	ECF21	Custom Elevator Cab Finishes	Manufacturer: Rigidized Metals Material: Stainless Steel Pattern: 6SL Material: 304 SS Finish: Satin #4 Thickness: Per Elevator Manufacturer	Location: PKG Solid Elevators Cab Panels Contact Information: Brian Whalen 716.849.4707 Brianwhalen@rigidized.com
	32 18 13.A	STS1	Synthetic Turf Surface - SARA	Manufacturer: ForeverLawn Product: K9Grass Lite Indoor Base: AirGrid 2 Color: To match Benjamin Moore Jute AF-80 Dimension: 70mm Installation: Horizontal and Vertical	Location: SARA Contact Information: Home Office 866.992.7876

General Notes:

1. Flooring material changes shall occur at the centerline of the door unless noted otherwise.
2. All exposed metal in public areas shall be painted to match (P1).

TABLE OF CONTENTS – 00 01 00
VOLUME 1 OF 5

Division	Section Title	Issue Date	Rev. Date
----------	---------------	------------	-----------

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS (see Vol. 1)

00 01 00 Table of Contents – Vols. 2-5 07/22/22

DIVISION 01 – GENERAL REQUIREMENTS (see Vol. 1)

VOLUME 2 OF 5

DIVISION 02 - EXISTING CONDITIONS

02 41 19 Selective Demolition 06/17/22

DIVISION 03 - CONCRETE

03 15 13 Waterstops 06/17/22

03 30 00 Cast-In-Place Concrete 06/17/22

03 45 00 Precast Architectural Concrete 06/17/22

~~03 47 00~~ ~~Tilt-Up Concrete~~ ~~06/17/22~~

DIVISION 04 - MASONRY

~~04 22 00~~ ~~Concrete Unit Masonry~~ ~~06/17/22~~ ~~07/22/22~~

DIVISION 05 - METALS

05 12 00 Structural Steel Framing 06/17/22

05 21 00 Steel Joist Framing 06/17/22

05 31 00 Steel Decking 06/17/22

05 40 00 Cold-Formed Metal Framing 06/17/22

05 50 00 Metal Fabrications 06/17/22

05 51 13 Metal Pan Stairs 06/17/22

~~05 51 16~~ ~~Metal Floor Plate Stairs~~ ~~06/17/22~~

05 52 13 Pipe and Tube Railings 06/17/22

~~05 53 13~~ ~~Bar Gratings~~ ~~06/17/22~~

~~05 53 16~~ ~~Plank Gratings~~ ~~06/17/22~~

05 58 13 Column Covers 06/17/22

05 71 00 Decorative Metal Stairs 06/17/22

~~05 73 00~~ ~~Decorative Metal Railings~~ ~~06/17/22~~

~~05 73 10~~ ~~Smoke Baffle System~~ ~~06/17/22~~

05 73 13 Glazed Decorative Metal Railings 06/17/22

05 75 00 Decorative Formed Metal 06/17/22

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

06 10 00 Rough Carpentry 06/17/22

06 16 00 Sheathing 06/17/22

06 41 16 Plastic-Laminate-Faced Architectural Cabinets 06/17/22

~~06 42 16~~ ~~Flush Wood Paneling~~ ~~06/17/22~~

06 64 00 Plastic Paneling 06/17/22

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 13 26	Self-Adhering Sheet Waterproofing	06/17/22
07 14 18	Fluid-Applied Waterproofing Deck System	06/17/22
07 16 13	Polymer Modified Cement Waterproofing	06/17/22
07 18 00	Traffic Coatings	06/17/22
07 19 00	Water Repellents	06/17/22
07 21 00	Thermal Insulation	06/17/22
07 21 19	Foamed-In-Place Insulation	06/17/22
07 24 23	Direct-Applied Finish System	06/17/22
07 27 29	Air-Barrier Coatings	06/17/22
<u>07 41 10</u>	<u>Metal Canopy Cladding System</u>	<u>06/17/22</u>
<u>07 41 13.16</u>	<u>Standing-Seam Metal Roof Panels</u>	<u>06/17/22</u>
07 41 50	Aluminum Rain-Screen Wall and Soffit Panels	06/17/22
07 42 10	Continuous Insulation with Composite Framing Support System	06/17/22
07 42 13.13	Formed Metal Wall Panels	06/17/22
07 42 13.19	Insulated Metal Wall Panels	06/17/22
07 42 13.23	Metal Composite Material Wall Panels	06/17/22
07 42 93	Soffit Panels	06/17/22
07 52 00	SBS Modified Bituminous Membrane Roofing	06/17/22
07 62 00	Sheet Metal Flashing and Trim	06/17/22
07 71 29	Manufactured Roof Expansion Joints	06/17/22
07 72 00	Roof Accessories	06/17/22
07 81 00	Applied Fireproofing	06/17/22
07 81 23	Intumescent Fireproofing	06/17/22
07 84 13	Penetration Firestopping	06/17/22
07 84 43	Joint Firestopping	06/17/22
07 92 00	Joint Sealants	06/17/22
07 92 19	Acoustical Joint Sealants	06/17/22
07 95 13.13	Interior Expansion Joint Cover Assemblies	06/17/22
07 95 13.16	Exterior Expansion Joint Cover Assemblies	06/17/22

DIVISION 08 - OPENINGS

08 11 13	Hollow Metal Doors and Frames	06/17/22
<u>08 14 16</u>	<u>Flush Wood Doors</u>	<u>06/17/22</u>
08 31 13	Access Doors and Frames	06/17/22
<u>08 33 10</u>	<u>Security Grilles</u>	<u>06/17/22</u>
08 33 23	Overhead Coiling Doors	06/17/22
<u>08 34 53</u>	<u>Bullet Resistant Hollow Metal Doors and Frames</u>	<u>06/17/22</u>
<u>08 34 63</u>	<u>Detention Doors and Frames</u>	<u>06/17/22</u>
08 34 73.13	Metal Sound Control Door Assemblies	06/17/22

<u>08 35 13.23</u>	<u>Accordion Folding Fire Doors</u>	<u>06/17/22</u>	
08 41 13	Aluminum-Framed Entrances and Storefronts	06/17/22	
08 41 20	Structural Glass Fin Wall	06/17/22	
08 41 26	All-Glass Interior Storefronts	06/17/22	
08 42 29.23	Sliding Automatic Entrances	06/17/22	
<u>08 44 13</u>	<u>Glazed Curtain Walls</u>	<u>06/17/22</u>	<u>07/22/22</u>
<u>08 56 67</u>	<u>Bullet-Resistant Transaction Windows</u>	<u>06/17/22</u>	
08 65 30	Sound Control Windows	06/17/22	
08 71 00	Door Hardware	06/17/22	
08 71 13	Automatic Door Operators	06/17/22	
<u>08 71 63</u>	<u>Detention Door Hardware</u>	<u>06/17/22</u>	
08 80 00	Glazing	06/17/22	
08 81 13	Decorative Glass Glazing	06/17/22	
<u>08 84 00</u>	<u>Plastic Glazing</u>	<u>06/17/22</u>	
<u>08 88 00</u>	<u>Special Function Glazing</u>	<u>06/17/22</u>	
08 91 19	Fixed Louvers	06/17/22	

DIVISION 09 – FINISHES

09 00 01	Finish Key	06/17/22	
09 21 16.23	Gypsum Board Shaft Wall Assemblies	06/17/22	
09 22 16	Non-Structural Metal Framing	06/17/22	
09 24 00	Cement Plastering	06/17/22	
<u>09 27 13</u>	<u>Glass-Fiber-Reinforced Gypsum Fabrications</u>	<u>06/17/22</u>	
09 29 00	Gypsum Board	06/17/22	
09 30 13	Ceramic Tiling	06/17/22	
09 30 23	Glass Tiling	06/17/22	
09 51 13	Acoustical Panel Ceilings	06/17/22	
<u>09 51 23</u>	<u>Acoustical Tile Ceilings</u>	<u>06/17/22</u>	
09 51 33	Acoustical Metal Pan Ceilings	06/17/22	
<u>09 54 33</u>	<u>Specialty Metal Ceilings</u>	<u>06/17/22</u>	
<u>09 54 36</u>	<u>Suspended Decorative Grids</u>	<u>06/17/22</u>	
09 65 13	Resilient Base and Accessories	06/17/22	
09 65 19	Resilient Tile Flooring	06/17/22	
09 65 36	Static-Control Resilient Flooring	06/17/22	
09 66 23	Resinous Matrix Terrazzo Flooring	06/17/22	
09 67 23	Resinous Flooring	06/17/22	
09 68 13	Tile Carpeting	06/17/22	
09 68 16	Sheet Carpeting	06/17/22	
<u>09 69 00</u>	<u>Access Flooring</u>	<u>06/17/22</u>	
09 75 13	Stone Wall Facing	06/17/22	

09 78 00	Interior Wall Paneling	06/17/22
09 82 60	Acoustical Plaster Systems	06/17/22
09 83 16	Spray-Applied Acoustical Finish System	06/17/22
09 84 00	Metal Wall Systems	06/17/22
09 84 33	Sound-Absorbing Wall Units	06/17/22
09 91 13	Exterior Painting	06/17/22
09 91 23	Interior Painting	06/17/22
09 94 13	Textured Plaster Finish	06/17/22
09 96 00	High-Performance Coatings	06/17/22

VOLUME 3 OF 5

Division	Section Title	Issue Date	Rev. Date
----------	---------------	------------	-----------

DIVISION 10 - SPECIALTIES

10 14 00	Wayfinding Signage	06/17/22
10 14 10	Vehicle Direction Signage	06/17/22
10 21 13	Solid Surface Toilet Compartments	06/17/22
10 21 14	Detention Stainless Steel Modesty Panels	06/17/22
10 22 13	Wire Mesh Partitions	06/17/22
10 22 26	Operable Partitions	06/17/22
10 26 00	Wall and Door Protection	06/17/22
10 26 41	Bullet Resistant Panels	06/17/22
10 28 00	Toilet, Bath and Laundry Accessories	06/17/22
10 43 13	Defibrillator Cabinets	06/17/22
10 44 13	Fire Protection Cabinets	06/17/22
10 44 16	Fire Extinguishers	06/17/22
10 51 13	Metal Lockers	06/17/22
10 71 13	Exterior Sun Control Devices	06/17/22
10 71 53	Debris Containment Netting	06/17/22
10 73 16	Aluminum Canopies	06/17/22
10 81 13	Bird Control Devices	06/17/22

DIVISION 11 - EQUIPMENT

11 13 16	Loading Dock Seals and Shelters	06/17/22
11 14 53	Pedestrian Security Breach Control System	06/17/22
11 30 13	Residential Appliances	06/17/22
11 81 29	Horizontal Fall Protection	06/17/22

DIVISION 12 - FURNISHINGS

12 21 13	Horizontal Louver Blinds	06/17/22
12 24 13	Roller Window Shades	06/17/22
12 36 16	Metal Countertops	06/17/22
12 36 23.13	Plastic-Laminate-Clad Countertops	06/17/22
12 36 61.16	Solid Surfacing Countertops	06/17/22
12 36 61.19	Quartz Agglomerate Countertops	06/17/22
12 48 43.23	Anti-Fatigue Floor Mats	06/17/22

Division	Section Title	Issue Date	Rev. Date
<u>12 93 00</u>	<u>Site Furnishings</u>		<u>06/17/22</u>
DIVISION 13 - SPECIAL CONSTRUCTION			
<u>13 46 00</u>	<u>Transparent Bullet Resistant Assemblies</u>		<u>06/17/22</u>
<u>13 47 13</u>	<u>Cathodic Protection System</u>		<u>06/17/22</u>
DIVISION 14 - CONVEYING EQUIPMENT			
14 00 00	Elevator, Escalator Maintenance and Repair	06/17/22	
14 00 00C	Attachment C	06/17/22	
14 21 00	Traction Elevators	06/17/22	
14 31 00	Escalators	06/17/22	
<u>14 91 82</u>	<u>Trash Chutes</u>		<u>06/17/22</u>
DIVISION 21 - FIRE SUPPRESSION			
21 05 17	Sleeves and Sleeve Seals for Fire-Suppression Piping	06/17/22	
21 12 00	Fire-Suppression Standpipes	06/17/22	
21 13 13	Wet-Pipe Sprinkler Systems	06/17/22	
21 13 16	Dry-Pipe Sprinkler Systems	06/17/22	

VOLUME 4 OF 5

Division	Section Title	Issue Date	Rev. Date
DIVISION 22 - PLUMBING			
22 05 00	Common Work Results for Plumbing	06/17/22	
22 05 13	Common Motor Requirements for Plumbing Equipment	06/17/22	
22 05 16	Expansion Fittings and Loops for Plumbing Piping	06/17/22	
22 05 19	Meters and Gages for Plumbing Piping	06/17/22	
22 05 23	General-Duty Valves for Plumbing Piping	06/17/22	
22 05 29	Hangers and Supports for Plumbing Piping and Equipment	06/17/22	
22 05 48	Vibration Controls for Plumbing Piping and Equipment	06/17/22	
22 05 53	Identification for Plumbing Piping and Equipment	06/17/22	
22 07 00	Plumbing Insulation	06/17/22	
22 11 16	Domestic Water Piping	06/17/22	
22 11 19	Domestic Water Piping Specialties	06/17/22	
22 11 23	Domestic Water Pumps	06/17/22	
22 13 16	Sanitary Waste and Vent Piping	06/17/22	
22 13 19	Sanitary Waste Piping Specialties	06/17/22	
22 13 23	Stormwater Wet Well	06/17/22	
22 13 29.01	Storm Sewerage Pumps 1750 RPM	06/17/22	
22 13 29.02	Storm Sewerage Pumps 1600 RPM	06/17/22	
22 13 29.03	Storm Sewerage Pumps Controllers	06/17/22	
22 14 13	Facility Storm Drainage Piping	06/17/22	
22 14 23	Storm Drainage Piping Specialties	06/17/22	
22 14 29	Sump Pumps	06/17/22	
22 33 00	Electric Domestic Water Heaters	06/17/22	
22 37 00	Potable Water Cabinet	06/17/22	
22 40 00	Plumbing Fixtures	06/17/22	
22 47 00	Drinking Fountains and Water Coolers	06/17/22	
22 70 00	Natural Fuel Gas Systems - Plumbing	06/17/22	
23 34 13	Axial HVAC Fans	06/17/22	
23 34 16	Centrifugal HVAC Fans	06/17/22	
23 34 23	HVAC Power Ventilators	06/17/22	
23 34 33	Air Curtains	06/17/22	
23 36 00	Air Terminal Units	06/17/22	
23 37 13	Diffusers, Registers, And Grilles	06/17/22	
23 41 00	Particulate Air Filtration	06/17/22	
23 72 00	Air to Air Energy Recovery Unit	06/17/22	
23 73 13	Modular Indoor Central Station Air Handling Units	06/17/22	

Division	Section Title	Issue Date	Rev. Date
23 74 33	Dedicated Outdoor Air Units	06/17/22	
23 81 23	Computer Room Air Conditioners	06/17/22	
23 81 26	Split System Air Conditioners	06/17/22	
23 82 16	Air Coils	06/17/22	
23 82 19	Fan Coil Units	06/17/22	
23 82 39	Unit Heaters	06/17/22	
23 90 00	Pre-Conditioned Air Units and Specialties	06/17/22	

VOLUME 5 OF 5

Division	Section Title	Issue Date	Rev. Date
DIVISION 26 - ELECTRICAL			
26 01 00	Operation and Maintenance Manuals	06/17/22	
26 01 03	Minor Electrical Demolition for Remodeling	06/17/22	
26 01 05	Investigation of Existing Electrical Systems	06/17/22	
26 05 00	Common Work Results for Electrical	06/17/22	
26 05 10	Electrical Symbols	06/17/22	
26 05 19	Building Wire and Cable	06/17/22	
26 05 26	Grounding and Bonding	06/17/22	
26 05 29	Hangers and Supports	06/17/22	
26 05 33	Conduit	06/17/22	
26 05 34	Outlet Boxes	06/17/22	
26 05 35	Pull and Junction Boxes	06/17/22	
26 05 53	Identification for Electrical Systems	06/17/22	
26 05 73	Power Systems Study with Arc Flash Analysis	06/17/22	
26 05 83	Wiring Devices	06/17/22	
26 07 17	SCADA Monitoring and Control	06/17/22	
26 08 03	Demonstration of Completed Electrical Systems	06/17/22	
26 08 13	Tests and Performance Verification	06/17/22	
26 09 24	Architectural Lighting Controls for Public Spaces	06/17/22	
26 09 24A	Architectural Lighting Controls for Public Spaces – Appendix A	06/17/22	
26 09 24B	Architectural Lighting Controls for Public Spaces – Appendix B	06/17/22	
26 12 19	Oil-Filled Pad Mounted Transformers	06/17/22	
26 22 13	Dry Type Transformers	06/17/22	
26 23 00	Low Voltage Transfer Switchgear	06/17/22	
26 24 13	Switchboards – Draw Out	06/17/22	
26 24 16	Panelboards	06/17/22	
26 24 17	Distribution Panelboards	06/17/22	
26 25 00	Busway – Low Voltage	06/17/22	
26 27 13	Electrical Metering and Monitoring System	06/17/22	
26 27 16	Electrical Cabinets and Enclosures	06/17/22	
26 28 16	Enclosed Switches and Circuit Breakers	06/17/22	
26 33 53	Static Uninterruptible Power Supply	06/17/22	
26 36 16	Maintenance Bypass Switches	06/17/22	
26 36 23	Automatic Transfer Switches	06/17/22	

Division	Section Title	Issue Date	Rev. Date
26 41 13	Lightning Protection System	06/17/22	
26 43 00	Surge Protective Devices	06/17/22	
26 50 10	Architectural Lighting Fixtures, Lamps, Ballasts for Public Spaces	06/17/22	
26 51 00	Interior Lighting – Back of House	06/17/22	
26 61 00	400Hz Frequency Converters	06/17/22	
DIVISION 27 - COMMUNICATIONS			
27 05 00	Common Work Elements for Communications	06/17/22	
27 10 00	Premise Distribution Systems	06/17/22	
	Attachment 0: General Labeling Guidelines		
	Attachment 1: Work Area Telecommunications Outlet		
	Attachment 2: Labeling Backbone Fiber Optic Cables		
27 10 05	Passive Optical Network	06/17/22	
27 10 10	Voice Over IP Telephone System	06/17/22	
27 10 15	Wireless Local Area Network System	06/17/22	
27 10 20	Visual Docking Guidance System	06/17/22	
27 20 00	Common Use Systems	06/17/22	
27 24 00	Electronic Gate Systems	06/17/22	
27 41 33	IP Master Antenna Television System	06/17/22	
27 42 20	Electronic Dynamic Signage System	06/17/22	
27 51 13	Emergency Communication System	06/17/22	
27 53 10	Distributed Antenna System – Cellular	06/17/22	
27 53 20	Distributed Antenna System – Public Safety 800MHz and Facilities Radio 460 MHz	06/17/22	
DIVISION 28 - ELECTRONIC SAFETY AND SECURITY			
28 05 00	Common Work Elements For ESS	06/17/22	
28 08 00	Commissioning of Life Safety and Security Systems	06/17/22	
28 13 00	Physical Access Control System (SSI)	06/17/22	
28 23 00	Video Surveillance System (SSI)	06/17/22	
28 31 00	Addressable Fire Detection and Alarm	06/17/22	
DIVISION 31 - EARTHWORK			
NOT USED			

Division	Section Title	Issue Date	Rev. Date
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DIVISION 32 - EXTERIOR IMPROVEMENTS

NOT USED

DIVISION 33 – UTILITIES

NOT USED

DIVISION 34 – TRANSPORTATION

32 18 13

Synthetic Turf Surfacing

07/22/22

34 77 13

Passenger Boarding Bridges

06/17/22

SPECIFICATION ISSUE KEY

Issue Date:	Rev. #	Issue Title:
July 22, 2022	0	Addendum No. 8

** Documents not Issued – Voided Deliverable

REVISIONS:

Rev. # column represents the sequence in which the specifications, whole or in part, were issued.

BOLD and Underlined are new, revised, or edited sections in this issue.

~~Strikethrough~~ for sections deleted in this issue.

END OF TABLE OF CONTENTS

SECTION 04 22 00 - CONCRETE UNIT MASONRY

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Masonry-joint reinforcement.
 - 5. Embedded flashing.
 - 6. Miscellaneous masonry accessories.
 - 7. Masonry-cell fill.
- B. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
 - 2. Section 07 19 00 "Water Repellents" for water repellents applied to unit masonry assemblies.
 - 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Product Data: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C" for Leadership Extraction Practices for the following:
 - a. Regional/Local Multiplier Compliance

- b. Leadership Extraction Practices for Recycled Content
 - 2. Product Certificates: Provide the following:
 - a. Environmental Product Declarations (EPD's)
 - b. Corporate Sustainability Reporting (CSR's) this will depend on the manufacturer sections
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
 - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
 - 4. Control joint locations corresponding with joints in cladding materials where applicable.
- C. Samples for Verification: For each type and color of the following:
 - 1. Exposed CMUs.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include data on material properties.
 - 2. Grout mixes. Include description of type and proportions of ingredients.
 - 3. Reinforcing bars.
 - 4. Joint reinforcement.
 - 5. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- D. Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Mockups: Build mockups as indicated in Section 01 43 39 "Visual Mock-up Requirements".
 - 1. Build mockup of typical wall area as directed by Architect.
 - 2. Protect accepted mockups from the elements with weather-resistant membrane.

3. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 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 aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 FIELD 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 of walls, and hold cover securely in place.
- B. Do not apply uniform loads for at least 12 hours and concentrated loads for at least three 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. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 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, from single source from 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 single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.
- D. Sustainability Requirements
 - 1. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 10 percent.
 - a. Refer to Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C" for additional information and requirements for recycled content.
 - 2. Regional Materials: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C" for CMUs manufactured within 100 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 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 exposed units.

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 according to ASTM E 514/E 514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - 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) ACM Chemistries.
 - 2) BASF Corporation; Construction Systems.
 - 3) Grace Construction Products.

C. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Density Classification: Normal weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.

D. Pre-faced CMUs: Lightweight hollow concrete units complying with ASTM C 90, with manufacturer's standard smooth resinous facing complying with ASTM C 744.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).
2. Size: Manufactured to dimensions specified in "CMUs" Paragraph but with pre-faced surfaces having 1/16-inch- (1.5-mm-) wide returns of facing to create 1/4-inch- (6.5-mm-) wide mortar joints with modular coursing.
3. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.5 MASONRY LINTELS

- A. General: Provide one of the following:
- B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, 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.

~~2.6 INSULATED CONCRETE MASONRY UNITS~~

- ~~A. Insulated Concrete Masonry Units: Pre-assembled structural concrete masonry units composed of an inner component concrete masonry shell that is continuously thermally broken from the outer concrete shell. The thermal break is expanded polystyrene (EPS) closed cell insulation. The insulation EPS is held firmly between the two concrete block shells by dove tail slots and internal stainless steel metal anchors molded into the EPS inserts, creating a cohesive and tightly fitting single unit.~~
- ~~1. Basis of Design Product: Subject to compliance with requirements, provide Northfield, an Oldcastle Company; InsulTech Insulated Concrete Masonry Units or comparable approved product meeting all requirements including sustainability requirements.~~

- ~~a. Refer to Sections 01 25 00 "Substitution Procedures" and 01 60 00 "Product Requirements" for comparable product requirements.~~
- ~~B. Unit Compressive Strength: Provide units with minimum average net area compressive strength of 2000 psi. Weight Classification: Medium weight with density not to exceed 125 lbs. per cubic foot concrete.~~
- ~~C. Molded Polystyrene Insulation:
 - ~~1. Rigid, cellular thermal insulation formed by the expansion of polystyrene resin beads or granules in a closed mold to comply with ASTM C 578, Type I.~~
 - ~~2. Provide specially shaped insulation designed for installing in face shells of insulated masonry units and providing continuous thermal barrier across head joints, including corner units. Provide an adhesive applied to EPS insert which serves as a continuous air barrier. Provide compliant closed cell gasket material to provide air tightness and continuous insulation across the bed joints.~~~~
- ~~D. Special Shapes:
 - ~~1. Provide special shapes as follows: Provide shapes including right and left corner and L corner units, jambs, half size shapes, solid bottom bond beams, and other special conditions manufactured as pre-assembled units with EPS, complying with above requirements, and match exposed finish of insulated concrete masonry units.~~
 - ~~2. Provide square edged units for outside corners. Provide EchelonMasonry.com separate 8" unit matching exposed finish to be installed at base of wall, above doors and windows, and other areas where flashing is required. Provide exterior face shell preassembled with 3" EPS with inside face shaved flush to be installed at base of wall, above doors and windows, and other areas where flashing is required.~~~~

2.7 THERMALLY IMPROVED CONCRETE MASONRY UNITS

- A. Thermally improved concrete masonry units: Specially formed concrete masonry units with pre-formed, molded expanded polystyrene inserts.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Omni Block Concrete Masonry Units or comparable approved product meeting all requirements including sustainability requirements.
- B. Provide special block sizes and shapes required or as shown on Drawings.

2.8 CMU INSULATION

- A. Where indicated, units shall contain rigid, specially shaped, cellular thermal insulation units complying with ASTM C 578, Type I, designed for installing in cores of masonry units.
 - 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. Concrete Block Insulating Systems.
 - b. Shelter Enterprises Inc.

2.9 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, 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 and hydrated lime containing no other ingredients.
- 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.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- E. Aggregate for Grout: ASTM C 404.
- F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ACM Chemistries.
 - b. BASF Corporation - Admixture Systems.
 - c. Grace Construction Products.
- G. Water: Potable.

2.10 REINFORCEMENT

- A. Provide Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 50 percent.
 - 1. Refer to Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C" for additional information and requirements for recycled content.
- B. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- C. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- D. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951/A 951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 2. Exterior Walls: Stainless steel.
 - 3. Wire Size for Side Rods: 0.187-inch diameter.

4. Wire Size for Cross Rods: 0.187-inch diameter.
5. Spacing of Cross Rods: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.11 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
- C. Partition Top Anchors: 0.105-inch-thick metal plate with a 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.
- D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.12 EMBEDDED FLASHING MATERIALS

- A. Single-Wythe CMU Flashing
 1. System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide Mortar Net Solutions, BlockFlash or comparable approved product meeting all requirements including sustainability requirements.
 - 1) Refer to Sections 01 25 00 "Substitution Procedures" and 01 60 00 "Product Requirements" for comparable product requirements.
 - b. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 40 percent.
 - 1) Refer to Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C" for additional information and requirements for recycled content.
- B. Flexible Thru-Wall Flashing
 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 1.0 mm (40 mil).
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Carlisle Coatings & Waterproofing Inc.

- 2) GCP Applied Technologies Inc. (formerly Grace Construction Products).
 - 3) W. R. Meadows, Inc.
- b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

2.13 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.
- 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 felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vent Products: Use the following unless otherwise indicated:
1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Advanced Building Products Inc.
 - 2) Keene Building Products.
 - 3) Mortar Net Solutions.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Configuration: Strips to fit within individual masonry cells.

2.14 MASONRY-CELL FILL

- A. Lightweight-Aggregate Fill: ASTM C 331/C 331M.

2.15 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. Use portland cement-lime mortar unless otherwise indicated.
 3. For exterior masonry, use portland cement-lime mortar.
 4. For reinforced masonry, use portland cement-lime mortar.
- B. 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.
1. For masonry below grade or in contact with earth, use Type S.

2. For reinforced masonry, use Type S.
 3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
 4. For interior nonload-bearing partitions, Type O may be used instead of Type N.
 5. For mortar parge coats, use Type S or Type N.
- C. 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 TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. 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.

3.3 FIELD QUALITY CONTROL

- A. Concrete unit masonry installer shall provide field quality control by staff having adequate prior experience and shall provide the following reports and checklists.

1. BECxA shall provide initial BECx checklists. Contractor shall provide weekly updates verifying all locations have been inspected and are free of installation defects and damage.
 - a. BECx Checklists shall include specific locations of the work and specific location and description of any repairs.
 - b. BECx checklist shall be completed in its entirety and shall be provided weekly to the Construction Manager, Architect, and Owner.
2. Provide field inspection reports within 5 working days of inspection.

3.4 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. 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.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. 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.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. 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.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:

1. For 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.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.5 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. Stopping and Resuming Work: Stop work by stepping 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.
- D. Retroactive Work: Where work requires modification of existing CMU installations and stepping back of courses is not feasible, either tooth the new CMU infill units or provide vertical and horizontal masonry control joints as required to infill or replace masonry. Tie new joint reinforcement to existing reinforcement to the extent possible.
- 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. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. 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.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-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. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 43 "Joint Firestopping."

3.6 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.

4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- E. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.7 MASONRY-CELL FILL

- A. Pour lightweight-aggregate fill into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than 20 feet.

3.8 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.
 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- 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.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 1. Provide an open space not less than 1/2-inch-wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.10 CONTROL AND EXPANSION JOINTS

- A. General: 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.
- B. Form control joints in concrete masonry as follows:
 1. Install preformed control-joint gaskets designed to fit standard sash block.
 2. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

3.11 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.12 FLASHING

- A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.
- B. Install flashing as follows unless otherwise indicated:
 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 3 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.
 4. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.13 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 loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- 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 TMS 602/ACI 530.1/ASCE 6 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.

3.14 FIELD QUALITY CONTROL

- A. Testing Prior to Construction: One set of tests.

3.15 PARGING

- A. Parge exterior faces of masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch (19 mm). Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.16 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 Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent 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 concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.17 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 04 22 00

SECTION 32 18 13 – SYNTHETIC TURF SURFACING

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. Synthetic turf surface.
 - 2. Inorganic loose-fill surface.

1.3 RELATED SECTIONS

- A. Division 09 Section “Finish Key” for additional finish and system information.

1.4 PERFORMANCE REQUIREMENTS

- A. Nominal Melt Flow Rate: According to ASTM D 1238.
- B. Transmissivity of Surface Systems: According to ASTM D 4716.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 “Sustainable Design Requirements – LEED V4 BD+C”.
 - 1. Product Data: For Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
 - b. Documentation on Low Emitting Materials.
 - 2. Product Certificates: Provide the following:
 - a. Environmental Product Declarations (EPD’s)
- C. Shop Drawings: For each synthetic turf surface system, include materials, plans, cross sections, drainage, installation, penetration details, and edge termination including loose fill edgings.
- D. Samples for Verification: For each type of synthetic turf surface system indicated.
 - 1. Minimum 1-quart loose-fill surface sealed in a container.
 - 2. Minimum 6-by-6-inch Sample of synthetic turf surface.
 - 3. 6-inch long by full-size cross section of border edging.
 - 4. Minimum 6-by-6-inch Sample of molded-sheet drainage panel.
- E. Product Schedule: For synthetic turf surface systems. Use same designations indicated on Drawings and in Division 09 Section “Finish Key.”

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: 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. Extent of surface systems and use zones for equipment.
 - 2. Critical heights for playground surfaces and fall heights for equipment.
- B. Qualification Data: For qualified Installer.
- C. Material Certificates: For each type of loose-fill synthetic turf surface system, from manufacturer.
- D. Product Certificates: For each type of synthetic turf surface system, from manufacturer.
- E. Field quality-control reports.
- F. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For synthetic turf surface system to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Synthetic Turf Fabric: Furnish quantity not less than 10 linear feet for every 500 linear feet or fraction thereof, in roll form and in full roll width for each color, pattern, and type of floor covering installed.
 - 2. Termination Edge Units: 3 full-size units.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain synthetic turf surface system materials from single source from single manufacturer.
 - 1. Provide secondary materials including adhesives, primers, and repair materials of type and from source recommended by manufacturer of synthetic turf surface system materials.

1.10 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of synthetic turf surface system that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:

- a. Reduction in impact attenuation.
- b. Deterioration of surface and other materials beyond normal use.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYNTHETIC TURF SURFACE

- A. Surface System: Woven synthetic grass turf with drainage sub-base.
 1. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent. Refer to Section 01 81 13.14 "SUSTAINABLE DESIGN REQUIREMENTS - LEED V4 BD+C" for additional recycled content requirements.
 2. Basis of Design: Subject to compliance with requirements, provide ForeverLawn; K9Grass Lite or approved product by one of the following or approved manufacturer:
 - a. Easy Turf
 - b. SynLawn.
 - c. Approved Substitution.
 3. Pile Yarn Type: UV-resistant polyethylene.
 4. Yarn Structure: Spined and texturized monofilament.
 5. Yarn Denier: 9000 per ASTM D 1577.
 6. Pile Height: 1.625 inches per ASTM D 5823.
 7. Pile Weight: 45 oz/cy, dual layer woven polypropylene, per ASTM D 5848.
 8. Primary Backing Weight: >7 oz/cy, dual system permeable polyurethane, per ASTM D 5848.
 9. Secondary Backing Weight: 22 oz/cy, per ASTM D 5848.
 10. Total Weight: 94 oz/cy, per ASTM D 5848.
 11. Stitch Gauge: 3/8-inch centers, per ASTM D 5793.
 12. Antimicrobial Protection: Built-in to blades.
 13. Total Infill: 4 lbs/sf.
 14. Color(s): As indicated by manufacturer's designations in Division 09 Section "Finish Key."
- B. Leveling and Patching Material: Portland cement-based grout or epoxy- or polyurethane-based formulation suitable for exterior use and approved by playground surface system manufacturer.

2.2 INORGANIC LOOSE-FILL

- A. Inorganic Aggregate Materials: Clean, washed, and free of loam, clay, organic matter, debris, and other foreign substances.
 1. Acrylic Coated Silica: Consisting of a 12/20 grit.
 2. Uncompressed Material Depth: Manufacturer's standard but not less than as indicated.

2.3 LOOSE-FILL ACCESSORIES

- A. Edgings: Anchored-in-place, weather-resistant containment barrier designed to minimize sharp edges, protrusions, and tripping hazards; formed by interconnected, modular units.

1. Polyethylene Units: UV-light-stabilized, 100 percent recycled polyethylene, not less than 1/4-inch wall thickness; made into smooth-surfaced straight and curved units with radiused exposed edges and integral, molded-in color; in manufacturer's standard sizes.
 - a. Color: As selected by Architect from manufacturer's full range.
2. Rubber Units: Compression molded from 100 percent recycled SBR, in manufacturer's standard sizes.
 - a. Color: As selected by Architect from manufacturer's full range.

2.4 MOLDED-SHEET DRAINAGE PANEL

- A. Molded-Sheet Drainage Panel: Manufacturer's standard prefabricated, drainage panel tiles.
 1. Drainage Panel Tile: Three-dimensional, non-biodegradable, molded-polypropylene-sheet material designed to effectively drain water under maximum fill pressures.
 - a. Weight: 1.5 lb per tile.
 - b. Size: 24-inches by 24-inches nominal.
 - c. Nominal Melt Flow Rate: 20g/10 minutes according to ASTM D 1238.
 - d. Notched Izod Impact Strength: No break according to ASTM D 256A.
 - e. Specific Gravity: 0.92 g/cc.
 - f. Thickness: 0.5-inches.
 - g. Compressive Stress: 180 psi according to ASTM D 6364.
 - h. Volume Voids: 84%.
 - i. Surface Voids: 71%.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer and CMAR present, for compliance with requirements for maximum moisture content, subgrade and substrate conditions, drainage, and other conditions affecting performance of the Work.
- B. Hard-Surface Substrates: Verify that substrates are satisfactory for synthetic turf surface system installation and that substrate surfaces are dry, cured, and uniformly sloped to drain within recommended tolerances according to synthetic turf surface system manufacturer's written requirements for cross-section profile.
 1. Concrete Substrates: Verify that substrates are dry, free from surface defects, and free of laitance, glaze, efflorescence, curing compounds, form-release agents, hardeners, dust, dirt, loose particles, grease, oil, and other contaminants incompatible with playground surface system or that may interfere with adhesive bond. Determine adhesion, dryness, and acidity characteristics by performing procedures recommended in writing by playground surface system manufacturer.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare substrates to receive surfacing products according to playground surface system manufacturer's written instructions. Verify that substrates are sound and without high spots, ridges, holes, and depressions.
- B. Concrete Substrates: Provide sound surface free of laitance, efflorescence, curing compounds, and other contaminants incompatible with playground surface system.
 - 1. Repair unsatisfactory surfaces and fill holes and depressions.
 - 2. Treat control joints and other nonmoving substrate cracks to prevent telegraphing through playground surface system.

3.3 INSTALLATION, GENERAL

- A. General: Comply with synthetic turf surface system manufacturer's written installation instructions. Install playground surface system over area and in thickness indicated.

3.4 DRAINAGE PANEL INSTALLATION

- A. General: Install drainage panel tiles according to synthetic turf surface system manufacturer's written instructions.

3.5 INSTALLATION OF SYNTHETIC TURF SURFACE SYSTEMS

- A. Turf Surface: Install components of synthetic turf surface system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of total thickness indicated.

3.6 INSTALLATION OF LOOSE-FILL

- A. Loose-Fill Edgings: Place as indicated, and permanently secure in place and attach to each other according to manufacturer's written instructions.
- B. Loose Fill: Place synthetic turf surface system materials including manufacturer's standard amount of excess material for compacting mechanically to required depths after Installation of drainage panels.

3.7 PROTECTION

- A. Synthetic Turf Systems: Prevent traffic over system for not less than 48 hours after installation.

END OF SECTION 09 62 53



ADDENDUM NO. 09

(Issued July 28, 2022)

**TO THE BID DOCUMENTS FOR
BP-S00195, TERMINAL C, PHASE 1X AIRSIDE CONCOURSE**

ORLANDO INTERNATIONAL AIRPORT

ADDENDUM NO. 09

TO ALL HOLDERS OF CONTRACT DOCUMENTS

1. Your attention is directed to the following interpretations of, changes in, and/or additions to the contract documents for the above-named project
2. This addendum is part of the Contract Documents
3. Bidders are required to acknowledge receipt of this Addendum in the space provided on the Bid Form Section 00 41 13

Revised Specifications

The following Specifications have been revised by this Addendum and are included as attachments to this Addendum:

00 01 00 TABLE OF CONTENTS VOL. 2-5
08 71 00 DOOR HARDWARE

Revised Drawings

- A0.31.00 DETAIL EWS-08 - CORRECTED - FINISH NOTES
- A0.31.00 DETAIL SS-02 - CORRECTED - NOTES
- A0.31.00 DETAIL EWS-02 - CORRECTED - NOTES
- A1.12.37 BP# 107: ADDED COLUMN WRAP C3
- A1.14.35 PLAN A1 - MODIFIED - DOORS 04.6087A, 04.6087B, AND 04.6087C WIDTH FROM 36 TO 48 INCH.
- A1.14.36 PLAN A1 - MODIFIED - DOORS 04.6160A, 04.6160B, AND 04.6160C WIDTH FROM 36 TO 48 INCH.
- A1.14.38 PLAN A1 - MODIFIED - DOORS 04.6250A, 04.6250B, AND 04.6250C WIDTH FROM 36 TO 48 INCH.
- A1.14.39 PLAN A1 - MODIFIED - DOORS 04.6297A, 04.6297B, AND 04.6297C WIDTH FROM 36 TO 48 INCH.
- A3.14.08 SHEET - DELETED - COMPLETE
- A3.14.11 SHEET - DELETED - COMPLETE
- A4.12.36 PLAN A1 - MODIFIED - TO CALL OUT WP1 and WP3 LOCATIONS.
- A4.14.36 PLAN A1 - MODIFIED - TO CALL OUT WP1 and WP3 LOCATIONS.
- A4.14.36 PLAN A1 - MODIFIED - DOORS 04.6160A, 04.6160B, AND 04.6160C WIDTH FROM 36 TO 48 INCH.
- A4.22.11 MODIFIED DIMENSIONS
- A4.22.12 MODIFIED DIMENSIONS
- A4.50.19 DETAIL A3 & E3 - MODIFIED - FINISH NOTES
- A5.12.11 DETAIL E3 - CORRECTED - FINISH NOTES
- A5.12.11 DETAIL D3 - DELETED - NOT IN SCOPE
- A5.12.23 SHEET - DELETED - COMPLETE
- A5.12.33 DETAIL D1 - CORRECTED - FINISH NOTES
- A5.12.33 DETAIL C1 - CORRECTED - FINISH NOTES
- A5.12.33 DETAIL C3 - CORRECTED - FINISH NOTES
- A5.12.33 DETAIL E5 - CORRECTED - FINISH NOTES
- A5.12.53 DETAIL C5 - CORRECTED - FINISH NOTES
- A5.12.53 DETAIL A5 - CORRECTED - FINISH NOTES
- A5.12.55 DETAIL C5 - CORRECTED - FINISH NOTES
- A5.12.57 DETAIL A1, A3, C1, C3, E1, & E3 - DELETED- AREA NOT IN SCOPE
- A5.12.58 DETAIL A1, D1 & D4 - DELETED- WORK NOT IN SCOPE AREA
- A5.12.71 DETAIL C5 - CORRECTED - FINISH NOTES
- A6.11.01 SCHEDULE - MODIFIED - DOORS 02.6066A, 02.6144A, 02.6252A, 02.6281A, 04.6297A, 04.6297B, 04.6297C, 04.6250A, 04.6250B, 04.6250C, 04.6160A, 04.6160B, 04.6160C, 04.6087A, 04.6087B, & 04.6087C.
- E1.11.36 UPDATED CIRCUITS
- E1.11.37 UPDATED CIRCUITS
- E1.11.38 UPDATED CIRCUITS
- E1.14.34 ADDED RECEPTACLE FOR AD DISPLAYS
- E1.14.34 ADDED RECEPTACLE FOR AD DISPLAYS
- E1.14.34 ADDED RECEPTACLE FOR AD DISPLAYS

- E1.14.34 ADDED KEYED NOTE 1
- E1.14.35 ADDED KEYED NOTE 2, REMOVED KEYED NOTE 1
- E1.14.35 ADDED RECEPTACLE FOR AD DISPLAYS
- E1.14.35 ADDED RECEPTACLE FOR AD DISPLAYS
- E1.14.36 ADDED KEYED NOTE 2, REMOVED KEYED NOTE 1
- E1.14.36 ADDED RECEPTACLE FOR AD DISPLAYS
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- E1.14.36 ADDED RECEPTACLE FOR AD DISPLAYS
- E1.14.37 ADDED KEYED NOTE 1
- E1.14.37 ADDED RECEPTACLE FOR AD DISPLAYS
- E1.14.38 ADDED KEYED NOTE 4
- E1.14.38 ADDED RECEPTACLE FOR AD DISPLAYS
- E1.14.39 ADDED KEYED NOTE 4
- E1.14.39 ADDED RECEPTACLE FOR AD DISPLAYS
- E1.31.34 ADDED EXIT SIGN
- E1.31.34 ADDED EXIT SIGN
- E1.31.34 ADDED EXIT SIGN
- E1.31.34 UPDATED CIRCUITS
- E1.31.35 ADDED EXIT SIGN
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- E1.31.37 ADDED EXIT SIGN
- E1.32.34 UPDATED CIRCUITS
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- E1.34.38 ADDED EXIT SIGN
- E1.34.38 ADDED EXIT SIGN
- E1.34.39 ADDED EXIT SIGN
- E1.34.39 ADDED EXIT SIGN
- E3.00.01 ADDED HEX NOTE #23: A PORTION OF THIS CONDUIT RUN WAS
INSTALLED UNDER PREVIOUS (PHASE I) CONTRACT. REFER TO
UNDERGROUND ELECTRICAL AS-BUILT PROVIDED WITH ADDENDUM
008 ON 07/22/2022 AS PART OF GMP 6S.6 FOR DETAILS.
CONTRACTOR TO MODIFY/INTERCEPT/EXTEND/ETC. AS REQUIRED
FOR A COMPLETE AND OPERATIONAL SYSTEM AS PART OF THIS
CONTRACT.
- E3.00.01 ADDED HEX NOTE #23.
- E3.00.01 ADDED HEX NOTE #23.
- E3.00.01 ADDED HEX NOTE #23.
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- E3.00.01 ADDED HEX NOTE #23.
- E3.00.01 ADDED HEX NOTE #23.
- E5.00.12 ADDED SHEET "E5.00.12" INTO ELECTRICAL SET.
- E6.00.01 ORGANIZED AND ADDED/REMOVED PANELS
- E6.10.01 UPDATED PANEL FEEDER SCHEDULES.
- E6.10.02 UPDATED PANEL FEEDER SCHEDULES.
- E6.60.01 REARRANGED PANELS AND UPDATED CIRCUITS
- E6.60.02 REARRANGED PANELS AND UPDATED CIRCUITS
- E6.60.03 REARRANGED PANELS AND UPDATED CIRCUITS
- E6.60.04 REARRANGED PANELS AND UPDATED CIRCUITS
- E6.60.05 REARRANGED PANELS AND UPDATED CIRCUITS
- E6.60.06 REARRANGED PANELS AND UPDATED CIRCUITS
- E6.60.07 REARRANGED PANELS AND UPDATED CIRCUITS
- E6.60.08 REARRANGED PANELS AND UPDATED CIRCUITS
- E6.60.09 REARRANGED PANELS AND UPDATED CIRCUITS
- E6.60.10 REARRANGED PANELS AND UPDATED CIRCUITS
- E6.60.11 RENAMED PANEL AND MOVED TO DIFFERENT SHEET
- E6.60.11 REARRANGED PANELS AND UPDATED CIRCUITS
- M6.01.02 UPDATED TO SHOW STARTER REQUIREMENTS AND SPECIFICATION REFERENCE
- S0.00.01 ADDED NOTE FOR SUPPORT OF 8" AND LARGER PIPING
- T5.01.03 GOAA AND CBP ZONE ENCLOSURE DETAILS UPDATED
- T7.10.01 FIBER CHANNELING NOTES REVISED

The following drawings have been revised by this Addendum and are included as attachments to this Addendum:

Responses to Bidders Questions

<i>Bidder Questions</i>	<i>Responses</i>
<i>Question 1: We would like to be listed as an Approved Lightning Protection Manufacturer on this project and future projects.</i>	Response 1: The Manufacturer's product will need to comply with all requirements listed in Section 01 25 00 Substitutions Procedures.

<p><i>Question 2: In order to be able to meet the requirements of the Terminal C-Phase 1x Request for Proposal, we would like to request a bid date extension to August 9th, 2022 Please confirm this is acceptable.</i></p>	<p>Response 2: Per Addendum No. 5, sealed bids will be received up to 2:00 p.m. local time, August 2, 2022.</p>
<p><i>Question 3: I do not see the Minimum wages for the Davis Bacon Act. Can you please provide those?</i></p>	<p>Response 3: Davis Bacon Act minimum wages were incorporated by Addendum No. 1 into Volume 1 of the Project Manual. See Special Provisions Section SP-1.</p>
<p><i>Question 4: Are the passenger boarding bridges, PCA, GPU and other ancillary gate equipment procurement and installation a part of this bid? If not, how will they be procured and installed.</i></p>	<p>Response 4: PBBs and GPU's will be procured and installed by the Owner and are not part of this bid. PBB Air Handlers will be procured and installed by the Owner and are not part of this bid. Final connection of Glycol Lines from the building to the PBB Air Handlers will be part of the Contractor's bid. Potable water cabinets will be procured by the owner and are not part of this bid, final connection of potable water line from the building to the potable water cabinet will be part of the Contractor's bid.</p> <p>Other ancillary gate equipment that is beyond the face of the building such as baggage conveyance equipment, supplemental air conditioning, etc., and that is associated with the passenger boarding bridges will be procured and installed by the owner as part of passenger boarding bridge procurement.</p>
<p><i>Question 5: RFI #1, Item #1– 274133 - AV Touchscreen Controller Specification Section 274133 Section 2.3.K specifies a 10" color touch screen is to be provided as part of the IP Master Antenna Television System (IPTV). The IPTV System Block Diagram on drawing TA6.01.01 does not illustrate any touch screen controllers to be part of the IPTV system. Please confirm the touchscreen controller is not required. If it is required, please provide an updated block diagram illustrating all required connectivity and components.</i></p>	<p>Response 5: The Touch Screen Controller is required and will be field located in one of the IDF rooms per GOAA IT as the project progresses.</p>

<p><i>Question 6: RFI #1, Item #2– 274133 – Networked AV Media Player</i></p> <p><i>Specification Section 274133 Section 2.3.G specifies a Networked AV Media Player is to be provided as part of the IP Master Antenna Television System (IPTV) but does not provide a model number as the basis of design. The specified manufacturers do not appear to provide models that meet the specified performance requirements. Please confirm a Brightsign XT1144 is an approved Networked AV Media Player and is compatible with the existing GOAA IPTV infrastructure. If not, please provide the manufacturer and model number of the required Media Player.</i></p>	<p>Response 6: The XT114 is acceptable.</p>
<p><i>Question 7: RFI #1, Item #3– 274220 – Fiber Channeling Contractor</i></p> <p><i>Specification Section 274220 Section 1.3.B specifies Fiber Channeling as described in Specification Section 271000 to be part of the Scope of Work for the Electronic Dynamic Signage System. Specification Section 271000 Section 1.3.C states that Fiber Channeling is to be provided by hiring the services of a GOAA Continuing Contractor. Specification Section 271000 does not provide any method for contacting the required contractor(s). Please provide the contact details for the required Fiber Channeling Contractor(s).</i></p>	<p>Response 7: Advanced Cable Connection, Inc. (ACCI): Project Manager: Alan Jones Phone (Office): 813-978-0101 EXT 249 Phone (Cell): 401-263-4070</p> <p>Orion Management: Florida Operations Manager: Billy Nobles Phone (Office): 321-453-4668 EXT 238 Phone (Cell): 321-615-2804</p> <p>Orlando Business Telephone Systems (OBTS): Project Manager: Tom Roberts Phone (Office): 813-978-0101 EXT 249 Phone (Cell): 321-239-3831 Project Manager: Bart Baranack Phone (Office): 321-239-4679 Phone (Cell): 321-239-3831</p> <p>Quality Cable Contractors, Inc (QCCI): President: Jorge del Rio Phone (Office): 407-246-0606 Phone (Cell): 407-468-6238</p> <p>Precision Contracting Services (PCS): Dir Ent Networks: Rick Arnold Phone (Office): 561-360-1104 Phone (Cell): 407-578-9607.</p>

<p><i>Question 8: RFI #1, Item #4– 274220 – Spare Materials</i> <i>Specification Section 274220 Section 1.12 specifies spare materials that are to be provided as part of the Electronic Dynamic Signage System. The language appears to mirror the original project specifications and requires spare materials in excess of the spare materials previously provided. Please clarify if additional spare materials are required as part of P1X, or if the specified spare materials can be disregarded. If additional spare materials are required, please clarify the quantities and models that are required.</i></p>	<p>Response 8: Refer to 1.12.D for the minimum requirements. Omit the Outdoor LED.</p>
<p><i>Question 9: RFI #1, Item #5– 275113 – Local Volume Controls</i> <i>Specification Section 275113 specifies the AtlasIED AT##-PA Local Volume Control to be provided where indicated on the drawings. The TA-Series drawings do not appear to illustrate any local volume controls to be part of the Emergency Communication System. Please confirm the specified local volume controls can be disregarded. If not, please provide updated block diagram and floor plan drawings illustrating all required connectivity and locations.</i></p>	<p>Response 9: None are currently shown in plan but may become necessary due to future revisions and/or tenant requests, provide only when shown on plans.</p>
<p><i>Question 10: RFI #1, Item #6– 275113 – Spare Materials</i> <i>Specification Section 275113 Section 1.12 specifies spare materials that are to be provided as part of the Emergency Communication System. The language appears to mirror the original project specifications and requires spare materials in excess of the spare materials previously provided. Please clarify if additional spare materials are required as part of P1X, or if the specified spare materials can be disregarded. If additional spare materials are required, please clarify the quantities and models that are required.</i></p>	<p>Response 10: See Revised Spare Material Schedule below</p> <ol style="list-style-type: none"> 1. (5) of each style AMP Card used 2. (2) AMP Mainframes 3. (2) Multifunction IO 4. (5) Ambient Sensor Collectors 5. (5) of each style Mic stations 6. Ceiling Speakers <ol style="list-style-type: none"> a. (20) Type 00 b. (5) Type 01 7. Wall Speakers <ol style="list-style-type: none"> a. (10) Type 01 b. (2) Type 06
<p><i>Question 11: RFI #1, Item #7– Communication System Terminal Cabinet</i> <i>The TA-series drawings illustrate CSTC terminal cabinets in the MDF/IDF rooms. Specification Section 275113 does not specify a manufacturer or model number for the CSTC cabinets. Please provide the manufacturer and model number for the required cabinets.</i></p>	<p>Response 11: Shall be per DIV 26 and DIV 27 general specification for terminal cabinets and junction boxes for additional requirements, and detail on drawings.</p>

<p><i>Question 12: RFI #1, Item #8– 275113 – Additional Devices</i> <i>Specification Section 275113 Section 1.13 specifies additional devices to be provided as part of the Emergency Communication System. The language appears to mirror the original project specifications and requires additional devices in excess of the additional devices previously provided. Please clarify if additional devices are required as part of P1X, or if the specified additional devices can be disregarded. If additional devices are required, please clarify the quantities and models that are required.</i></p>	<p>Response 12: Devices shall be per specifications.</p>
<p><i>Question 13: RFI #1, Item #9– 275113 – Fire Alarm Interface</i> <i>The Head End Fire Alarm Interface block diagram on drawing TA5.02.24 notes that the contractor is to “PROVIDE THIS DETAIL (x2) IN HEAD END. TOTAL OF (2) OF EACH CONNECTION SHOWN BELOW.” Please confirm a quantity of four (4) AtlasIED IP116 ECS System Controllers are required to accommodate the illustrated and noted connectivity.</i></p>	<p>Response 13: Will remove note requiring detail x2, only (2) total ACS to support additional equipment are required.</p>
<p><i>Question 14: RFI #1, Item #10– 275113 – Logic Relay Module</i> <i>The Head End Fire Alarm Interface block diagram on drawing TA5.02.24, as well as the ECS Block Diagrams on drawing TA6.12.20 and TA6.12.21 illustrate connectivity for a Logic Relay Module. Specification Section 275113 specifies the AtlasIED IED1516LI to be the Logic Relay Module. The IED1516LI does not have Relay Outputs as illustrated on the block diagrams. Please confirm the IED1516LI is the required interface module.</i></p>	<p>Response 14: Specifications will be revised to indicate correct part number IED: 1522LR 2 Input x 2 Relay Output.</p>
<p><i>Question 15: RFI #1, Item #11– Type C41 Displays</i> <i>The Display Schedule on drawing TA7.01.01 notes the Type C41 displays and mounts to be TBD “Pending response to RFI 1135.” Please provide a manufacturer and model for the Type C41 displays and mounts that can be included as a baseline value for the purpose of accurately estimating the project.</i></p>	<p>Response 15: Refer to specification 27 42 20 part 2.3.B.b. Gable Z-Clip LED Cabinet Bracket. Note that the displays and supporting AV equipment for this sign type is also Owner Furnished.</p>

<p><i>Question 16: RFI #1, Item #12– Type C06 FIDS Wall The Display Schedule on drawing TA7.01.01 notes the Type C06 displays to require six (6) displays and to be “14 Phase 1.” The display detail on drawing X8.00.18 illustrates the Type C06 displays to have twenty (20) displays. Please confirm the quantity of displays required for each Type C06 location.</i></p>	<p>Response 16: 20 Displays.</p>
<p><i>Question 17: RFI #1, Item #13– Type C07 Information Tower The Display Schedule on drawing TA7.01.01 notes the Type C07 display to be two sided and require two (2) displays. The display detail on drawing X8.00.19 illustrates the Type C07 displays to have two (2) displays on both front and back. Please confirm the quantity of four (4) displays are required for each Type C07 location.</i></p>	<p>Response 17: 4 Displays.</p>
<p><i>Question 18: RFI #1, Item #14– 275113 – Mic Station Cabling Specification Section 275113 Section 1.3.C states that PAS Signal Cabling falls under the scope of work for the Emergency Communication System contractor. Specification Section 275113 Section 2.13.A refers to the Network Cabling requirements to Specification Section 271000 for the Horizontal Cabling that would be required for the Microphone Paging Stations. Please clarify who is to provide the network cabling for the Microphone Paging Stations.</i></p>	<p>Response 18: To be coordinated with CM / GC.</p>
<p><i>Question 19: RFI #1, Item #15– 275113 – Additional Mic Station Quantity Specification Section 275113 Section 2.8.A specifies the provision of an “additional twenty-five (25) stations and all associated cable, conduit, labor, programing and materials to be located where directed by GOAA.” The language appears to mirror the original project specifications and requires devices in excess of the additional devices previously provided. Please clarify if additional devices are required as part of P1X, or if the specified additional devices can be disregarded.</i></p>	<p>Response 19: Will revise specifications, provide additional (5) Type 1 Station only.</p>

<p><i>Question 20: RFI #1, Item #16– 275113 – Type 4 Wall Speakers</i> <i>Specification Section 275113 Section 2.10.6 specifies the Renkus-Heinz ICL-F-DUAL-RN to be the Type 4 Wall Speaker. The TA-Series drawings do not appear to illustrate any Type 4 Wall Speakers to be part of the Emergency Communication System. Please confirm the specified Type 4 Wall Speakers can be disregarded. If not, please provide updated block diagram and floor plan drawings illustrating all required connectivity and locations.</i></p>	<p>Response 20: Will revise specifications and remove type 4 wall speakers as they are not used in this phase.</p>
<p><i>Question 21: RFI #1, Item #17– 275113 – Type 5 Wall Speakers</i> <i>Specification Section 275113 Section 2.10.6 specifies the AtlasIED ALA5T to be the Type 5 Wall Speaker. The TA-Series drawings do not appear to illustrate any Type 5 Wall Speakers to be part of the Emergency Communication System. Please confirm the specified Type 5 Wall Speakers can be disregarded. If not, please provide updated block diagram and floor plan drawings illustrating all required connectivity and locations.</i></p>	<p>Response 21: Will revise specifications and remove type 5 wall speakers as they are not used in this phase.</p>
<p><i>Question 22: I came across your project mentioning IPTV in the spec. VITEC is a leading manufacturer of IPTV, Signage and Videowall solutions and I wanted to see if it makes sense for us to bid on this project. There weren't any details and I'm reaching out to see if you can refer me to someone to speak with or an area that lists specific for the IPTV requirement and how we can be included in the bid process.</i></p>	<p>Response 22: The IPTV details are in the plans and specifications. Refer to the TA series plans for Dynamic Signage and IPTV locations, quantities, logic diagrams and details. Refer to specification 27 41 33 for IPTV requirements. Refer to 27 42 20 for dynamic signage requirements.</p>
<p><i>Question 23: Please provide current prevailing wages to be used for this project.</i></p>	<p>Response 23: Refer to Response for Question 3.</p>
<p><i>Question 24: Section 30-20 Award of contract, indicates that proposal shall be valid for the duration of the Bid Guarantee period as indicated in section 20. Under section 20-13 - Bid Security, it indicates bid shall not be withdraw for a period of 30 days. Please confirm that bidder's validity of proposal is 30 days as well. If not, then indicate how many days the bidder's proposal shall be valid for.</i></p>	<p>Response 24: This was revised in Addendum No. 1 to 93 days.</p>
<p><i>Question 25: When is the expected start date for the project?</i></p>	<p>Response 25: Expected NTP for this work is 12/6/2022.</p>

<p><i>Question 26: Section 01 50 00 - Temporary Facilities and Control, paragraph 1.2 D, temporary facilities or location are not stated. Please clarify if field offices will be required for Owner and GCs. If new offices are to be provided, indicate minimal criteria and scope so we can price accordingly.</i></p>	<p>Response 26: No field offices will be required for the Owner. See "South Trailer Complex.pdf" for reference. GOAA will provide office trailer space for up to ten (10) employees in the existing GOAA trailer complex highlighted in red. Contractors will be allowed to place temporary field offices / trailers on site in the blue area located along Terminal C Service Road. All office supplies, office operating costs, and any additional fit-out and furniture by Contractor.</p>
<p><i>Question 27: See attached filled out SSI form as provided in section 03 73 93.03 - Special Procedures for Sensitive Security Information. Please provide any additional specifications or drawings associated to Division 28 (physical access control systems, intrusion detection system, video surveillance).</i></p>	<p>Response 27: There are no additional specifications or drawings associated with Division 28 that are under SSI protection required for Bid Documents.</p>
<p><i>Question 28: Please clarify who is responsible to furnish and install the passenger boarding bridges.</i></p>	<p>Response 28: Refer to Response for Question 4.</p>
<p><i>Question 29: Bird Control Devices is included in the specifications but do not find any on the drawings. Please confirm no Bird Control Devices (Bird Netting) for P1X.</i></p>	<p>Response 29: Confirmed; there are no bird control devices for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 30: Roller Window Shades is included in the specifications but do not find any on the drawings. Please confirm no Roller Window Shades for P1X.</i></p>	<p>Response 30: Confirmed; there is no roller shade requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 31: The 2nd level door schedule is duplicated on sheet A6.11.01</i></p>	<p>Response 31: Duplicated schedule has been removed.</p>
<p><i>Question 32: Sheet A1.12.34 openings are not in the 2nd level Door Schedule. Please provide</i></p>	<p>Response 32: Door Schedule updated in Addendum No. 08 to include missing doors.</p>
<p><i>Question 33: Sheet A1.12.39 openings are not on the Door Schedule. Please provide</i></p>	<p>Response 33: Door Schedule updated in Addendum No. 08 to include missing doors.</p>
<p><i>Question 34: Exit Stair doors on Intl level (ex. 04.6087C) have a passage set lock spec'd. We do not believe that will not work at those locations. Please confirm or clarify.</i></p>	<p>Response 34: Exit Doors 04.6087C, 04.6160C, 04.6250C, and 04.6295C will have a fire exit device set in lieu of the passage set.</p>
<p><i>Question 35: STC Landside had a temp power transformer adjacent to P1x that the electrician used to permit HP's temp power plan (see sketch attached). Please answer the following questions taking this information into consideration: 1) Is this transformer still onsite? 2) Conduit, pathways & cabling, DB still intact?, 3) If everything has been removed from its current location, is the transformer onsite for use?, 3) If the transformer and pathways are not available, we are we to get temporary power from?</i></p>	<p>Response 35: The existing service is a 1,200 amp 480V 3-phase service at the SE corner of the ASC Phase 1 building. There is a 4" conduit from this to a 48"x60" pullbox which continues into the P1-X construction area at column Y15/D12. The plan is to leave the transformer and DP in place for the P1X construction.</p>

<p><i>Question 36: Drawing A5.14.15 indicate Trash Chute Details but cannot find any trash chute on the floor plans. Please confirm there are no trash chutes required for P1X. If none required, please remove drawing A5.14.15 from contract documents.</i></p>	<p>Response 36: There are no trash chutes for this project. Sheet A5.14.15 and specification section 14 91 82 are deleted. Index sheet and Table of Contents are updated to reflect this change.</p>
<p><i>Question 37: Tilt Up is included in the specifications but none was found within the drawings. Please confirm Tilt-Up does not apply for P1X.</i></p>	<p>Response 37: Confirmed; there is no tilt up requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 38: Metal Floor Plate Stairs is included in the specifications, but none was found within the drawings. Please confirm Metal Floor Plate Stairs do not apply for P1X</i></p>	<p>Response 38: Confirmed; there is no Metal Floor Plate Stair requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 39: Smoke Baffle System is included in the specifications, but none was found within the drawings for P1X areas. Please confirm Smoke Baffle System does not apply for P1X</i></p>	<p>Response 39: Confirmed; there is no Smoke Baffle System requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 40: Please provide locations and details for passenger boarding bridge foundations</i></p>	<p>Response 40: See Addendum No. 07 for foundation information.</p>
<p><i>Question 41: Please provide miles stone dates for Owner provided Baggage Handling System (installation, commissioning, etc.)</i></p>	<p>Response 41: Owner, BHS DBOM Contractor and the GC will prepare an integrated project schedule with the goal of completing the job together.</p>
<p><i>Question 42: Please confirm that the bid schedule provided in Addendum #3 - BPS195 Bid Schedule for civil work should dbe included in the proposal as part of the base bid amount</i></p>	<p>Response 42: Confirmed.</p>
<p><i>Question 43: Bid schedule, item C-106-4.2 provided in addendum 3 has a line item for temporary fence with Jersey Barrier. Please indicate if the Jersey barrier has to meet AOA requirements or it can be a regular jersey barrier.</i></p>	<p>Response 43: All temporary fence with or without jersey barrier shall be AOA requirements. All costs associated to this shall be incidental to the fencing pay items. There shall be no gaps larger than 2-inches.</p>
<p><i>Question 44: Detail A1 on A5.11.09 references specification 09 25 13.13. This specification is not included in the Project Manual. Please clarify if the Acrylic Plaster Finish indicated at this location is to follow 09 24 00 Cement Plastering, 07 24 23 Direct-Applied Finish System, or another specification for this application.</i></p>	<p>Response 44: This is revised to show 07 24 23; see revised sheet A5.11.09 included in Addendum No. 08.</p>
<p><i>Question 45: Will temporary parking be provide for subcontractor employees? Please clarify.</i></p>	<p>Response 45: Subcontractor employees may park in the Site Logistics Craft Parking Lot along Terminal C Service Road. See "South Trailer Complex.pdf" area highlighted in blue.</p>

<p><i>Question 46: Please clarify if insulated concrete masonry units are to be used on this project. If so, please indicate location or wall type.</i></p>	<p>Response 46: Insulated concrete masonry units are not being used for this project. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 47: Please review and advise as relates to Division 08 Specifications for Airside Concourse P1X:</i></p> <p><i>1) 08 14 16 – Flush Wood Doors – There are currently no doors listed on Door Schedule to be Wood. Please confirm no Wood Doors, and if not, remove Specification</i></p> <p><i>2) 08 33 10 – Security Grilles - There are currently no Security Grilles listed on Door Schedule. Please confirm no Security Grilles, and if not, remove Specification</i></p> <p><i>3) 08 34 53 – Bullet Resistant Hollow Metal Doors and Frames - There are currently no doors or frames listed on Door Schedule to be Bullet Resistant (BRBP). Please confirm no BRBP Doors or Frames, and if not, remove Specification.</i></p> <p><i>4) 08 34 63 – Detention Doors and Frames - There are currently no doors or frames listed on Door Schedule to be Detention Doors and Frames. Please confirm no Detention Doors and Frames, and if not, remove Specification</i></p> <p><i>5) 08 35 13.23 – Accordion Folding Fire Doors - There are currently no doors listed on Door Schedule to be Accordion Folding Fire Doors. Please confirm no Accordion Folding Fire Doors and if not, remove Specification</i></p> <p><i>6) 08 56 67 – Bullet Resistant Transaction Windows - There are currently no openings listed on Door Schedule to be Bullet Resistant Transaction Windows. Please confirm no Bullet Resistant Transaction Windows and if not, remove Specification</i></p> <p><i>7) 08 71 63 – Detention Doors Hardware - There are currently no doors or frames listed on Door Schedule to be Detention Doors. Please confirm no Detention Doors, and if not, remove Specification</i></p> <p><i>8) There are six (6) Doors and Frames listed on the Door Schedule to be Stainless Steel (SS) but there is no Specification provided. Please confirm doors and frames to be SS and if so, please provide Specification.</i></p>	<p>Response 47: 1) There are no Flush Wood Doors 2) There are no Security Grilles 3) There are no Bullet Resistant Metal Doors 4) There are no Detention Doors and Frames 5) There are no Accordion Folding Fire Doors 6) There are no Bullet Resistant Transaction Windows 7) There are no Detention Doors</p> <p>See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 48: Detention Stainless Steel Modesty Panels are included in the specifications but do not find any on the drawings. Please confirm no Detention Stainless Steel Modesty Panels for P1X.</i></p>	<p>Response 48: Confirmed; there is no Detention Stainless Steel Modesty Panel requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>

<i>Question 49: Operable Panel Partitions is included in the specifications but do not find any on the drawings. Please confirm no Operable Panel Partitions for P1X.</i>	Response 49: Confirmed; there is no Operable Panel Partitions requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 50: Bullet Resistant Panels are included in the specifications but do not find any on the drawings. Please confirm no Bullet Resistant Panels for P1X.</i>	Response 50: Confirmed; there is no Bullet Resistant Panels requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 51: Metal Lockers are included in the specifications but do not find any on the drawings. Please confirm no Metal Lockers for P1X.</i>	Response 51: Confirmed; there is no Metal Lockers requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 52: Exterior Sun Control Devices are included in the specifications but do not find any on the drawings. Please confirm no Exterior Sun Control Devices for P1X.</i>	Response 52: Confirmed; there is no Exterior Sun Control Device requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 53: Debris Containment Netting is included in the specifications but do not find any on the drawings. Please confirm no Debris Containment Netting for P1X.</i>	Response 53: Confirmed; there is no Debris Containment Netting requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 54: Aluminum Canopies are included in the specifications but do not find any on the drawings. Please confirm no Aluminum Canopies for P1X.</i>	Response 54: Confirmed; there is no Aluminum Canopy requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 55: Horizontal Louver Blinds are included in the specifications but do not find any on the drawings. Please confirm no Horizontal Louver Blinds for P1X.</i>	Response 55: Confirmed; there is no Horizontal Louver Blind requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 56: Anti-Fatigue Floor Mats are included in the specifications but do not find any on the drawings. Please confirm no Anti-Fatigue Floor Mats for P1X.</i>	Response 56: Confirmed; there is no Anti-Fatigue Floor Mat requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 57: Site Furnishings are included in the specifications but do not find any on the drawings. Please confirm no Site Furnishings for P1X.</i>	Response 57: Confirmed; there is no Site Furnishings requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 58: Transparent Bullet Resistance Assemblies are included in the specifications but do not find any on the drawings. Please confirm no Metal Lockers for P1X.</i>	Response 58: Confirmed; there is no Transparent Bullet Resistance Assemblies requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.
<i>Question 59: Cathodic Protection System is included in the specifications but do not find any on the drawings. Please confirm no Cathodic Protection System for P1X.</i>	Response 59: Confirmed; there is no Cathodic Protection System requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.

<p><i>Question 60: Trash Chutes are included in the specifications but do not find any on the drawings. Please confirm no Trash Chutes for P1X.</i></p>	<p>Response 60: Confirmed; there is no Trash Chute requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 61: Drawing X8.00.05 Note 5 and Drawing X8.00.25 Note 4 states “Additional Info: refer to common detail sheet X9.00.04 – for connection details” but there is no sheet X9.00.04. Please provide</i></p>	<p>Response 61: For the drawing X8.00.05 Note 5, please refer to the detail on X8.00.06 instead. For X8.00.25, please refer to the updated sheet in Addendum No. 06 that refers to structural for details.</p>
<p><i>Question 62: The architectural lighting fixture schedule in section 26 50 10, pages 18-21 do not match the fixtures designations on the drawings. Please update either the drawings or the fixture schedule in section 26 50 10. Clarify.</i></p>	<p>Response 62: Assume as follows: Electrical Drawings -> New Fixture Designation F3 (coves in restrooms) -> F87 F2a (downlights in single-occ restrooms) -> F86 F25 (perimeter fixture at restroom changing areas/entries and water fountains) -> F91 F25C (perimeter fixture in restroom at toilet wall) -> F91A F24 (vertical light between restroom mirrors) -> F90 F9 (downlights in slots at RR entry mazes) -> F88 F24 (SARA linear fixtures) -> F89 F1 (linears in hold rooms) -> F85 F9a (downlights in slots at gate areas) -> F88a F3B (Cove at boarding pier back wall) -> F87A F22d (downlights in boarding pier entry) -> F86a F45 (uplights at east windows) -> F92 F50(interior) – no change F1C (fixtures in high ceiling over hold room) -> F85a F48 (drop lens fixture at gate, white light) -> F93 F48A (drop lens fixture at gate, RGBW) -> F93A</p> <p>Ramp Loading Connector: F50 (exterior) -> F98 F44d (linear) -> F94 F64 (downlights under stairs) -> F97</p>

<p>Question 63: The following drawings are either missing or have incorrect information, Please provide or clarify: • E6.10.01, Emergency Feeder Schedule - Plotted Incorrectly, does not show the feeder sizes.</p> <ul style="list-style-type: none"> • E6.10.02, Normal Feeder Schedule - Plotted Incorrectly, does not show the feeder sizes. • E8.00.01, Lightning Protection - Missing • E8.11.00, Lightning Protection - Missing • E8.11.01, Lightning Protection - Missing • E8.16.00, Lightning Protection - Missing • E8.20.01, Lightning Protection - Missing • E8.20.02, Lightning Protection - Missing • E8.20.03, Lightning Protection - Missing • E8.50.02, Lightning Protection - Missing • E8.50.03, Lightning Protection - Missing • E8.50.04, Lightning Protection - Missing • E8.50.05, Lightning Protection - Missing • E8.50.06, Lightning Protection - Missing • E8.50.07, Lightning Protection - Missing 	<p>Response 63: Revised sheets E6.10.01 and E6.10.02 were provided in Addendum No. 06 on 07/13/2022. The Lightning Protection sheets listed in question do not exist and are not part of the BP-S195 Electrical Set. The following Lightning Protection sheets were issued in Addendum No. 03 on 07/08/2022:</p> <p>E8.00.00 E8.41.34 E8.41.35 E8.41.36 E8.41.37 E8.41.38 E8.41.39 E8.41.40 E8.46.34 E8.46.35 E8.46.36 E8.46.37 E8.46.38 E8.46.39 E8.46.40 E8.50.01</p>
<p>Question 64: Section 10 14 10 – Vehicle Directional Signage (Non-Electrified) – Parking Garage is included in specifications. Please confirm there is no scope as relates to this specification or work to be performed in the Parking Garage. If not, please remove this Section.</p>	<p>Response 64: Confirmed; there is no Vehicle Directional Signage (Non-Electrified) requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p>Question 65: AM#06 EC4.01.04 – The (4) new panels in the IDF closets (7LRCRC3W3A, 7EXLRCRC3W3A, 7LRCRSW3B, 7EXLRCRC3W3B) do not show up on the riser diagram or feeder schedules. Please provide information on what is feeding these panels and what the feeder sizes are.</p>	<p>Response 65: Feeders and upstream breakers will be added in a future bulletin.</p>

<p><i>Question 66: AM#06 E6.10.01 – Emergency Feeder Schedule</i></p> <p><i>a. 7EQHRCSW1B – Does not show up on riser diagram.</i></p> <p><i>b. 7EQLRCSW1B – Does not show up on riser diagram.</i></p> <p><i>c. XFMR-7EQLRCSW1B – Does not show up on riser diagram.</i></p> <p><i>d. 7EHRCSW1B – Does not show up on riser diagram.</i></p> <p><i>e. 7ELRCSW1B – Does not show up on riser diagram.</i></p> <p><i>f. XFMR-7ELCSW1B – Does not show up on riser diagram.</i></p> <p><i>g. 7EUPSG236 – Does not show up on riser diagram.</i></p> <p><i>h. XFMR-7EQLRCSW2A Disc – Does not show up on riser diagram, please confirm if a disconnect is required.</i></p>	<p>Response 66: Revised Riser Diagram sheet E3.00.01 was provided in Addendum No. 03 on 07/08/2022.</p> <p>Revised sheet E6.10.01 was provided in Addendum No. 06 on 07/13/2022.</p>
<p><i>Question 67: AM#06 E6.10.02 – Normal Feeder Schedule</i></p> <p><i>a. 7HRCSW1B – Does not show up on riser diagram.</i></p> <p><i>b. 7LRCSW1B – Does not show up on riser diagram.</i></p> <p><i>c. XFMR-7LRCSW1B – Does not show up on riser diagram.</i></p> <p><i>d. XFMR-7LRCSW2 Disc – Does not show up on riser diagram, please confirm if a disconnect is required.</i></p> <p><i>e. XFMR-7LRCSW2A Disc – Does not show up on riser diagram, please confirm if a disconnect is required.</i></p> <p><i>f. XFMR-7LRDPCSW2 Disc – Does not show up on riser diagram, please confirm if a disconnect is required.</i></p>	<p>Response 67: Revised Riser Diagram sheet E3.00.01 was provided in Addendum No. 03 on 07/08/2022.</p> <p>Revised sheet E6.10.01 was provided in Addendum No. 06 on 07/13/2022.</p>
<p><i>Question 68: E3.00.01 – Electrical Riser Diagram</i></p> <p><i>a. Feeder from 7LRDPG250 to 7LRCRCSW3 does not have a feeder size in the provided schedules, please provide required feeder size.</i></p> <p><i>b. Feeder from 7LRDPG250 to 7LRCRCSW4 does not have a feeder size in the provided schedules, please provide required feeder size.</i></p> <p><i>c. Feeder from 7HRDPCSW2 to 7HADIMG252 does not have a feeder size in the provided schedules, please provide required feeder size.</i></p> <p><i>d. Feeder from 7HRDPCSW2 to 7HADIMG253 does not have a feeder size in the provided schedules, please provide required feeder size.</i></p>	<p>Response 68: Revised Riser Diagram sheet E3.00.01 was provided in Addendum No. 03 on 07/08/2022.</p>
<p><i>Question 69: MWC9 and MWC11 are used at Boarding Piers as indicated per A6.12.01. MWC9 and MWC11 aren't described per finish key 09 00 01. Please advise materials for MWC9 and MWC11.</i></p>	<p>Response 69: MWC9 and MWC11 are not in the project. All areas noted MWC9 & MWC11 shall receive interior paint P1</p>

<p><i>Question 70: MWC9 and MWC11 are indicated at Boarding Piers per Finish Schedule A6.12.01. The extents of MWC9 and MWC11 are difficult to understand. For example, MWC9 is shown by callout on enlarged plan A4.12.36 but elevations aren't provided to show the start, stop, and height of paneling. Similarly, MWC11 is indicated via Boarding Pier section cuts per A3.12.21 and A3.12.22 but an elevation showing a paneled wall is missing. Please provide clear elevations that show the entire extent of MWC9 and MWC11 at boarding piers.</i></p>	<p>Response 70: MWC9 and MWC11 are not in the project. All areas noted MWC9 & MWC11 shall receive interior paint P1. Sheets have been updated for Addendum No. 08.</p>
<p><i>Question 71: Reference Specification 27 05 00 1.2.C and confirm the intent of this project is NOT to award as a CMAR and the TPM will be the responsibility of the Owner/GOAA.</i></p>	<p>Response 71: Refer to Addendum No. 03 for revisions to Specification Section 27 05 00 1.2.C. The intent of this project is to award, as a sub-contractor to the General Contractor, a TPM for the oversight and coordination of all related scopes of work described herein who will be a single point of contact to the Authority and the OAR. Refer to Addendum No. 07 for revisions to Specification Section 27 05 00 1.1.E.11 which states that the TPM shall serve for the entire project through closeout.</p>
<p><i>Question 72: All panel schedule drawings in E6 series have panel IDs designations that do not match panel IDs shown on the floor plan, feeder schedule & riser diagram. The P1X E6 series panel schedule shows the old gate numbering system (i.e. 233 thru 236) for Panels, UPSs, Dimming racks .. etc. while the floor plans & the feeder schedule show those panels with the new gate numbering system (i.e. 250 thru 253) Panel schedule needs to be revised.</i></p>	<p>Response 72: Panels updated in Addendum No. 09 issued on 07/28/2022.</p>
<p><i>Question 73: All panel schedule drawings in E6 series utilize the old rooms numbering system that does not match with the floor plans new GOAA numbering system, Panel schedule needs to be revised.</i></p>	<p>Response 73: Nomenclature revisions will be issued with the conformed document set.</p>
<p><i>Question 74: DWG E4.04.01 Dimming panels 7EQHADIMG235 & 7HADIMG235 were deleted from floor plan ER 04.6162 without deleting the Control Rack DMX512, also the panel schedule for those deleted panels still exists in DWG E6.60.04, need confirmation and revised drawings.</i></p>	<p>Response 74: Gate 235 was renumbered to Gate 251. Panels were not deleted from project, contractor to provide costs as originally indicated on plans and panels shall be included with the conformed document set.</p>
<p><i>Question 75: DWG E3.00.04 need to add the OUC transformer TX-PCA-U14 that feeds the PCA room to the drawing and to the feeder schedule.</i></p>	<p>Response 75: No sheet E3.00.04 exists as part of the BP-S195 bid package.</p>

<p><i>Question 76: DWG EX7.12.35 thru 39 shows newly added Exterior Gate Identity (EGI) power EGI JB + circuitry at each PBB. Circuits for EGI do not match with the panel schedule, a revised panel schedule is required.</i></p>	<p>Response 76: Contractor to provide cost of circuits as indicated on plans, revised panel schedules shall be issued with the conformed document set.</p>
<p><i>Question 77: DWG EX7.12.35 thru 39 VDGS circuits do not match the panel schedule, a revised panel schedule is required.</i></p>	<p>Response 77: Contractor to provide cost of circuits as indicated on plans, revised panel schedules shall be issued with the conformed document set.</p>
<p><i>Question 78: Reference drawing X8.00.25 and specification section 27 05 00. Please confirm who will furnish and install the Peerless SmartMount Back-to-Back Ceiling Mounts and Adjustable Drop Columns for the C25 displays per details A2 (Qty 1), A5 (Qty 12) & D4 (Qty 4) / X8.00.25.</i></p>	<p>Response 78: Mounts are F/I by the contractor.</p>
<p><i>Question 79: Sheet A0.31.00 shows 2" spray insulation and intumescent seal coating for EWS-02a. Various wall sections for EWS-02a (A6, A3, and A1/A3.13.01, A1 and A3/A3.13.02, A2/A3.13.07, A4/A3.13.09) show 1-½" polyisocyanurate insulation on 3-5/8" metal studs, with no intumescent coating indicated or listed in the finish scheduled for these locations. Please clarify if: a.) Spray insulation or polyisocyanurate insulation is to be used. Please include the desired thickness and/or R-value for the desired product. b.) Intumescent coatings are required at exterior wall system EWS-02a.</i></p>	<p>Response 79: Intent for Sprayfoam Insulation is for application where no drywall is present meeting an R-14 minimum as noted on A0.31.00. The Intumescent coating is required to encapsulate closed cell foam per FBC CH7 where exposed to interior. Where GWB on studs are shown, provide rigid insulation as noted. See revised EWS Legend issued in Addendum No. 09.</p>
<p><i>Question 80: Please clarify if the mockup requirements listed in various specification sections (03 30 00, 03 45 00, 04 22 00, 07 24 23, etc.) apply to this phase of work or if the adjacent existing construction can serve as the mockup for each scope.</i></p>	<p>Response 80: Mockup Requirements still apply for this phase. Owner reserves the right to eliminate any mockup requirements. Intent is to match the existing structure as much as possible.</p>
<p><i>Question 81: Are the PACs door schedule and VSS camera schedule for new devices to be installed or any of these device existing already?</i></p>	<p>Response 81: PACS and VSS scheduled elements are new to be installed.</p>
<p><i>Question 82: Sheet A0.31.00 indicates a custom form-liner and sand-blasted finish for the 6" architectural precast panels. Please clarify if the new precast panels for this project are to match the existing panels used on Phase 1, where no custom form-liner was required.</i></p>	<p>Response 82: Finishes and Materials to match existing P1 Construction subject to the Buy America requirement.</p>

<p><i>Question 83: Performance mock ups indicated under section 08 44 13 part 1.17 seem to be for STC Phase 1. Please confirm that performance mock-ups and testing of mock-ups will not be required for STC Phase 1X. If they are required for STC Phase 1X, please clarify requirements.</i></p>	<p>Response 83: See revised specification in Addendum No. 08.</p>
<p><i>Question 84: Provide quantity and locations of field testing for Phase 1X. The ones provided in section 08 44 13 part 3.4 appeared to be for STC Phase 1.</i></p>	<p>Response 84: See revised specification in Addendum No. 08.</p>
<p><i>Question 85: Airside concourse Phase 1 provided FAA approved 7460 Crane heights plan (see attached). Please provide approved crane heights for Phase 1X concourse scope of work.</i></p>	<p>Response 85: See STC Temp Construction Equipment Airspace Determinations drawing. The plan is to extend the same determinations through the P1X construction duration.</p>
<p><i>Question 86: Reference Specification Section 09 00 01-13 – Key Item STS1 – Synthetic Turf Surface – SARA references Spec. Section 32 18 13.A but 32 18 13.A is not provided. Please provide required specification for complete scope requirement.</i></p>	<p>Response 86: See added specification in Addendum No. 08</p>
<p><i>Question 87: Refer to E3.00.01 revised in addendum #6. This drawing added a new electrical room but is missing the panel schedule. Please provide.</i></p>	<p>Response 87: Panel schedule for the six (6) new panels are included in Addendum No. 09.</p>
<p><i>Question 88: Can we utilize part of the employee parking as a staging area for the sand blasting and prep of the steel? If so what is the maximum height of the crane we can utilize?</i></p>	<p>Response 88: Site Logistics Craft Parking Lot and Laydown Area located along Terminal C Service Road may be utilized. See STC Temp Construction Equipment Airspace Determinations to answer any questions on crane heights.</p>
<p><i>Question 89: Reference details A3, C3 & E3/A5.12.33. Please confirm that only four (4) of these are required as indicated on drawing A5.12.33</i></p>	<p>Response 89: Details Referenced are for WP3 corner Guards, Reference Floor Plans for locations and quantities. Plans A4.12.36 & A4.14.36 Modified to include all WP tags at Piers WP3 and WP1 for BOH (Included in Addendum No. 09)</p>
<p><i>Question 90: Refer to BP-S195 BID SCHEDULE provided in addendum 3. Item P-501-8.4: Raise Existing Structures to Grade, 10 EA. Please clarify what constitutes a structure? In other words, where are the Fire Hydrant, Water Valve and Storm and Sanitary Cleanout adjustments to be paid for?</i></p>	<p>Response 90: Item P-501-8.4: Raise Existing Structures to Grade quantity has been increase to 48 EA to include sanitary, storm and electrical manholes, cleanouts, valves, fire hydrants, etc. that extend through the P-501 PCC pavement (i.e. not sidewalks). Small handholes and pull boxes located in sidewalk pavement are incidental to the respective electrical/communication pay item.</p>

<p><i>Question 91: Exterior wall system SS-02 on sheet A0.31.00 indicates a layer of 07 41 50 Self-Adhering, High Temperature Underlayment between the glass-mat sheathing and stucco finish. Please clarify if this layer is to be the underlayment material specified in specification 07 41 50 (Aluminum Rain-Screen Wall and Soffit Panels) with SBS-modified asphalt, or if the air barrier product listed in specification 07 27 29 Air-Barrier Coatings is appropriate for this location where there are no metal panels.</i></p>	<p>Response 91: Air-barriers as specified 07 27 29 shall be used as indicated via reference in Div 06 sheathing sections applicable to this detail.</p>
<p><i>Question 92: Reference Drawings A0.14.01, A5.12.90 and Electrical and Fire Alarm Drawings for International Level. There are eight (8) stand-alone pylons scheduled for the International Level. One (1) contains FEC & AED & F/A Pull Station One (1) contains FEC & AED Four (4) contain FEC & F/A Pull Station One (1) contains FEC only One (1) contains AED only Currently there is no power/outlets shown at these pylon locations and no Fire Alarm for the AED's Please confirm Power and Fire Alarm requirements for each condition</i></p>	<p>Response 92: Provide Fire Alarm Monitor Module to supervise the local AED at all AED location referenced in question. Not all require Pull Stations, provide where indicated.</p>
<p><i>Question 93: Elevator Emergency power transfer signaling. Emergency power transfer to Generator feed signaling shall be coordinated from the emergency switchboards to each elevator control panel to indicate that the elevators are on emergency power and also to receive a pre-transfer signal. Please update the riser diagram to indicate the above-mentioned signals from the emergency switchboards by adding a hex note or a as a single line.</i></p>	<p>Response 93: See Hex Note #10 on Sheet E4.11.01.</p>
<p><i>Question 94: EXIT signs for BHS areas. No EXIT signs are shown along the baggage row and the baggage sortation. Please provide a revised ramp level drawing showing the necessary EXIT signs along the baggage area with all necessary power supply circuiting.</i></p>	<p>Response 94: Exit sign locations in baggage ROW are indicated on A0.11.01. Contractor to provide power on a life safety circuit for all exit sign locations shown. Final circuiting information will be shown on the electrical drawings in a future DSI for the successful bidder.</p>

<p><i>Question 95: ACR-CP Magnetic Starter. Please confirm that the water-cooled DX coil CIRCULATION PUMP ACR-CP requires a magnetic starter with HOA to operate either through the BMS and on manual mode please provide updated mechanical schedule sheet #2 M6.01.02.</i></p>	<p>Response 95: The DX coil circulation pump, ACR-CP, listed on M.01.02 shall be connected to a magnetic starter with HOA switch. Refer to Detail #10 on Dwg. M8.51.03 for remote on/off control and status monitoring via the magnetic starter. HOA switch is to provide manual override near the equipment. M6.01.02 has been updated to show starter requirements.</p>
<p><i>Question 96: Poke thru locations at passenger seating areas. Please confirm that the poke thru exact location at the transfer level hold rooms shall be coordinated with respect to FFE type and orientation, constructability due to building steel and equipment at ramp level ceiling.</i></p>	<p>Response 96: Confirmed. Contractor to coordinate exact poke through locations with respect to FFE type and orientation, constructability due to building steel, and equipment at ramp level ceiling.</p>
<p><i>Question 97: Weather Alert System WAS. DWG TA1.01.22 does not show the two WAS HPSA-PS in area 34 & area 37 please provide an updated drawing in accordance with RFI 2656 response issued back in July 14 2020 for P1X.</i></p>	<p>Response 97: No HPSA is provided in areas 34 or 37. They are only provided on PBBs, there are no PBBs in these areas. Please disregard any old RFI's as this is now a new separate project.</p>
<p><i>Question 98: Virtual Ramp Control VRC. Please confirm whether P1X requires an additional RU sled to be installed at the south wing roof, or RU-19 will cover the whole west wing and the south wing Ramp.</i></p>	<p>Response 98: Per SAAB: There are no additional cameras planned for the south extension, the camera array F4-6 is intended to provide coverage there.</p>
<p><i>Question 99: Please confirm that in order to maintain GOAA standards, an on-site dedicated Quality Control/Safety Manager with no other duties shall be included to assist in the quality control and safety requirements per the Contract Documents. Also, confirm that this Quality Control/Safety Manager shall be an employee of the Subcontractor.</i></p>	<p>Response 99: Confirmed that a dedicated, on-site QC/Safety Manager shall be included by the Contractor.</p>
<p><i>Question 100: Enlarged plan A1 on sheet A4.22.11 shows a G1 wall behind the toilets in the restrooms. Per A0.21.00, G1 walls only have gypsum board one side. The enlarged RCP A4 on sheet A4.22.11 shows a gypsum ceiling in the chase behind the G1 wall. Please clarify if the wall drawn as G1 is to be a G2 wall or if the ceiling in the restroom chase is to be removed.</i></p>	<p>Response 100: Ceiling is required for fire protection. Chase walls should be G2.</p>

<p><i>Question 101: The G1 walls that make up the (3) mechanical chases in front of each boarding pier (reference rooms 02.6051 and 02.6080 on sheet A1.12.35, 04.6048, 04.6075, and 04.6080 on sheet A1.14.35, typical for all boarding pier areas on transfer and IA level) are shown as non-rated walls. We believe these should be fire rated. Please confirm these should be G1. If not, please clarify. Also, if they are rated walls, confirm that the wall expansion joints that pass through the southernmost mechanical chase at each pier are or are to be fire rated.</i></p>	<p>Response 101: "Chases" are actually an unoccupiable space and have unrated partitions as fire separations occur at floor, note mechanical fire dampers shown on mechanical documents. This is a variance in approach from chases in the P1 construction. G1 partitions apply as shown.</p>
<p><i>Question 102: Textured plaster finish DF1 is not listed in the finish key and there is no product listed in specification 09 94 13. Please provide information for the materials to be used at the locations where 09 94 13 – Texture Plaster Finish is indicated on the drawings, or provide an alternate finish.</i></p>	<p>Response 102: DF1 finish is not in contract. Select details revised in Addendum No. 09. Where DF1 is indicated and not corrected by addendum shall receive P1 painting.</p>
<p><i>Question 103: Specification 09 83 16 Spray-Applied Acoustical Finish System is listed in the project manual but is not indicated on the drawings. Please confirm that this specification section is not applicable to this bid.</i></p>	<p>Response 103: Confirmed; there is no requirement for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 08.</p>
<p><i>Question 104: Specification 07 14 18 Fluid-Applied Waterproofing Deck is listed in the project manual but is not indicated on the drawings. Please confirm that this specification section is not applicable to this bid.</i></p>	<p>Response 104: Confirmed; there is no fluid-applied waterproofing deck for P1X. See Specification Table of Contents for Vols. 2-5 issued with Addendum No. 09.</p>
<p><i>Question 105: Please see M0.00.00 Note 22. For liquid filled pipe supported by hangers bellow the concrete deck. Please confirm the minimum size of pipe that will require additional structural steel be added to the deck.</i></p>	<p>Response 105: General Note 22 requires the contractor to submit load calculations of supports and hangers (regardless of the pipe size) to account for the building structural design for the Structural Engineer's review. Also refer to Specification 23 05 29 – Hangers and Supports for HVAC Piping and Equipment for all requirements. The following note on structural drawing XX has been added: "The contractor shall not attach or hang 8" diameter or larger piping from the composite floor deck, the piping shall be hung from the structural steel. The contractor shall provide any additional steel for the installation and support of the piping.</p>

<p><i>Question 106: 1) Will the glass required be as specified or to match existing? If existing , what was the coating used?</i></p> <p><i>2) Laminated glass warranty available is 5 years not 10 specified 074413.1.19.D.4. Will this be acceptable?</i></p> <p><i>3) Will the Kynar finish paint be selected to match existing? If yes what was the previous color code selected</i></p>	<p>Response 106: All finishes and materials are to match existing subject to the Buy America requirement.</p> <p>1) Refer to specifications for requirements on glazing.</p> <p>2) Basis of Design manufacturer provides a 10-year warranty.</p> <p>3) Duranar Cement White; UV coating for exterior installations.</p>
<p><i>Question 107: Columns at intersections D4-Y29, D4-Y30, and D8-Y31 per A1.12.37 are shown without metal column don't require a metal column cover or partition enclosure.</i></p>	<p>Response 107: D4-Y29 and Y30 are within concession spaces. Wrap will be by concessionaire. D8-Y31 requires a half round column cover Type C3.</p>
<p><i>Question 108: Please advise if a standalone mockup is required for the column cover bid package and specifications 01 43 39, 05 58 13. Previous mockups are already in place and approved.</i></p>	<p>Response 108: Confirmed, mockups are required for this project.</p>
<p><i>Question 109: Please advise if a standalone mockup is required for the ornamental metals bid package and specifications 01 43 39, 05 73 00, 05 73 13, and 05 75 00. Previous mockups are already in place and approved.</i></p>	<p>Response 109: Confirmed, mockups are required for this project.</p>
<p><i>Question 110: Please advise if a standalone mockup is required for the millwork bid package and specifications 01 43 39, 06 41 16, 06 42 16, and 12 36 61.19. Previous mockups are already in place and approved.</i></p>	<p>Response 110: Confirmed, mockups are required for this project.</p>

TABLE OF CONTENTS – 00 01 00
VOLUME 1 OF 5

Division	Section Title	Issue Date	Rev. Date
----------	---------------	------------	-----------

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS (see Vol. 1)

00 01 00	Table of Contents – Vols. 2-5	07/22/22	07/28/22
----------	-------------------------------	----------	--------------------------

DIVISION 01 – GENERAL REQUIREMENTS (see Vol. 1)

VOLUME 2 OF 5

Division	Section Title	Issue Date	Rev. Date
DIVISION 02 - EXISTING CONDITIONS			
02 41 19	Selective Demolition	06/17/22	
DIVISION 03 - CONCRETE			
03 15 13	Waterstops	06/17/22	
03 30 00	Cast-In-Place Concrete	06/17/22	
03 45 00	Precast Architectural Concrete	06/17/22	
DIVISION 04 - MASONRY			
04 22 00	Concrete Unit Masonry	06/17/22	07/22/22
DIVISION 05 - METALS			
05 12 00	Structural Steel Framing	06/17/22	
05 21 00	Steel Joist Framing	06/17/22	
05 31 00	Steel Decking	06/17/22	
05 40 00	Cold-Formed Metal Framing	06/17/22	
05 50 00	Metal Fabrications	06/17/22	
05 51 13	Metal Pan Stairs	06/17/22	
05 52 13	Pipe and Tube Railings	06/17/22	
05 58 13	Column Covers	06/17/22	
05 71 00	Decorative Metal Stairs	06/17/22	
05 73 13	Glazed Decorative Metal Railings	06/17/22	
05 75 00	Decorative Formed Metal	06/17/22	
DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES			
06 10 00	Rough Carpentry	06/17/22	
06 16 00	Sheathing	06/17/22	
06 41 16	Plastic-Laminate-Faced Architectural Cabinets	06/17/22	
06 64 00	Plastic Paneling	06/17/22	
DIVISION 07 - THERMAL AND MOISTURE PROTECTION			
07 13 26	Self-Adhering Sheet Waterproofing	06/17/22	
07 14 18	Fluid-Applied Waterproofing Deck System	06/17/22	

Division	Section Title	Issue Date	Rev. Date
07 16 13	Polymer Modified Cement Waterproofing	06/17/22	
07 18 00	Traffic Coatings	06/17/22	
07 19 00	Water Repellents	06/17/22	
07 21 00	Thermal Insulation	06/17/22	
07 21 19	Foamed-In-Place Insulation	06/17/22	
07 24 23	Direct-Applied Finish System	06/17/22	
07 27 29	Air-Barrier Coatings	06/17/22	
07 41 50	Aluminum Rain-Screen Wall and Soffit Panels	06/17/22	
07 42 10	Continuous Insulation with Composite Framing Support System	06/17/22	
07 42 13.13	Formed Metal Wall Panels	06/17/22	
07 42 13.19	Insulated Metal Wall Panels	06/17/22	
07 42 13.23	Metal Composite Material Wall Panels	06/17/22	
07 42 93	Soffit Panels	06/17/22	
07 52 00	SBS Modified Bituminous Membrane Roofing	06/17/22	
07 62 00	Sheet Metal Flashing and Trim	06/17/22	
07 71 29	Manufactured Roof Expansion Joints	06/17/22	
07 72 00	Roof Accessories	06/17/22	
07 81 00	Applied Fireproofing	06/17/22	
07 81 23	Intumescent Fireproofing	06/17/22	
07 84 13	Penetration Firestopping	06/17/22	
07 84 43	Joint Firestopping	06/17/22	
07 92 00	Joint Sealants	06/17/22	
07 92 19	Acoustical Joint Sealants	06/17/22	
07 95 13.13	Interior Expansion Joint Cover Assemblies	06/17/22	
07 95 13.16	Exterior Expansion Joint Cover Assemblies	06/17/22	
DIVISION 08 - OPENINGS			
08 11 13	Hollow Metal Doors and Frames	06/17/22	
08 31 13	Access Doors and Frames	06/17/22	
08 33 23	Overhead Coiling Doors	06/17/22	
08 34 73.13	Metal Sound Control Door Assemblies	06/17/22	
08 41 13	Aluminum-Framed Entrances and Storefronts	06/17/22	
08 41 20	Structural Glass Fin Wall	06/17/22	
08 41 26	All-Glass Interior Storefronts	06/17/22	
08 42 29.23	Sliding Automatic Entrances	06/17/22	
08 44 13	Glazed Curtain Walls	06/17/22	07/22/22
08 65 30	Sound Control Windows	06/17/22	
08 71 00	Door Hardware	06/17/22	07/28/22

Division	Section Title	Issue Date	Rev. Date
08 71 13	Automatic Door Operators	06/17/22	
08 80 00	Glazing	06/17/22	
08 81 13	Decorative Glass Glazing	06/17/22	
08 91 19	Fixed Louvers	06/17/22	

DIVISION 09 – FINISHES

09 00 01	Finish Key	06/17/22	
09 21 16.23	Gypsum Board Shaft Wall Assemblies	06/17/22	
09 22 16	Non-Structural Metal Framing	06/17/22	
09 24 00	Cement Plastering	06/17/22	
09 29 00	Gypsum Board	06/17/22	
09 30 13	Ceramic Tiling	06/17/22	
09 30 23	Glass Tiling	06/17/22	
09 51 13	Acoustical Panel Ceilings	06/17/22	
09 51 33	Acoustical Metal Pan Ceilings	06/17/22	
09 65 13	Resilient Base and Accessories	06/17/22	
09 65 19	Resilient Tile Flooring	06/17/22	
09 65 36	Static-Control Resilient Flooring	06/17/22	
09 66 23	Resinous Matrix Terrazzo Flooring	06/17/22	
09 67 23	Resinous Flooring	06/17/22	
09 68 13	Tile Carpeting	06/17/22	
09 68 16	Sheet Carpeting	06/17/22	
09 75 13	Stone Wall Facing	06/17/22	
09 84 00	Metal Wall Systems	06/17/22	
09 91 13	Exterior Painting	06/17/22	
09 91 23	Interior Painting	06/17/22	
09 96 00	High-Performance Coatings	06/17/22	

VOLUME 3 OF 5

Division	Section Title	Issue Date	Rev. Date
DIVISION 10 - SPECIALTIES			
10 14 00	Wayfinding Signage	06/17/22	
10 21 13	Solid Surface Toilet Compartments	06/17/22	
10 22 13	Wire Mesh Partitions	06/17/22	
10 26 00	Wall and Door Protection	06/17/22	
10 28 00	Toilet, Bath and Laundry Accessories	06/17/22	
10 43 13	Defibrillator Cabinets	06/17/22	
10 44 13	Fire Protection Cabinets	06/17/22	
10 44 16	Fire Extinguishers	06/17/22	
DIVISION 11 - EQUIPMENT			
11 81 29	Horizontal Fall Protection	06/17/22	
DIVISION 12 - FURNISHINGS			
12 36 23.13	Plastic-Laminate-Clad Countertops	06/17/22	
12 36 61.16	Solid Surfacing Countertops	06/17/22	
12 36 61.19	Quartz Agglomerate Countertops	06/17/22	
DIVISION 14 - CONVEYING EQUIPMENT			
14 00 00	Elevator, Escalator Maintenance and Repair	06/17/22	
14 00 00C	Attachment C	06/17/22	
14 21 00	Traction Elevators	06/17/22	
14 31 00	Escalators	06/17/22	
DIVISION 21 - FIRE SUPPRESSION			
21 05 17	Sleeves and Sleeve Seals for Fire-Suppression Piping	06/17/22	
21 12 00	Fire-Suppression Standpipes	06/17/22	
21 13 13	Wet-Pipe Sprinkler Systems	06/17/22	
21 13 16	Dry-Pipe Sprinkler Systems	06/17/22	

VOLUME 4 OF 5

Division	Section Title	Issue Date	Rev. Date
DIVISION 22 - PLUMBING			
22 05 00	Common Work Results for Plumbing	06/17/22	
22 05 13	Common Motor Requirements for Plumbing Equipment	06/17/22	
22 05 16	Expansion Fittings and Loops for Plumbing Piping	06/17/22	
22 05 19	Meters and Gages for Plumbing Piping	06/17/22	
22 05 23	General-Duty Valves for Plumbing Piping	06/17/22	
22 05 29	Hangers and Supports for Plumbing Piping and Equipment	06/17/22	
22 05 48	Vibration Controls for Plumbing Piping and Equipment	06/17/22	
22 05 53	Identification for Plumbing Piping and Equipment	06/17/22	
22 07 00	Plumbing Insulation	06/17/22	
22 11 16	Domestic Water Piping	06/17/22	
22 11 19	Domestic Water Piping Specialties	06/17/22	
22 11 23	Domestic Water Pumps	06/17/22	
22 13 16	Sanitary Waste and Vent Piping	06/17/22	
22 13 19	Sanitary Waste Piping Specialties	06/17/22	
22 13 23	Stormwater Wet Well	06/17/22	
22 13 29.01	Storm Sewerage Pumps 1750 RPM	06/17/22	
22 13 29.02	Storm Sewerage Pumps 1600 RPM	06/17/22	
22 13 29.03	Storm Sewerage Pumps Controllers	06/17/22	
22 14 13	Facility Storm Drainage Piping	06/17/22	
22 14 23	Storm Drainage Piping Specialties	06/17/22	
22 14 29	Sump Pumps	06/17/22	
22 33 00	Electric Domestic Water Heaters	06/17/22	
22 37 00	Potable Water Cabinet	06/17/22	
22 40 00	Plumbing Fixtures	06/17/22	
22 47 00	Drinking Fountains and Water Coolers	06/17/22	
22 70 00	Natural Fuel Gas Systems - Plumbing	06/17/22	
23 34 13	Axial HVAC Fans	06/17/22	
23 34 16	Centrifugal HVAC Fans	06/17/22	
23 34 23	HVAC Power Ventilators	06/17/22	
23 34 33	Air Curtains	06/17/22	
23 36 00	Air Terminal Units	06/17/22	
23 37 13	Diffusers, Registers, And Grilles	06/17/22	
23 41 00	Particulate Air Filtration	06/17/22	
23 72 00	Air to Air Energy Recovery Unit	06/17/22	
23 73 13	Modular Indoor Central Station Air Handling Units	06/17/22	

Division	Section Title	Issue Date	Rev. Date
23 74 33	Dedicated Outdoor Air Units	06/17/22	
23 81 23	Computer Room Air Conditioners	06/17/22	
23 81 26	Split System Air Conditioners	06/17/22	
23 82 16	Air Coils	06/17/22	
23 82 19	Fan Coil Units	06/17/22	
23 82 39	Unit Heaters	06/17/22	
23 90 00	Pre-Conditioned Air Units and Specialties	06/17/22	

VOLUME 5 OF 5

Division	Section Title	Issue Date	Rev. Date
DIVISION 26 - ELECTRICAL			
26 01 00	Operation and Maintenance Manuals	06/17/22	
26 01 03	Minor Electrical Demolition for Remodeling	06/17/22	
26 01 05	Investigation of Existing Electrical Systems	06/17/22	
26 05 00	Common Work Results for Electrical	06/17/22	
26 05 10	Electrical Symbols	06/17/22	
26 05 19	Building Wire and Cable	06/17/22	
26 05 26	Grounding and Bonding	06/17/22	
26 05 29	Hangers and Supports	06/17/22	
26 05 33	Conduit	06/17/22	
26 05 34	Outlet Boxes	06/17/22	
26 05 35	Pull and Junction Boxes	06/17/22	
26 05 53	Identification for Electrical Systems	06/17/22	
26 05 73	Power Systems Study with Arc Flash Analysis	06/17/22	
26 05 83	Wiring Devices	06/17/22	
26 07 17	SCADA Monitoring and Control	06/17/22	
26 08 03	Demonstration of Completed Electrical Systems	06/17/22	
26 08 13	Tests and Performance Verification	06/17/22	
26 09 24	Architectural Lighting Controls for Public Spaces	06/17/22	
26 09 24A	Architectural Lighting Controls for Public Spaces – Appendix A	06/17/22	
26 09 24B	Architectural Lighting Controls for Public Spaces – Appendix B	06/17/22	
26 12 19	Oil-Filled Pad Mounted Transformers	06/17/22	
26 22 13	Dry Type Transformers	06/17/22	
26 23 00	Low Voltage Transfer Switchgear	06/17/22	
26 24 13	Switchboards – Draw Out	06/17/22	
26 24 16	Panelboards	06/17/22	
26 24 17	Distribution Panelboards	06/17/22	
26 25 00	Busway – Low Voltage	06/17/22	
26 27 13	Electrical Metering and Monitoring System	06/17/22	
26 27 16	Electrical Cabinets and Enclosures	06/17/22	
26 28 16	Enclosed Switches and Circuit Breakers	06/17/22	
26 33 53	Static Uninterruptible Power Supply	06/17/22	
26 36 16	Maintenance Bypass Switches	06/17/22	
26 36 23	Automatic Transfer Switches	06/17/22	

Division	Section Title	Issue Date	Rev. Date
26 41 13	Lightning Protection System	06/17/22	
26 43 00	Surge Protective Devices	06/17/22	
26 50 10	Architectural Lighting Fixtures, Lamps, Ballasts for Public Spaces	06/17/22	
26 51 00	Interior Lighting – Back of House	06/17/22	
26 61 00	400Hz Frequency Converters	06/17/22	
DIVISION 27 - COMMUNICATIONS			
27 05 00	Common Work Elements for Communications	06/17/22	
27 10 00	Premise Distribution Systems	06/17/22	
	Attachment 0: General Labeling Guidelines		
	Attachment 1: Work Area Telecommunications Outlet		
	Attachment 2: Labeling Backbone Fiber Optic Cables		
27 10 05	Passive Optical Network	06/17/22	
27 10 10	Voice Over IP Telephone System	06/17/22	
27 10 15	Wireless Local Area Network System	06/17/22	
27 10 20	Visual Docking Guidance System	06/17/22	
27 20 00	Common Use Systems	06/17/22	
27 24 00	Electronic Gate Systems	06/17/22	
27 41 33	IP Master Antenna Television System	06/17/22	
27 42 20	Electronic Dynamic Signage System	06/17/22	
27 51 13	Emergency Communication System	06/17/22	
27 53 10	Distributed Antenna System – Cellular	06/17/22	
27 53 20	Distributed Antenna System – Public Safety 800MHz and Facilities Radio 460 MHz	06/17/22	
DIVISION 28 - ELECTRONIC SAFETY AND SECURITY			
28 05 00	Common Work Elements For ESS	06/17/22	
28 08 00	Commissioning of Life Safety and Security Systems	06/17/22	
28 13 00	Physical Access Control System (SSI)	06/17/22	
28 23 00	Video Surveillance System (SSI)	06/17/22	
28 31 00	Addressable Fire Detection and Alarm	06/17/22	
DIVISION 31 - EARTHWORK			
NOT USED			

Division	Section Title	Issue Date	Rev. Date
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DIVISION 32 - EXTERIOR IMPROVEMENTS

NOT USED

DIVISION 33 – UTILITIES

NOT USED

DIVISION 34 – TRANSPORTATION

32 18 13	Synthetic Turf Surfacing	07/22/22
34 77 13	Passenger Boarding Bridges	06/17/22

SPECIFICATION ISSUE KEY

Issue Date:	Rev. #	Issue Title:
July 22, 2022	0	Addendum No. 8
<u>July 28, 2022</u>	1	<u>Addendum No. 9</u>

** Documents not Issued – Voided Deliverable

REVISIONS:

Rev. # column represents the sequence in which the specifications, whole or in part, were issued.

Blue and Underlined are new, revised, or edited sections in this issue.

~~Strikethrough~~ for sections deleted in this issue.

END OF TABLE OF CONTENTS

SECTION 08 71 00 - DOOR HARDWARE

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Intent: The intent of this Section is to provide finish hardware for the proper operation and control of all wood, hollow metal, and aluminum doors in the Project. Prior to bidding, notify the Architect of any doors that do not have hardware meeting this intention.
- B. This Section includes, but is not necessarily limited to furnishing and installing complete, the following:
 - 1. Finish hardware for proper operation, function, control and protection of all doors, as required.
- C. Related Sections:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames"
 - 2. Section 08 11 19 "Stainless Steel Doors and Frames"
 - 3. Section 08 33 23 "Overhead Coiling Doors"
 - 4. Section 08 33 26 "Overhead Coiling Grilles"
 - 5. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts"
 - 6. Division 28 Physical Access Control System Section

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Extended Producer Responsibility
 - 2. Product Certificates: Provide the following:
 - a. Environmental Product Declarations (EPD's)
 - b. Corporate Sustainability Reporting (CSR's)
- C. Other Action Submittals:
 - 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with

doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

- a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - c. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Fastenings and other pertinent information.
 - 5) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 6) Mounting locations for door hardware.
 - 7) List of related door devices specified in other Sections for each door and frame.
2. Wiring Diagrams: For electrified hardware items specified for this Project, Provide complete wiring diagrams along with riser drawings and elevations, showing locations where such material is to be installed. Wiring Diagrams shall be submitted with Hardware Schedule. Verify and coordinate with the electrical systems installer.
- a. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Architectural Hardware Consultant.
- B. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- C. Warranty: Special warranty specified in this Section.
- D. Florida Building Code: Provide Miami-Dade Notice of Authorization (NOA) if required by authority having jurisdiction. Engineering Reports that opening meet requirement for wind load, water infiltration and impact as required in FBC.

1.5 CLOSEOUT SUBMITTALS

- A. Operations and Maintenance Data: Provide two copies in accordance with Division 01 and include:
1. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 2. Catalog pages for each product.
 3. Name, address, and phone number of local representative for each manufacturer.
 4. Parts list for each product. Final approved hardware schedule, edited to reflect conditions as-installed.
 5. Final keying schedule
 6. Copies of floor plans with keying nomenclature
 7. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
 8. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
 9. Any specialized tools needed to maintain the hardware.

1.6 QUALITY ASSURANCE

- A. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
1. For door hardware, an Architectural Hardware Consultant (AHC).
- B. Source Limitations: Obtain each type of door hardware from a single manufacturer.
- C. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in 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 252 or UL 10C, unless otherwise indicated.
- D. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.
- E. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- F. Accessibility Requirements: For door hardware on doors in an accessible route, comply with [the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.
1. Provide operating devices 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. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.

- b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- G. Keying Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." In addition to Owner, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 1. Requirements for keyways provided in permanent cores.
 2. Requirements for access control.
 3. Address and schedule for delivery of permanent cores.
- H. Preinstallation Conference: Conduct conference at Project site.
 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Inspect and discuss preparatory work performed by other trades.
 3. Review sequence of operation for each type of electrified door hardware.
 4. Review required testing, inspecting, and certifying procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.8 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
 - a. Exit Devices: Three years from date of Substantial Completion.
 - b. Locksets: Five years from date of Substantial Completion.
 - c. Manual Closers: 10 years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.
1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
 2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. IVES Hardware.
 - b. Hager.
 - c. Bommer Industries, Inc.
 2. Requirements:
 - a. Exterior out-swinging door butts shall be stainless steel and shall have stainless steel hinge pins. All doors to have non-rising pins.
 - b. Hinges shall be sized in accordance with the following:
 - 1) Height:
 - a) Doors up to 41" wide: 4-1/2" inches.
 - b) Doors 42" to 48" wide: 5 inches.
 - c. Width: Sufficient to clear frame and trim when door swings 180 degrees.
 - d. Number of Hinges: Furnish 3 hinges per leaf to 7'-6" in height. Add one hinge for each additional 30 inches of height.

2.3 CONTINUOUS HINGES

- A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
1. IVES Hardware.
 2. Markar.
 3. Pemko.
- B. Requirements:
1. Aluminum Geared
 - a. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
 - b. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.

2.4 ELECTRIC POWER TRANSFERS

- A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
1. Von Duprin EPT.
 2. Securitron CEPT
- B. Requirements:
1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.
 2. Power transfer hinges are not allowed.

2.5 PIVOTS

- A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
 - 1. IVES Hardware.
 - 2. Rixson.
 - 3. Dorma.
- B. Requirements:
 - 1. Provide pivot sets complete with oil-impregnated top pivot, unless indicated otherwise.
 - 2. Where offset pivots are specified, Provide one intermediate pivot for doors less than 91 inches (2311 mm) high and one additional intermediate pivot per leaf for each additional 30 inches (762 mm) in height or fraction thereof. Intermediate pivots spaced equally not less than 25 inches (635 mm) or not more than 35 inches (889 mm) on center, for doors over 121 inches (3073 mm) high.
 - 3. Provide appropriate model where pivot sets are scheduled at fire rated openings.

2.6 FLUSH BOLTS

- A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
 - 1. Ives Hardware.
 - 2. Burns.
 - 3. Rockwood.
- B. Requirements:
 - 1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch steel or brass rods at doors up to 90 inches in height. For doors over 90 inches in height increase top rods by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.

2.7 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
- C. Lock Backset: 2-3/4 inches, unless otherwise indicated.
- D. Lock Trim:
 - 1. Operating Device: Lever with 2 1/8" diameter roses.
 - 2. All inside thumb pieces are to have ADA thumbturns.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
- F. Electronic Options: Provide electronic locks where specified. Electronic locks are to incorporate a request to exit switch (REX) in the lever.
- G. Mortise Locks: BHMA A156.13; Grade 1; stamped steel case with steel or brass parts; Series 1000.
1. Manufacturers: Subject to compliance with requirements provide products by one of the following:
 - a. Corbin Russwin ML2000 Series; an ASSA Abloy company.
 - b. Marks Series 5; a Marks USA company.

2.8 COMBINATION LOCKS

- A. Lock Functions: As indicated in door hardware schedule.
- B. Rim Device: FF-L-2890 compliant.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. LOCKMASTERS, INC.
 2. No Substitutions – Owner Standard.

2.9 ELECTRONIC STRIKES

- A. Provide electric strikes designed for use with type of locks shown at each opening.
- B. Where required, provide electric strikes UL Listed for fire doors and frames.
- C. Provide fail-secure type electric strikes, unless specified otherwise.
- D. Coordinate voltage and provide transformers and rectifiers for each strike as required.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. HES 8500 Series; an ASSA Abloy Company.

2.10 MAGNETIC LOCKS

- A. Surface Magnetic Locks: ANSI/BHMA A156.23.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Schlage Electronics; an Allegion company.
 - b. Securitron; an ASSA Abloy Company.
- B. Magnetic locks to include minimum holding force of 1200 LBF. Provide magnetic locks equipped with SPDT Magnetic Bond Sensing device, where specified, to monitor whether sufficient magnetic holding force exists to ensure adequate locking and SPDT Door Status Monitor device, where specified, to monitor whether door is open or closed. Provide bond sensors fully concealed within electromagnet to resist tampering or damage.

- C. Provide fasteners, mounting brackets, and spacer bars required for mounting and details.
- D. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of magnetic locks for each individual leaf. Switches control both doors simultaneously at pairs. Locate controls as directed by Architect.

2.11 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Von Duprin 35A/98 Series; an Allegion company.
 - b. No Substitutions – Owner Standard.
 - 2. Additional Requirements:
 - a. Strikes: Rim and surface vertical rods are to be provided with roller strikes. Devices without roller strikes will not be acceptable. Provide manufacturers standard strike for concealed vertical rod devices.
 - b. Touchpad is to extend minimum of one half of door width, but not the full length of exit device rail.
 - c. Provide flush, tapered end-cap with two-point attachment to door.
 - d. All non-rated exit devices on exterior doors shall incorporate cylinder dogging. Exit devices with access control are to be supplied less dogging.
 - e. Thru-bolting is not recommended provided the door is specified with proper reinforcement to accept surface mounted exit device.
 - f. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrical requirements.
 - g. Where lever trim is provided it is to be break-away type.
 - h. Provide electrical options as scheduled.

2.12 LOCK CYLINDERS

- A. Lock Cylinders: BHMA A156.5; Grade 1. Tumbler type, constructed from brass or bronze.
 - 1. **Permanent** Cylinders and cores are to be furnished and supplied into the Owner's existing Corbin Russwin large format 6 pin removable core key system with L4 keyway.
 - 2. O-bitted cores are to be provided to the Owner for keying.
 - 3. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - a. 12 construction change (day) keys.

2.13 KEYING

- A. Keying System:
 - 1. Owner will perform keying of lock and cylinders.
 - 2. Stamping: Permanently inscribe each key with a visual key control number and include the following notation: "DO NOT DUPLICATE."

- B. Quantity: In addition to one extra key blank for each lock, provide the following:
1. Cylinder Change Keys: Three.
 2. Permanent Control Keys: Three.
 3. Interchagable Core Construction Keys: Twelve.

2.14 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; brass or stainless steel, unless otherwise 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. IVES Hardware; an Allegion company.
 - b. Rockwood Manufacturing Company.
 - c. Trimco.

2.15 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Provide bar type coordinating devices surface applied to the underside of the stop at the frame head.
1. Coordinators to be prime coat to receive same finish paint as the door frame.
 2. Provide filler bar of the correct length to span the entire width of the opening. Provide appropriate brackets for parallel arm closers and surface vertical rod panics.
- B. Astragals: BHMA A156.22.

2.16 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Parallel arm closers to have forged steel forearms. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. LCN 4040XP Series; an Allegion company.
 - b. No Substitutions – Owner Standard.
 2. Additional requirements:
 - a. All Closers UL Certified to be in compliance with UBC 7.2 and UL 10C.
 - b. Door closer cylinders shall be of high strength cast construction to provide low wear operating capabilities of internal parts throughout the life of the installation.
 - c. Door closers shall incorporate tamper resistant non-critical screw valves of V-slot design to reduce possible clogging from particles within the closer. Closers shall have separate and independent screw valve adjustments for latch speed, general speed, and hydraulic backcheck. Backcheck shall be properly located so as to effectively slow the swing

- of the door at a minimum of 10 degrees in advance of the dead stop location to protect the door frame and hardware from damage.
- d. Closers with pressure relief values will not be acceptable.
- e. Closer cylinders, arms, adapter plates, and metal covers shall have a powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117.
- f. Coordinate closer installation with overhead stop where required, provide special templates if required by manufacturer.
- g. Provide brackets or plates required for proper Installation of door closers.

2.17 Automatic operators

A. Low energy automatic operators: BHMA A156.19.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. LCN Senior Swing
 - b. Horton 4000LE Series.
2. Requirements:
 - a. Provide low energy automatic operator electro mechanical units complying with ANSI A156.19.
 - b. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.
 - c. Provide drop plates, brackets, or adapters for arms as required for details.
 - d. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
 - e. Provide units with inputs for smoke evacuation doors, where specified, which allow doors to power open upon fire alarm activation and hold open indefinitely or until fire alarm is reset, presence detector input, which prevents closed door from opening or door that is fully opened from closing, hold open toggle input, which allows remote activation for indefinite hold open and close second time input is activated, vestibule inputs, which allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.18 DOOR STOPS

- ### A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. IVES Hardware; an Allegion company.
 2. Rockwood Manufacturing Company.
 3. Trimco.

- B. Provide wall stops wherever possible. Provide convex type.
- C. Provide floor stops only where specified.

2.19 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

- A. Manufacturers:
 - 1. Glynn-Johnson
 - 2. Rixson
- B. Requirements:
 - 1. Provide heavy duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop.
 - 2. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.20 Door Gasketing

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. National Guard Products.
 - b. Zero Manufacturing.
 - c. Reese Weatherstripping

2.21 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. National Guard Products.
 - b. Zero Manufacturing.
 - c. Reese Weatherstripping

2.22 SILENCERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. IVES Hardware; an Allegion company.
 - 2. Rockwood Manufacturing Company.
 - 3. Trimco.
- B. Requirements:
 - 1. Provide "push-in" type silencers for hollow metal or wood frames.

2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified

2.23 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch-thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. IVES Hardware; an Allegion company.
 - b. Rockwood Manufacturing Company.
 - c. Trimco.
 2. Additional Requirements:
 - a. All protective plates are to be beveled on all four edges and have countersunk screw holes.

2.24 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.
 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. IVES Hardware; an Ingersoll-Rand company.
 - b. Rockwood Manufacturing; an ASSA Abloy company.
 - c. Trimco.

2.25 DOOR POSITION SWITCHES

- 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. Sentrol 2700 Series High Security Concealed Magnetic Contacts.
- B. Requirements:
 1. Provide surface mount switches on secure side of door.

2.26 POCKET DOOR 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. Brio; an Allegion company.

2.27 FABRICATION

- A. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

- B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
 3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
 5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.28 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. **Contractor** will replace construction cores with permanent cores after acceptance **and core configuration by Owner.**
- E. Thresholds: Set thresholds for doors indicated in full bed of sealant complying with requirements specified in Section 07 92 00 "Joint Sealants."
- F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- H. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

- A. Contractor to instruct owner's personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.7 DOOR HARDWARE SCHEDULE

- A. The hardware sets listed below represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process.

HARDWARE SET: EAC-01
NOT USED:

HARDWARE SET: EAC-02
NOT USED:

HARDWARE SET: EAC-03
NOT USED:

HARDWARE SET: EAC-03A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PIVOT SET	7215 SET	626	IVE
2	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	RX-HH-98-L-E996-06-FSE-CON	630	VON
1	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
	EA	SURFACE CLOSER	4040 EDA SRI	689	LCN
1	EA	CUSH SHOE SUPPORT	SRI 4040-30	689	LCN
1	EA	BLADE STOP SPACER	SRI 4040-61	689	LCN
1	EA	FIRE/LIFE HOLDER	SEM 7820	689	LCN
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
2	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL
PROVIDER
POWER SUPPLY BY ACCESS
CONTROL PROVIDER
WEATHERSTRIP/ASTRAGAL BY DOOR
SUPPLIER

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ENTRY VIA VALID CARD READ. PANICS MAY BE DOGGED (MADE PUSH/PULL) ELECTRONICALLY OR VIA KEYSWITCH. ALWAYS FREE FOR EGRESS.

HARDWARE SET: EAC-04

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	PIVOT SET	7215 SET	626	IVE
4	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954	689	VON
1	EA	DELAYED PANIC HARDWARE	HH-98-EO-SNB-CON	630	VON
1	EA	ELEC DELAYED PANIC HARDWARE	HH-98-L-E996-03 SS-FSE-630-CON	630/630	VON
3	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	CUSH SHOE SUPPORT	4040-30	689	LCN
2	EA	BLADE STOP SPACER	4040-61	689	LCN

1	EA	MULLION SEAL	8780N	N	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL
PROVIDER
POWER SUPPLY BY ACCESS
CONTROL PROVIDER
WEATHERSTRIP/ASTRAGAL BY DOOR
SUPPLIER

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. VALID CARD READ
ALLOWS ENTRY FROM PULL SIDE. WITHOUT VALID CARD READ ALARM WILL SOUND WHEN
PUSH PAD IS DEPRESSED.

HARDWARE SET: EAC-04A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	PIVOT SET	7215 SET	626	IVE
4	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
2	EA	DELAYED PANIC HARDWARE	CX-HH-3547A-EO	626	VON
2	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	CUSH SHOE SUPPORT	4040-30	689	LCN
2	EA	BLADE STOP SPACER	4040-61	689	LCN
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
1	EA		POWER SUPPLY BY ACCESS CONTROL PROVIDER		
	EA	NOTE	WEATHERSTRIP/ASTRAGAL BY DOOR SUPPLIER		

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED, EXIT ONLY. ALARM
WILL SOUND WHEN PUSH PAD IS DEPRESSED, THE DEVICE WILL PREVENT EGRESS FOR 15
SECONDS OR LESS. DEVICE WILL DISARM IMMEDIATELY UPON FIRE ALARM. ALARM MUST
RESET AT THE OPENING.

DPS WHEN REQUIRED BY DIVISION 28.

HARDWARE SET: EAC-04B
NOT USED:

HARDWARE SET: EAC-05
NOT USED:

HARDWARE SET: EAC-07
NOT USED:

HARDWARE SET: EAC-08
NOT USED:

HARDWARE SET: EAC-09

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PIVOT SET	7215 SET	626	IVE
2	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
<u>1</u>	<u>EA</u>	<u>POWER TRANSFER</u>	<u>EPT10</u>	<u>689</u>	<u>VON</u>
4	EA	STOREROOM LOCK	ML2057 LWM CT6R	630	C-R
<u>1</u>	<u>EA</u>	<u>FAIL SECURE EL LOCK</u>	<u>ML20906 LWM SEC M92 CT6R</u>	<u>630</u>	<u>C-R</u>
<u>1</u>	<u>EA</u>	<u>PERMANENT CORE</u>	<u>8000</u>	<u>626</u>	<u>C-R</u>
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	CUSH SHOE SUPPORT	4040-30	689	LCN
1	EA	BLADE STOP SPACER	4040-61	689	LCN
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
<u>1</u>			<u>CARD READER BY ACCESS CONTROL PROVIDER</u>		
<u>1</u>	<u>EA</u>		<u>POWER SUPPLY BY ACCESS CONTROL PROVIDER</u>		
	EA	NOTE	WEATHERSTRIP/ASTRAGAL BY DOOR SUPPLIER		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ALWAYS FREE FOR EGRESS FROM ROOF.

HARDWARE SET: EAM-01
NOT USED:

HARDWARE SET: EAM-02

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	PIVOT SET	7215 SET	626	IVE
4	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
2	EA	PANIC HARDWARE	HH-LD-9847-L-SNB	630	VON
2	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
2	EA	90 DEG OFFSET PULL	8190HD 12" O	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	CUSH SHOE SUPPORT	4040-30	689	LCN
2	EA	BLADE STOP SPACER	4040-61	689	LCN
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
	EA	NOTE	WEATHERSTRIP/ASTRAGAL BY DOOR SUPPLIER		

HARDWARE SET: EAM-03

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	PIVOT SET	7215 SET	626	IVE
4	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
2	EA	ELEC PANIC HARDWARE	HH-LD-9847-L-SNB-CON	630	VON
2	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	CUSH SHOE SUPPORT	4040-30	689	LCN
2	EA	BLADE STOP SPACER	4040-61	689	LCN
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
2	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
	EA	NOTE	WEATHERSTRIP/ASTRAGAL BY DOOR SUPPLIER CARD READER BY ACCESS CONTROL PROVIDER. POWER SUPPLY BY ACCESS CONTROL PROVIDER.		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. VALID CARD READER ALLOWS ENTRY FROM PULL SIDE. ALWAYS FREE EGRESS.

HARDWARE SET: EAM-04

NOT USED:

HARDWARE SET: EAM-05
NOT USED:

HARDWARE SET: EAM-06
NOT USED:

HARDWARE SET: EHC-01

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED FIRE RATED REMOVABLE MULLION	KR9954	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	LX-RX-HH-98-EO-F-SNB-CON	630	VON
1	EA	ELEC FIRE EXIT HARDWARE	LX-RX-QEL-HH-98-L-NL-F-03 SS-630-CON	630/630	VON
1	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	MULLION SEAL	8780N	N	ZER
1	EA	ASTRAGAL SET	8193AA	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
POWER SUPPLY BY ACCESS CONTROL PROVIDER

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ENTRY VIA VALID CARD READ. ALWAYS FREE FOR EGRESS.

HARDWARE SET: EHC-01A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE

2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-HH-98-EO-SNB-CON	630	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-HH-98-L-NL-03 SS-630-CON	630/630	VON
1	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	MULLION SEAL	8780N	N	ZER
2	EA	ASTRAGAL SET	8193AA	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL
PROVIDER
POWER SUPPLY BY ACCESS
CONTROL PROVIDER

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ENTRY VIA VALID CARD READ. ALWAYS
FREE FOR EGRESS.

HARDWARE SET: EHC-01B
NOT USED:

HARDWARE SET: EHC-02
NOT USED:

HARDWARE SET: EHC-03

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	LX-RX-QEL-HH-98-L-NL-F-03 SS-630- CON	630/630	VON
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER

1	EA	RAIN DRIP	142A	A	ZER
2	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
POWER SUPPLY BY ACCESS CONTROL PROVIDER

HARDWARE SET: EHC-03A
NOT USED:

HARDWARE SET: EHC-04
NOT USED:

HARDWARE SET: EHC-05

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954	689	VON
1	EA	DELAYED PANIC HARDWARE	CX-HH-98-EO-SNB-CON	630	VON
1	EA	ELEC DELAYED PANIC HARDWARE	CX-HH-98-L-E996-03 SS-FSE-630-CON	630/630	VON
3	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	MULLION SEAL	8780N	N	ZER
1	EA	ASTRAGAL SET	8193AA	AA	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
POWER SUPPLY BY ACCESS CONTROL PROVIDER

OPERATION: PULL SIDE - DOOR NORMALLY CLOSED AND LOCKED, VALID CARD READ ALLOWS ENTRY. PUSH SIDE - VALID CARD READ TEMPORARILY DISABLES CX DEVICE ALLOWING EGRESS. WITHOUT VALID CARD READ ALARM WILL SOUND WHEN PUSH PAD IS DEPRESSED, THE DEVICE WILL PREVENT EGRESS FOR 15 SECONDS OR LESS. DEVICE WILL DISARM IMMEDIATELY UPON FIRE ALARM.

HARDWARE SET: EHC-05A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	DELAYED PANIC HARDWARE	CX-HH-9847-EO-SNB-CON	630	VON
1	EA	ELEC DELAYED PANIC HARDWARE	CX-HH-9847-L-E996-03 SS-FSE-630-CON	630/630	VON
2	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	ARMOR PLATE	8402 34" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
2	EA	ASTRAGAL SET	8193AA	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
1	EA	POWER SUPPLY	PS904 900-4R-FA CARD READER BY ACCESS CONTROL PROVIDER POWER SUPPLY BY ACCESS CONTROL PROVIDER	LGR	VON

OPERATION: PULL SIDE - DOOR NORMALLY CLOSED AND LOCKED, VALID CARD READ ALLOWS ENTRY. PUSH SIDE - VALID CARD READ TEMPORARILY DISABLES CX DEVICE ALLOWING EGRESS. WITHOUT VALID CARD READ ALARM WILL SOUND WHEN PUSH PAD IS DEPRESSED, THE DEVICE WILL PREVENT EGRESS FOR 15 SECONDS OR LESS. DEVICE WILL DISARM IMMEDIATELY UPON FIRE ALARM.

HARDWARE SET: EHC-05B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954	689	VON

2	EA	DELAYED PANIC HARDWARE	CX-HH-98-EO-SNB-CON	630	VON
3	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	MULLION SEAL	8780N	N	ZER
1	EA	ASTRAGAL SET	8193AA	AA	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL
PROVIDER WHERE SHOWN ON TS
DRAWINGS
POWER SUPPLY BY ACCESS
CONTROL PROVIDER

OPERATION: PULL SIDE - DOOR NORMALLY CLOSED AND LOCKED, NO ENTRY. PUSH SIDE -
ALARM WILL SOUND WHEN PUSH PAD IS DEPRESSED, THE DEVICE WILL PREVENT EGRESS
FOR 15 SECONDS OR LESS. DEVICE WILL DISARM IMMEDIATELY UPON FIRE ALARM.

HARDWARE SET: EHC-05C

EACH TO HAVE:

QTY	EA	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED FIRE RATED REMOVABLE MULLION	KR9954	689	VON
1	EA	ELEC DELAYED FIRE EXIT HARDWARE	CX-HH-9847-L-F-E996-03 SS-FSE-630- CON	630/630	VON
1	EA	DELAYED FIRE EXIT HARDWARE	CX-HH-98-EO-F-SNB-CON	630	VON
3	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	MULLION SEAL	8780N	N	ZER
1	EA	ASTRAGAL SET	8193AA	AA	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL
PROVIDER
POWER SUPPLY BY ACCESS
CONTROL PROVIDER

OPERATION: PULL SIDE - DOOR NORMALLY CLOSED AND LOCKED, VALID CARD READ ALLOWS ENTRY. PUSH SIDE - VALID CARD READ TEMPORARILY DISABLES CX DEVICE ALLOWING EGRESS. WITHOUT VALID CARD READ ALARM WILL SOUND WHEN PUSH PAD IS DEPRESSED, THE DEVICE WILL PREVENT EGRESS FOR 15 SECONDS OR LESS. DEVICE WILL DISARM IMMEDIATELY UPON FIRE ALARM.

HARDWARE SET: EHC-06

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC DELAYED PANIC HARDWARE	CX-HH-98-L-E996-03 SS-FSE-630-CON	630/630	VON
1	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
2	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL
PROVIDER
POWER SUPPLY BY ACCESS
CONTROL PROVIDER

OPERATION: PULL SIDE - DOOR NORMALLY CLOSED AND LOCKED, VALID CARD READ ALLOWS ENTRY. PUSH SIDE - VALID CARD READ TEMPORARILY DISABLES CX DEVICE ALLOWING EGRESS. WITHOUT VALID CARD READ ALARM WILL SOUND WHEN PUSH PAD IS DEPRESSED, THE DEVICE WILL PREVENT EGRESS FOR 15 SECONDS OR LESS. DEVICE WILL DISARM IMMEDIATELY UPON FIRE ALARM.

HARDWARE SET: EHC-06A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON

1	EA	DELAYED PANIC HARDWARE	CX-HH-98-EO-SNB-CON	630	VON
1	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
2	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
1	EA		POWER SUPPLY BY ACCESS CONTROL PROVIDER		

OPERATION: PULL SIDE - DOOR NORMALLY CLOSED AND LOCKED, NO ENTRY. PUSH SIDE - ALARM WILL SOUND WHEN PUSH PAD IS DEPRESSED, THE DEVICE WILL PREVENT EGRESS FOR 15 SECONDS OR LESS. DEVICE WILL DISARM IMMEDIATELY UPON FIRE ALARM.

HARDWARE SET: EHC-07

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2	626	IVE
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	GASKETING	488S-BK	S-BK	ZER
1	EA	ASTRAGAL	(APPLY TO ASTRAGAL) BY DOOR MANUFACTURER	630	
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
			CARD READER BY ACCESS CONTROL PROVIDER		
			POWER SUPPLY BY ACCESS CONTROL PROVIDER		

HARDWARE SET: EHC-07A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2	626	IVE
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	485A	A	ZER
1	EA	ASTRAGAL	BY DOOR MANUFACTURER	630	
2	EA	DOOR BOTTOM	361AA6-Z49	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
POWER SUPPLY BY ACCESS CONTROL PROVIDER

HARDWARE SET: EHC-08

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
POWER SUPPLY BY ACCESS CONTROL PROVIDER

HARDWARE SET: EHC-08A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	485A	A	ZER
1	EA	DOOR BOTTOM	360AA6-Z49	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
POWER SUPPLY BY ACCESS CONTROL PROVIDER

HARDWARE SET: EHC-09
NOT USED:

HARDWARE SET: EHC-10
NOT USED:

HARDWARE SET: EHC-10A
NOT USED:

HARDWARE SET: EHC-10B
NOT USED:

HARDWARE SET: EHC-11

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	LOCK GUARD	LG14	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
			CARD READER BY ACCESS CONTROL PROVIDER POWER SUPPLY BY ACCESS CONTROL PROVIDER		

HARDWARE SET: EHC-11A
NOT USED:

HARDWARE SET: EHC-12

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2	626	IVE
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP	689	LCN
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	ASTRAGAL SET	555AA X 55AA	AA	ZER
2	EA	DOOR BOTTOM	361AA6	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN SHIELD	141AA	AA	ZER
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
			CARD READER BY ACCESS CONTROL PROVIDER POWER SUPPLY BY ACCESS CONTROL PROVIDER		

HARDWARE SET: EHM-01

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	PANIC HARDWARE	CD-9849-L-DT-03 SS-630-249-LBL	630/630	VON
1	EA	PANIC HARDWARE	CD-9849-L-NL-03 SS-630-249-LBL	630/630	VON
2	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN

2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	ASTRAGAL SET	8193AA	AA	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

HARDWARE SET: EHM-02

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	KEYED REMOVABLE MULLION	KR4954	689	VON
2	EA	PANIC HARDWARE	HH-LD-98-L-03 SS-630	630/630	VON
1	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
2	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	MULLION SEAL	8780N	N	ZER
1	EA	ASTRAGAL SET	8193AA	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

WHERE REQUIRED ON TS DRAWINGS

HARDWARE SET: EHM-02A
NOT USED:

HARDWARE SET: EHM-02B
NOT USED:

HARDWARE SET: EHM-02C
NOT USED:

HARDWARE SET: EHM-03
NOT USED:

HARDWARE SET: EHM-04
NOT USED:

HARDWARE SET: EHM-04A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	KEYED REMOVABLE MULLION	KR4954	689	VON
2	EA	PANIC HARDWARE	HH-98-EO-SNB	630	VON
1	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	485A	A	ZER
1	EA	MULLION SEAL	8780N	N	ZER
1	EA	ASTRAGAL SET	8193AA	AA	ZER
2	EA	DOOR BOTTOM	360AA6-Z49	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

HARDWARE SET: EHM-05
NOT USED:

HARDWARE SET: EHM-06
NOT USED:

HARDWARE SET: EHM-06A
NOT USED:

HARDWARE SET: EHM-07
NOT USED:

HARDWARE SET: EHM-07A
NOT USED:

HARDWARE SET: EHM-08
NOT USED:

HARDWARE SET: EHM-08A
NOT USED:

HARDWARE SET: EHM-08B
NOT USED:

HARDWARE SET: EHM-08C

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2	626	IVE
1	EA	STOREROOM LOCK	ML2057 LWM CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4040XP ST-1630	689	LCN
1	EA	GASKETING	429A	A	ZER
1	EA	GASKETING	488S-BK (APPLY TO ASTRAGAL)	S-BK	ZER
1	EA	ASTRAGAL	BY DOOR MANUFACTURER	630	
2	EA	DOOR BOTTOM	361AA6	AA	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN SHIELD	141AA	AA	ZER
2	EA	DOOR POSITION SWITCH	2757 SWITCH (WHEN REQUIRED ON TS DRAWINGS)	630	SEN

HARDWARE SET: EHM-08D
EACH TO HAVE:

HARDWARE SET: EHM-09

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	STOREROOM LOCK	ML2057 LWM CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

HARDWARE SET: EHM-09A
NOT USED:

HARDWARE SET: EHM-10
NOT USED:

HARDWARE SET: EHM-11
NOT USED:

HARDWARE SET: EHM-11A
NOT USED:

HARDWARE SET: EHM-12
NOT USED:

HARDWARE SET: EHM-13
NOT USED:

HARDWARE SET: EHM-14
NOT USED:

HARDWARE SET: EHM-15
NOT USED:

HARDWARE SET: EHM-16

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	ENTRANCE LOCK	ML2053 LWM CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	429A	A	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	656A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

HARDWARE SET: IHC-01

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED FIRE RATED REMOVABLE MULLION	KR9954	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-98-EO-F-CON	630	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-QEL-98-L-NL-F-03 SS-630-CON	630/630	VON

1	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK	S-BK	ZER
1	EA	MULLION SEAL	8780N	N	ZER
1	EA	ASTRAGAL SET	8193AA	AA	ZER
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
CARD READER BY ACCESS CONTROL PROVIDER POWER SUPPLY BY ACCESS CONTROL PROVIDER					

HARDWARE SET: IHC-02

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED FIRE RATED REMOVABLE MULLION	KR9954	689	VON
2	EA	FIRE/LIFE WALL MAG	PRACTICAL? SEM7850	689	LCN
1	EA	ELEC PANIC HARDWARE	98-EO-CON	630	VON
1	EA	ELEC PANIC HARDWARE	QEL-98-L-SS-630-CON	630/630	VON
1	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	SILENCER	SR64	GRY	IVE
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
CARD READER BY ACCESS CONTROL PROVIDER POWER SUPPLY BY ACCESS CONTROL PROVIDER					

HARDWARE SET: IHC-03

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
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3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-QEL-98-L-NL-F-03 SS-630-CON	630/630	VON
1	EA	OH STOP	90S (WHERE WALL STOP IS NOT PRACTICAL)	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK	S-BK	ZER
1	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
			CARD READER BY ACCESS CONTROL PROVIDER		
			POWER SUPPLY BY ACCESS CONTROL PROVIDER		

HARDWARE SET: IHC-04
NOT USED:

HARDWARE SET: IHC-05
NOT USED:

HARDWARE SET: IHC-06

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	CX-9875-L-F-E996-03 SS-FSE-630-SS7500-CON	630/630	VON
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK	S-BK	ZER
2	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
			CARD READER BY ACCESS CONTROL PROVIDER (WHEN REQUIRED BY TS DRAWINGS)		

POWER SUPPLY BY ACCESS CONTROL PROVIDER
(WHEN REQUIRED BY TS DRAWINGS)

OPERATION: PULL SIDE - DOOR NORMALLY CLOSED AND LOCKED, VALID CARD READ ALLOWS ENTRY. PUSH SIDE - VALID CARD READ TEMPORARILY DISABLES CX DEVICE ALLOWING EGRESS. WITHOUT VALID CARD READ ALARM WILL SOUND WHEN PUSH PAD IS DEPRESSED, THE DEVICE WILL PREVENT EGRESS FOR 15 SECONDS OR LESS. DEVICE WILL DISARM IMMEDIATELY UPON FIRE ALARM.

HARDWARE SET: IHC-06A
NOT USED:

HARDWARE SET: IHC-06B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	CX-98-L-F-03 SS-630-CON	630/630	VON
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK	S-BK	ZER
1	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
(WHEN REQUIRED BY TS DRAWINGS)
POWER SUPPLY BY ACCESS CONTROL PROVIDER
(WHEN REQUIRED BY TS DRAWINGS)

OPERATION: PULL SIDE - DOOR NORMALLY CLOSED AND LOCKED, KEY ALLOWS ENTRY. PUSH SIDE - VALID CARD READ TEMPORARILY DISABLES CX DEVICE ALLOWING EGRESS. WITHOUT VALID CARD READ ALARM WILL SOUND WHEN PUSH PAD IS DEPRESSED, THE DEVICE WILL PREVENT EGRESS FOR 15 SECONDS OR LESS. DEVICE WILL DISARM IMMEDIATELY UPON FIRE ALARM.

HARDWARE SET: IHC-07
NOT USED:

HARDWARE SET: IHC-07A
NOT USED:

HARDWARE SET: IHC-07B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
2	EA	TWO PT EU MORT LOCK	LM9295EUL 03A LBL	630	SCH
2	EA	SURFACE CLOSER	4040XP CUSH MC	MTLPC	LCN
2	EA	FIRE/LIFE HOLDER	4040SEH	689	LCN
2	EA	SILENCER	SR64	GRY	IVE
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
			CARD READER BY ACCESS CONTROL PROVIDER		
			POWER SUPPLY BY ACCESS CONTROL PROVIDER		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED, VALID CARD READ ALLOWS ENTRY/EXIT. NOT AN EGRESS DOOR.

HARDWARE SET: IHC-07C

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	DELAYED FIRE EXIT HARDWARE	CX-9847-EO-F-LBR-CON	630	VON
1	EA	ELEC DELAYED FIRE EXIT HARDWARE	CX-9847-L-F-LBR-E996-03 SS-FSE-630-CON	630/630	VON
2	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	FIRE/LIFE HOLDER	4040SEH	689	LCN
1	EA	GASKETING	488S-BK	S-BK	ZER
2	EA	ASTRAGAL SET	8193AA	AA	ZER
4	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
2			CARD READER BY ACCESS CONTROL PROVIDER		
1	EA		POWER SUPPLY BY ACCESS CONTROL PROVIDER		

OPERATION: PULL SIDE - DOOR NORMALLY CLOSED AND LOCKED, VALID CARD READ ALLOWS ENTRY. PUSH SIDE - VALID CARD READ TEMPORARILY DISABLES CX DEVICE ALLOWING EGRESS. WITHOUT VALID CARD READ ALARM WILL SOUND WHEN PUSH PAD IS DEPRESSED, THE DEVICE WILL PREVENT EGRESS FOR 15 SECONDS OR LESS. DEVICE WILL DISARM IMMEDIATELY UPON FIRE ALARM. HOLD OPEN TO INTERFACE WITH SECURITY AND FIRE SYSTEM.

HARDWARE SET: IHC-08
NOT USED:

HARDWARE SET: IHC-08A
NOT USED:

HARDWARE SET: IHC-08B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	CX-98-EO-F-CON	630	VON
1	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S-BK	S-BK	ZER
2	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)		SCH
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN
1	EA		POWER SUPPLY BY ACCESS CONTROL PROVIDER		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED, EXIT ONLY. ALARM WILL SOUND WHEN PUSH PAD IS DEPRESSED, THE DEVICE WILL PREVENT EGRESS FOR 15 SECONDS OR LESS. DEVICE WILL DISARM IMMEDIATELY UPON FIRE ALARM.

HARDWARE SET: IHC-09
NOT USED:

HARDWARE SET: IHC-10
NOT USED:

HARDWARE SET: IHC-11

NOT USED:

HARDWARE SET: IHC-12
NOT USED:

HARDWARE SET: IHC-13
NOT USED:

HARDWARE SET: IHC-14
NOT USED:

HARDWARE SET: IHC-15
NOT USED:

HARDWARE SET: IHC-16
NOT USED:

HARDWARE SET: IHC-17
NOT USED:

HARDWARE SET: IHC-17A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS438 (WHERE WALL STOP IS NOT FEASIBLE)	626	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	485A	A	ZER
1	EA	DOOR BOTTOM	360AA6-Z49	AA	ZER
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL
PROVIDER
POWER SUPPLY BY ACCESS
CONTROL PROVIDER

HARDWARE SET: IHC-18
NOT USED:

HARDWARE SET: IHC-19

EACH TO HAVE:

QTY	EA	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK	S-BK	ZER
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
POWER SUPPLY BY ACCESS CONTROL PROVIDER

HARDWARE SET: IHC-19A
NOT USED:

HARDWARE SET: IHC-19AB

EACH TO HAVE:

QTY	EA	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS438 (WHERE WALL STOP IS NOT COMPATIBLE)	626	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	485A	A	ZER
1	EA	DOOR BOTTOM	360AA6-Z49	AA	ZER
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
POWER SUPPLY BY ACCESS CONTROL PROVIDER

HARDWARE SET: IHC-19B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	BY SOUND DOOR SUPPLIER		
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	SOUND SEALS	BY DOOR/FRAME SUPPLIER		
1	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
POWER SUPPLY BY ACCESS CONTROL PROVIDER

NOTE: STC RATED DOOR ASSEMBLY. COORDINATE HARDWARE REQUIREMENTS WITH DOOR MANUFACTURER.

HARDWARE SET: IHC-20
NOT USED:

HARDWARE SET: IHC-21
NOT USED:

HARDWARE SET: IHC-22
NOT USED:

HARDWARE SET: IHC-23
NOT USED:

HARDWARE SET: IHC-23A
NOT USED:

HARDWARE SET: IHC-23B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON

1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2	626	IVE
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
2	EA	ARMOR PLATE	8402 34" X 2" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS438	626	IVE
			(WHERE WALL STOP IS NOT PRACTICAL)		
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK	S-BK	ZER
1	EA	ASTRAGAL SET	8193AA	AA	ZER
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
POWER SUPPLY BY ACCESS CONTROL PROVIDER

HARDWARE SET: IHC-23C

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2	626	IVE
1	EA	FAIL SECURE EL LOCK	ML20906 LWM SEC M92 CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
2	EA	ARMOR PLATE	8402 34" X 2" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS438	626	IVE
			(WHERE WALL STOP IS NOT PRACTICAL)		
1	EA	GASKETING	488S-BK	S-BK	ZER
2	EA	DOOR SWEEP	39A	A	ZER
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

CARD READER BY ACCESS CONTROL PROVIDER
POWER SUPPLY BY ACCESS CONTROL PROVIDER

HARDWARE SET: IHM-01
NOT USED:

HARDWARE SET: IHM-02
NOT USED:

HARDWARE SET: IHM-03
NOT USED:

HARDWARE SET: IHM-04
NOT USED:

HARDWARE SET: IHM-04A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	PANIC HARDWARE	9849-EO-249-LBL	630	VON
1	EA	PANIC HARDWARE	9849-L-NL-03 SS-630-249-LBL	630/630	VON
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK	S-BK	ZER
2	EA	ASTRAGAL SET	8193AA	AA	ZER
2	EA	DOOR POSITION SWITCH	2757 SWITCH	630	SEN

HARDWARE SET: IHM-05
NOT USED:

HARDWARE SET: IHM-06
NOT USED:

HARDWARE SET: IHM-07
NOT USED:

HARDWARE SET: IHM-08
NOT USED:

HARDWARE SET: IHM-09
NOT USED:

HARDWARE SET: IHM-09A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
2	EA	FIRE EXIT HARDWARE	9849-EO-F-249-LBL	630	VON
1	EA	IC RIM CYLINDER	3080 CT6R	630	C-R
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK	S-BK	ZER
1	EA	ASTRAGAL SET	8193AA	AA	ZER

HARDWARE SET: IHM-10
NOT USED:

HARDWARE SET: IHM-11
NOT USED:

HARDWARE SET: IHM-12
NOT USED:

HARDWARE SET: IHM-13
NOT USED:

HARDWARE SET: IHM-15
NOT USED:

HARDWARE SET: IHM-16
NOT USED:

HARDWARE SET: IHM-17

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	STOREROOM LOCK	ML2057 LWM CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK	S-BK	ZER
3	EA	SILENCER	SR64 (AT RATED OPENINGS)	GRY	IVE
1	EA	DOOR POSITION SWITCH	2757 SWITCH (WHEN REQUIRED ON TS DRAWINGS)	630	SEN

HARDWARE SET: IHM-18

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	STOREROOM LOCK	ML2057 LWM CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK (AT RATED OPENINGS)	S-BK	ZER
3	EA	SILENCER	SR64 (AT NON-RATED OPENINGS)	GRY	IVE
1	EA	DOOR POSITION SWITCH	2757 SWITCH (WHEN REQUIRED ON TS DRAWINGS)	630	SEN

HARDWARE SET: IHM-19

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	STOREROOM LOCK	ML2057 LWM CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS438 (WHERE REQUIRED)	626	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK (AT RATED OPENINGS)	S-BK	ZER
3	EA	SILENCER	SR64 (AT NON-RATED OPENINGS)	GRY	IVE

HARDWARE SET: IHM-20

NOT USED:

HARDWARE SET: IHM-20A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW NRP (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE

1	EA	STOREROOM LOCK	ML2057 LWM CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	OH STOP	90S (WHERE WALL STOP IS NOT COMPATIBLE)	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE SET: IHM-21
NOT USED:

HARDWARE SET: IHM-22
NOT USED:

HARDWARE SET: IHM-23
NOT USED:

HARDWARE SET: IHM-24

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2	626	IVE
1	EA	STOREROOM LOCK	ML2057 LWM CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
2	EA	OH STOP & HOLDER	90H	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
2	EA	ARMOR PLATE	8402 34" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE SET: IHM-25
NOT USED:

HARDWARE SET: IHM-26
NOT USED:

HARDWARE SET: IHM-27
NOT USED:

HARDWARE SET: IHM-28
NOT USED:

HARDWARE SET: IHM-29
NOT USED:

HARDWARE SET: IHM-30
NOT USED:

HARDWARE SET: IHM-31
NOT USED:

HARDWARE SET: IHM-32
NOT USED:

HARDWARE SET: IHM-33
NOT USED:

HARDWARE SET: IHM-34

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2	626	IVE
1	EA	CLASSROOM LOCK	ML2055 LWM CT6R	630	C-R
1	EA	PERMANENT CORE	8000	626	C-R
1	EA	COORDINATOR	COR X FL	628	IVE
1	EA	OH STOP & HOLDER	90H (WHERE DOOR DOES NOT RETURN TO WALL)	630	GLY
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP/HOLDER	FS495	626	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK	S-BK	ZER
1	EA	ASTRAGAL SET	8193AA	AA	ZER

HARDWARE SET: IHM-35
NOT USED:

HARDWARE SET: IHM-36
NOT USED:

HARDWARE SET: IHM-37
NOT USED:

HARDWARE SET: IHM-38
NOT USED:

HARDWARE SET: IHM-39
NOT USED:

HARDWARE SET: IHM-39A
NOT USED:

HARDWARE SET: IHM-40
NOT USED:

HARDWARE SET: IHM-41
NOT USED:

HARDWARE SET: IHM-42
NOT USED:

HARDWARE SET: IHM-43
NOT USED:

HARDWARE SET: IHM-44
NOT USED:

HARDWARE SET: IHM-45
NOT USED:

HARDWARE SET: IHM-46
NOT USED:

HARDWARE SET: IHM-47
NOT USED:

HARDWARE SET: IHM-48
NOT USED:

HARDWARE SET: IHM-49
NOT USED:

HARDWARE SET: IHM-50
NOT USED:

HARDWARE SET: IHM-51
NOT USED:

HARDWARE SET: IHM-52
NOT USED:

HARDWARE SET: IHM-53
NOT USED:

HARDWARE SET: IHM-54

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	PRIVACY LOCK	ML2030 LWA X LWM M19V	630	C-R
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK (AT RATED DOORS)	S-BK	ZER
3	EA	SILENCER	SR64 (AT NON-RATED OPENINGS)	GRY	IVE

HARDWARE SET: IHM-55
NOT USED:

HARDWARE SET: IHM-56
NOT USED:

HARDWARE SET: IHM-57

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HW HINGE	5BB1HW (VERIFY TYPE AND QUANTITY REQUIRED)	652	IVE
1	EA	PASSAGE SET	ML2010 LWM	630	C-R

1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S-BK (AT RATED OPENINGS)	S-BK	ZER
3	EA	SILENCER	SR64 (AT NON-RATED OPENINGS)	GRY	IVE

HARDWARE SET: IHM-58
NOT USED:

HARDWARE SET: IHM-59
NOT USED:

HARDWARE SET: IHM-60
NOT USED:

HARDWARE SET: IHM-61
NOT USED:

HARDWARE SET: IHM-62
NOT USED:

HARDWARE SET: IHM-63
NOT USED:

HARDWARE SET: IHM-64
NOT USED:

HARDWARE SET: IHM-65
NOT USED:

HARDWARE SET: IHM-66
NOT USED:

HARDWARE SET: IHM-67
NOT USED:

HARDWARE SET: IHM-68

EACH TO HAVE:

ORLANDO INTERNATIONAL AIRPORT
BP-S195, TERM C, PH1X - ASC

DOOR HARDWARE
SECTION 08 71 00

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	IC MORT. CYLINDER	1080 CT6R	630	C-R
2	EA	OH DOOR POSITION SWI	EDWARDS SIGNALIN 2207AU-L (WHERE REQUIRED BY TS DRAWINGS)	628	
1	EA	NOTE	REMAINDER OF HARDWARE BY DOOR SUPPLIER		

HARDWARE SET: IHM-69
NOT USED:

HARDWARE SET: IHM-70

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	NOTE	REMAINDER OF HARDWARE BY DOOR SUPPLIER		
1	EA	NOTE	REFER TO DIVISION 28 FOR CONTROLS		

END OF SECTION 08 71 00