PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Division 0 BIDDING AND CONTRACT REQUIREMENTS and Division 01 GENERAL REQUIREMENTS Specification Sections apply to this Section:

1.2 SUMMARY

This Section includes the following:

A. Passenger Boarding Bridges: Provide new apron drive passenger boarding bridges (PBB), complete including all structural, support, mechanical, electrical, and finish requirements, roof top 10 ton PBB PCAir (PCA), 90 and 180 KVA Ground Power Units (GPU) per gate design, aircraft cooling Air Handler Units AHU (45 ton and 90 ton) per gate design, PBB mounted belt loaders (KCI or owner approved alternate) and Water Cabinets to serve the aircraft mix indicated on the provided drawings. Provide a bridge monitoring system for all installed bridges. All components delivered on all equipment shall be compliant with the latest manufacturer bulletins/safety instructions

B. Fixed Walkways: Provide new fixed walkways as indicated on the drawings and in these specifications. The fixed walkway shall meet all structural, dimensional, and finish requirements specified for the PBB.

1.3 INTENT

A. The intent of this specification is to describe the design requirements, quantities, performance, and maintenance properties of the passenger boarding bridges and affiliated equipment required at Orlando International Airport (MCO). Operator training, maintenance training, installation requirements, and acceptance conditions are also requirements of this Specification.

B. Safety of passengers, other personnel, aircraft, and equipment is of prime importance. Nothing in these specifications shall relieve the Contractor of the responsibility for providing safe products.
1.4 APPLICABLE STANDARDS:

A. The design, fabrication, and construction, including all manufactured components, fittings, and hardware, shall be in U.S. standard units (metric or SI units shall be presented in parentheses following the U.S. standard units), and shall conform to the current issue at the time this project is advertised, of one or more of the following codes and standards as applicable and as referenced herein:

1. City of Orlando and Greater Orlando Aviation Design Standards
2. Society of Automotive Engineers (SAE)
3. American Society for Testing and Materials (ASTM)
4. American Welding Society (AWS)
5. American Iron and Steel Institute (AISI)
6. American Society of Mechanical Engineers (ASME)
7. American National Standards Institute (ANSI)
8. National Electric Code (NEC)
9. National Electrical Manufacturers Association (NEMA)
10. National Fire Protection Association (NFPA)
11. Florida Building Code (FBC)
12. American Institute of Steel Construction (AISC)
13. Occupational Safety and Health Administration (OSHA)
14. Underwriters Laboratory (UL)
15. Americans with Disabilities Act (ADA)
16. Florida Accessibility Code for Building Construction (FACBC)
17. Society for Protective Coatings (SSPC)
18. Any/all applicable Orlando, FL State or Federal Govt. department’s requirements

1.5 SUBMITTALS

A. Shop Drawings Product Data and Samples: Submit complete and detailed shop drawings for review in accordance with the requirements of Division 01. No fabrication and/or assembly of any of the passenger boarding bridge components shall begin until the shop drawings for such components have been reviewed and approved by the Owner’s Authorized Representative (OAR). Additional shop drawings shall be submitted as necessary to fully describe the PBBs, GPUs, Air Handlers, roof mounted PCAir, PBB mounted belt loaders and Water Cabinets to be delivered and ensure proper interface with the external environment. All drawings, sketches, details, and material shall be submitted in the English language and in Inch-Pound units, including dimensions, volumes, weights, and forces. Shop drawings shall include but not be limited to the following:
1. An index prepared in chronological order listing all drawings, sketches, details, and material submitted.

2. Product Data: Manufacturer's technical product data, including specifications. Include data substantiating that materials comply with requirements.

3. Interior Finishes:
   a. Interior finish schedule including interior wall and ceiling finishes.
   b. Transition details.
   c. Wall finish attachment methods.
   d. LED Light fixture details, ceiling materials, layout, and maintained illumination calculations at floor using the actual interior finishes.
   e. Joint details.
   f. PBB section dimensions and general arrangement drawings.
   g. Tunnel floor finish.
   h. Cab floor finish.
   i. Flooring edging details, including lines of demarcation to/from hard surfaced floor at wall areas, and treatment at doors and thresholds.
   j. Floor Covering.
   k. Insulation.
   l. Handrail details.
   m. Roof mounted PBB air conditioning unit and ducting system for bridge cooling.

4. Exterior Configuration:
   b. Exterior elevations.
   d. Paint finishes.
   e. Flashing (building to PBB & Fixed Walkway sections).
   f. Ramp service stairway.
   g. KCI Jet Bridge Belt Loader or owner approved similar belt.
   h. Service/maintenance ladder, cage and cab roof handrails.
   i. PBB roof tie-off safety cable system.
   j. Hurricane tie down details and locations.
   k. PBB wall penetration and exterior duct.

5. Cab:
   a. Operator's cone of visibility, including mirrors/camera viewing screens for visualizing drive wheels and apron.
b. Control panel location and functional layout.
c. View panels.
d. Safety devices.
e. Aircraft interface.
f. Modifications necessary for proper connection with required aircraft types including auto-leveling devices.
g. Operating instructions placard.
h. Cab saloon doors.
i. VDGS controller location.
j. Camera with visibility of operator and aircraft door viewable within the gate monitoring system.

6. Fixed Walkway:
   a. Structural calculations sealed by a professional engineer licensed in the State of Florida.
   b. Design of structure to support fixed walkway.

7. Aesthetics and Safety Markings:
   a. Color and finish, exterior.
   b. Safety markings and labels.
   c. Signage and plaques (interior).
      • Transition ramp signs: Signage size, lettering, colors, and message
      • Smoke Detectors

8. Electrical, Mechanical, Structural:
   a. Certifications of Compliance with all listed Design and Construction Standards.
   b. Electrical power calculations that shall be signed and sealed by a professional engineer legally licensed in the State of Florida.
   c. Electrical power and control schematic diagrams.
   d. Hydraulic schematics.
   e. Interface requirements for foundations and building supplied utilities. Provide exact location of electrical power and communications J-boxes.
   f. Structural drawings including all pertinent calculations which shall be signed and sealed by a professional engineer licensed in the State of Florida. PBB must meet all wind loading requirements for the greater Orlando area. Minimum wind loading shall be 170 mph.
   g. The bridge manufacturer shall provide the Owner's Authorized Representative (OAR) with actual foundation loading data sheets for

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each type of bridge provided based on load requirements specified in the "Structural Design and Support Elements" Article in PART 2 of this SECTION.

9. Communications and Data:
   a. Cable access, raceways and routing along with all interfaces and coordination details with interior and exterior finishes.
   b. All cable assemblies for communications and data cables including CAT 6 and ACS Beldin Cable #9841.
   c. Connection, termination, and interface details for all communications and data cables within the PBB and with the building.
   d. Connection and mounting details for Physical Access Control System (PACS).
   e. Connection and mounting details for cameras.
   f. Connection and mounting details for WIFI antenna.
   g. Flow and control diagrams for all systems including interfaces with PACS.

10. Confirmation of aircraft parking plan and PBB slopes.

11. Certificates of compliance with NFPA 415 from a certified testing company located in the continental United States. The manufacturer shall also provide affidavits attesting to the passenger boarding bridge’s compliance with NFPA 415. NFPA Certificate of Compliance, and all the supporting test results, and the certificates must be submitted with the bid documents.

12. Notarized certifications that all electrical, mechanical, and hydraulic designs, components, and installations meet the requirements prescribed in this specification.

B. Spare Parts:

1. Submit list of recommended spare parts, prices and sources within 60 calendar days after the date of the Notice to Proceed.

2. Pricing shall be provided for the following spare parts at the time of Bid. Price provided on the following items shall be valid for five (5) years after substantial completion and will be used for replacement parts for bridges in the North and South terminals:

   a. Thyssen Krupp
      • Full Canopy Replacement Kit
      • Canopy, Tube Motor 120V / 60 Hz, Thyssen Krupp #A4230300
      • Canopy, Pulley, Complete, Right, Thyssen Krupp #A4230293
      • Canopy, Pulley, Complete, Left, ThyssenKrupp #A4230294
      • Variable Frequency Drive, 7.5HP, 480 VAC, UL, Thyssen Krupp #2552042
      • Display, Magelis, 5.7" Color, Thyssen Krupp #25524121
• Hydraulic Cylinder 10FT STRK, (Rebuilt - Re-Sealed cylinder)

b. JBT
• Full Canopy Replacement Kit
• Bridge Operator Display Screen
• Cab curtain and barrel right side assembly for bottom tension 125 CORNELL JBT # 3716699
• Canopy Curtain, Kit, ACFT Clos/Inr, Std, JBT #3656365
• Ball Screw, Vertical Column, JBT #3640979.01
• Motor, Vertical Drive, 3 HP, W/Mounting Bracket, JBT #2136033.01
• VFD, AC Motor Driver, 3. 5.5Kw, (used at PBB control console), Schneider # ATV312HU55N4
• Bearing, Rotex bearing for Jetway PBB Boggie Housing, Kit Brg. Rdl, Lwr,Dr. Col Std., JBT # 3721723

c. Other Manufacturers
• Identify and price the top ten (10) parts (by highest cost) that may likely be replaced within the first five (5) years of operation. Candidates are canopies and canopy components, hydraulic components, ball screws, motors, etc.

C. Manuals:

1. Not less than 30 days prior to acceptance inspections, supply three (3) copies of technical manuals for each passenger boarding bridge furnished under this Contract. Manuals shall not be generic in nature and shall reflect the exact construction of each bridge furnished. Non-applicable items and drawings shall not be included in the manuals. Manuals may have descriptive type photographs. Pages shall have reinforced edges. Manuals shall be compact in size and bound. Manufacturer shall also provide one (1) copy of all listed manual information on a USB/jump drive.

2. The technical manuals shall be all inclusive but must contain the following information:

a. Description and operation of all systems and components.
b. Electrical drawings specific for each bridge furnished. Provide one set of bound, laminated electrical drawings for each bridge, to be placed in the control console.
c. Maintenance instructions including troubleshooting/diagnostics guidelines.
d. Overhaul instructions.
e. List of parts and part numbers.
f. Illustrated parts list of all components.
g. Recommended spare parts list and source.
h. Complete and detailed Preventive Maintenance Program for each type of boarding bridge furnished under this Contract.
i. Diagrams that show the interconnections with 400 Hz Power Air Handler units, PBB cooling PCAir and the PBB mounted belt loader.

j. Instructions for the transition of key activation to PACS card reader activation.

D. Test Reports: Submit all factory and field test reports to the Owner's Representative prior to the final inspection.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. The manufacturer and PBB installer shall provide evidence of at least ten (10) years of satisfactory experience in the design and manufacture of passenger boarding bridges, including evidence of at least fifty (50) airport PBBs installed and in use at airports within the past ten (10) years.
   2. It is preferred that the bridges be manufactured in the US and shall be made of parts manufactured within the US whenever possible.
   3. Qualified proposers shall further provide references/proof of all airport passenger boarding bridges installed and in use in US airports within the past five (5) years.

B. Regulatory Requirements: The PBB shall be designed to conform to all applicable Federal, State and Municipal Codes and regulations as applicable to the project site in effect at the time of manufacture.

   1. Structural Design and Construction Standards:
      b. American Welding Society Standards. All welds shall exhibit adequate penetration and shall be clean and free of slag. Welds shall not be ground to improve appearance except as required for flush surfaces or where nonstructural parts are involved. On site welding and pedestal modifications shall be performed by an AWS 6G certified welder.
      c. American Iron and Steel Institute Specification for the Design of Cold-Formed Steel Structural Members, Van Karmon theory and buckling studies by Peterson and Card, finite element analysis or other approved method.
      d. All sheared or sharp metal edges shall be deburred or broken. All exposed metal corners shall have minimum radii in accordance with the appropriate material specification.

   2. Mechanical and Hydraulic Specifications and Standards:
      a. All mechanical and hydraulic components and designs shall conform to the recommendations and standards established by the Society of Automotive Engineers, Joint Industrial Conference and the American Society of Mechanical Engineers.
b. All threaded fasteners shall incorporate suitable locking devices.

3. Electrical Specifications and Standards:
   a. All electrical equipment and methods of installation shall conform to the Electrical Manufacturers Association, Joint Industrial Conference, the National Electrical Code, and modifications to the NEC by the local authority having jurisdiction.
   b. All electrical components utilized shall be recognized by Underwriters Laboratories in all cases where UL maintains a listing category for the devices installed.
   c. All low voltage pathways and cabling equipment and methods of installation shall conform to applicable TIA standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver PBB with protective covering to prevent exposure of interior to weather, dirt, water and nearby construction activities.

B. Storage: Coordinate delivery/storage with the owner. Terminal C is currently scheduled for opening in 2021.

C. At all times, protect interior from weather, dirt, water, and construction debris.

D. Handling: Handle PBB according to manufacturer's written rigging and installation instructions for unloading, transporting, storing and setting in final location.

1.8 SEQUENCING, SCHEDULING AND COORDINATION

A. Working Area: Coordinate the location of PBB staging areas, storage areas and erection areas with Airport Operations Authorities and other Contractors.

B. Bridge Foundation: Coordinate the installation of PBB with installation of PBB foundations. The PBB foundations will be completed by others. Bridge foundation components must be designed to support wind speed up to and including 170 miles per hour.

C. Bridge Monitoring and Installed Equipment: Provide, coordinate and install the 400 Hz equipment, preconditioned air handlers, potable water cabinets, bridge monitoring system and building interface electrical and communication services to ensure a complete and operational installation of the PBB. The PBB work shall include the PBB roof top cooling units and all electrical and communication components of the PBB from the building interface outward.

D. Coordinate the breakouts and terminations of all low voltage cabling assemblies with contractor installed items, in addition to item provided by the manufacturer, prior to shop drawing submittal, PBB installation and manufacturing.
E. Thoroughly review GOAA STC construction documents, including specifications, for PBB interface requirements prior to shop drawing submittal, PBB installation and manufacturing.

1.9 MAINTENANCE

A. Extra Materials:

1. Within 60 calendar days after the date of the Notice to Proceed, furnish a list of recommended spare parts, including prices and sources.

2. Provide the following materials for each bridge at Substantial Completion:
   a. Spare fuses, minimum one (1) each size per bridge. A spare set of fuses shall be provided for all power and control types used on all bridges and turned over to GOAA maintenance.
   b. Paint touch-up kits.
   c. Aircraft closure repair kits.
   d. Three (3) bridge stands.

B. The Contractor shall maintain an adequate inventory of all proprietary or Contractor fabricated or modified parts, especially the long lead time items considered as insurance, for routine maintenance of the unit. All stock shall be maintained, whether or not the unit is in current production for a minimum of fifteen (15) years from the date of the last unit’s final acceptance. An adequate inventory of all industry standard parts shall also be available.

C. The Contractor shall provide the Owner with Service Bulletins outlining product improvement data resulting from continuing field operation experiences. Service Bulletins shall be sent to the Director of Operations: Orlando International Airport, 1 Jeff Fuqua Blvd, Orlando, FL 32827, United States and e-mailed to PBBServiceBulletins@GOAA.ORG.

1.10 OPERATOR TRAINING

A. Training Requirements:

1. The Contractor shall conduct training utilizing prepared texts, slides, actual boarding bridges, and other instructional aides as appropriate.

2. Provide a minimum sixteen (16) hours of operator training, in separate sessions, by a qualified manufacturer's representative for the models and types of boarding bridges purchased under this Contract.
   a. Training shall be conducted at the installation site and in classrooms (if needed) as designated and provided by the Owner.
   b. Operator training shall include proper demonstration as well as actual use of correct bridge operations to avoid damaging the equipment by improper use of the controls.
c. One session of training shall be recorded on USB/Jump drive and shall be provided to the owner.

3. Training shall be provided for classes of up to 16 attendees per session, classes will be offered during the morning/daytime shift and during the afternoon/evening shift at a time and place mutually agreed upon by the Contractor and the Owner. Dates shall be prior to scheduled commercial service of the boarding bridges.

4. The Owner will assign the individuals and/or companies to be trained.

5. Upon completion of training program, provide the Owner with ten (10) operating instruction brochures and ten (10) maintenance manuals for each model or type passenger boarding bridge. Copies shall also be provided on individual USB/Jump drives.

6. 1.11 WARRANTY

A. Provide special project warranty signed by the Contractor, installer and manufacturer, agreeing to replace, repair or restore defective materials and workmanship of passenger boarding bridge work during the minimum two (2) year warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

1. "Defective" is hereby defined to include, but not by way of limitation, operation, or control system failures, performance below required minimums, excessive wear, unusual deterioration or aging of materials of finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected, and unsatisfactory conditions.

2. Warranty period is a minimum of two (2) years on all components (AHU, bridge PCAir, GPU, bridge belt loaders, water cabinets and PBB) (excluding wear and tear/ water hoses) following the date of passenger boarding bridge final acceptance/use. NOTE: Pricing for this specification includes but is not limited to all parts and labor for all assets for the term of the Contract.

B. Provide coincidental product warranties where available for major components of passenger boarding bridge work. Submit with maintenance manuals.

C. The Contractor shall warrant that the PBB's and all components and accessories comply with the requirements of the Contract Documents, including approved drawings and this specification. The PBB's shall perform to the design function for a minimum period of twenty (20) years from the date of final acceptance of each PBB by the Owner. Failures caused by normal wear and tear, Acts of God,
and modifications by the Owner, which have not been approved by the manufacturer, will be excluded from the coverage in this Section.

D. The Contractor shall warrant that the PBB's and all components are new and manufactured using new materials, and are of good quality, suitable for aircraft use, and are free and clear from liens, encumbrances and title defects.

E. The Contractor shall repair or replace any warranty defect, including both parts and labor at Contractor's expense, within forty-eight (48) hours of written or notification from the Owner. (On site authorized representative response requirements differ.)

F. The firm performing warranty service shall be authorized by the Contractor and approved by the Owner. In addition, the authorized firm shall be located on site of Orlando International Airport.

G. Service calls during the contract period shall require a 10 minute response time from 3 a.m. to 12 a.m. midnight, seven days a week. (Hours are subject to change based on flight schedule activity.) A factory-authorized representative is required to respond to all service calls.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. JBT AeroTech.
2. ThyssenKrupp, Inc.
3. Other Bridge Manufacturers who may be deemed qualified by the Authority and meet required manufacturing, install and use requirements as stated in section 1.6.A.3 of this specification.

B. Duct work in PBB

1. UNICO Systems.
2. Per PBB manufacturer’s specific design

2.2 MATERIALS

A. Material Specifications:

<table>
<thead>
<tr>
<th>Component</th>
<th>Applicable Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Plate</td>
<td>ASTM A36</td>
</tr>
<tr>
<td>Structural Steel &amp; Shapes</td>
<td>ASTM A36 or ASTM A572 Grade</td>
</tr>
<tr>
<td>Steel Hollow Structural</td>
<td>ASTM A500 Grade B</td>
</tr>
</tbody>
</table>

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### Mechanical and Hydraulic Specifications and Standards:

a. All mechanical and hydraulic components and designs shall conform to the recommendations and standards established by the Society of Automotive Engineers (SAE), Joint Industrial Conference (JIC) and the American Society of Mechanical Engineers (ASME).

b. All threaded fasteners shall incorporate suitable locking devices.

### Fire Protection Standards:


### Electrical Specifications and Standards:

a. All electrical equipment and methods of installation shall conform to the requirements and recommendations of the American Insurance Association (AIA), National Electrical Manufacturers Association (NEMA), Joint Industrial Conference (JIC), National Electrical Code (NEC), and latest issue and modifications to the NEC by the City of Orlando.

b. All electrical components utilized shall be recognized by Underwriters Laboratories (UL) in all cases where UL maintains a listing category for the devices installed.

c. All equipment and controls which are exposed to the weather shall be of weatherproof type or shall be contained within weatherproof housings.

d. Where required by the type of components installed therein and the installation environment, electrical panels or cabinets which are mounted externally to the bridge, shall be equipped with heaters or electric components to control condensation.

e. All electrical installations shall comply with the Greater Orlando Aviation Authority Electrical Standards.
commercial jet aircraft indicated in the drawings. No other bridge models, other than the ones listed, shall be acceptable.

2. Terminal floor elevation varies above the apron at the face of the building.

3. Where the passenger boarding bridge rotunda is installed at the face of the terminal building, it shall be supported entirely by its own structural support and no load or structural stress shall be transmitted to the aircraft or terminal building.

4. The vertical dimension from the passenger service finished floor to the top of concrete rotunda foundation and the horizontal dimension from the service level face of the building to the center of the rotunda column anchor bolt pattern shall be field verified by contractor.

5. The fixed walkway tunnels may be supported by support angles from the terminal building; support angles shall be provided and installed by the Contractor. The Contractor shall, as part of the work under this Contract, design, furnish, and erect the fixed walkways as necessary to complete the installations. The long and short fixed walkways shall meet all the structural, dimensional and finish requirements specified for apron drive PBB's. Fixed walkways shall be installed where shown on the drawings. Construction of the fixed walkway tunnel shall be substantially identical to that of the telescoping tunnels. Continuous handrails with returned ends shall be installed the full length and on both sides of the fixed walkways.

6. Reflected loads imposed on the terminal shall not exceed 5 kips applied horizontally, parallel to the face of the building.

7. Basis of Design Model Numbers and Operational Limits. Models and bridge size will vary and it is the manufacturer’s responsibility to ensure that the proper bridge fit/size is used at each location as per provided drawings and aircraft type utilization.

B. Operation Limits:

1. The passenger boarding bridge shall be capable of moving to any point on the terminal apron within its design operation range. The passenger boarding bridges shall be capable of having simultaneous directional movements: extension-retraction, lateral motion, vertical elevation, and cab rotation.

2. The passenger boarding bridge shall be able to reach and service all aircraft indicated on the plans without operating in a slowdown mode, including the 1U door for the A380.
C. Operating Environment: The bridges shall operate satisfactorily under ambient temperatures from -25°F to 125°F with sustained winds up to 65 mph on wet apron surfaces. The entire bridge shall be weatherproof when extended while parked to the aircraft and in the stowed position with the cab door closed. Equipment and controls exposed to the weather shall be of weatherproof type or housed in weatherproof enclosures. Electrical panels or cabinets mounted external to the bridge shall be equipped with heaters or electric components to control condensation where required by the installation environment.

D. Operating Instructions: A weatherproof and water resistant placard outlining the bridge operating instructions shall be displayed in a prominent location in the cab of each bridge in plain sight of the Operator. A qualified graphics expert shall prepare the placard and the displayed instructions.

E. Safety Requirements:

1. All equipment shall be designed to be fail-safe and all controls that regulate bridge motions (i.e., horizontal travel, vertical travel, and cab rotation) shall be of the dead-man type. Dead-man type shall mean controls that require the operator to apply constant pressure to be engaged. Once the pressure is released the control is disengaged.

2. All operating mechanisms (i.e., horizontal and vertical drive, cab rotation) shall be designed so the drive mechanism is locked when power fails or is shut off.

3. Positive mechanical stops shall be provided to prevent over-travel where any component might become disengaged from its guiding or restraining component. The positive stop shall be in addition to all limit switches provided to restrict over-travel during normal operating conditions, including drive wheel steering motions and cab rotation. This does not apply to tunnel rotation which shall have dual limit switches. Mechanical stops shall be identified and detailed on the shop drawings.

4. The operator's position in the control cab shall be designed to provide the operator adequate visibility to position the boarding bridge with the cab weather door closed. Suitable enclosures, guard rails, and other restraint devices shall be provided to protect the operator from being pitched out the open end of the cab in case of sudden stops or inadvertent movements of the bridge when operated with the door open. A handhold shall be attached to the wall on both sides of the cab weather door.

F. Maintenance Provisions:

1. Maintenance requirements shall present no special problems to personnel knowledgeable in their respective fields of hydraulics, electrical power and controls, or general mechanical assembly.

2. Install bridge components with adequate access and appropriate fastener types to permit change-out by one person. If a component's weight
requires mechanical assistance to lift, the component or assembly shall be provided with lift eyes, fork lift guides, or other means of providing a mechanical advantage. Components shall be simple, rugged and easily accessible for routine maintenance, lubrication, exchange and adjustment. Electrical cabinets, hydraulic cabinets and pumps shall be located so they are always accessible to maintenance personnel standing at ground level without the use of a ladder, regardless of the vertical position of the bridge.

3. Access panels, where required to gain access to equipment or maintenance areas, shall be sized to allow necessary tools and equipment to be inserted to complete the work. The panel shall be permanently attached to the structure by hinges, and any fasteners required shall be permanently affixed to the panel. Fasteners shall be quick lock/disconnect for expedited servicing wherever possible.

4. Provide all product specific tools required for all maintenance.

5. Modular components: Utilize standardized modular components that are readily available in the continental United States to provide rapid corrective measures of malfunctioning critical components. Critical bridge components shall be located to allow for ease of access and installation.

6. All hardware items required including, but not limited to, bolts, studs, nuts, washers and fasteners shall be provided in Inch-Pound unit sizes.

7. The manufacturer shall maintain an adequate inventory of all proprietary or contractor fabricated and modified parts for all maintenance of the unit. All stock shall be maintained, whether or not the unit is in current production, for a minimum of fifteen (15) years from date of the last unit’s final acceptance.

8. All mechanical and electrical systems shall be protected from potential damage resulting from climatic conditions, falling objects or collision with aircraft service equipment and other moving vehicles.

G. Power Characteristics:

1. The apron drive passenger boarding bridge shall operate on a 480 volt, 3 phase, 60 Hz, 60 Amp circuit, with ground and neutral. A minimum of four spare conductors shall be included in the bridge control circuitry for possible future additions or changes to the control system.

2. The power supplies for the electrical receptacles and lighting shall be supplied from separate sources from the building. The receptacles shall be designed for two separate circuits equally distributed through the passenger boarding bridge interior and exterior. Power sources for the receptacles shall alternate as much as possible.

3. Provide transformers and circuit breakers as required to transform the 480 volt, 3 phase power for the bridge drive to 120 / 208 volt or 120 / 240-volt
power for the bridge lighting and other power distribution and controls on the bridge.

4. All exterior electrical components shall be housed in weather-tight and corrosion resistant enclosures conforming to NEMA 4X stainless steel.

5. Provide sufficient cable lengths to reach the panel board or disconnect switches mounted on the face of the terminal wall at the apron level.

6. Provide strain relief devices on all unsupported cables.

7. Provide cabling for the following across each bridge: Bridge drive, bridge controls, 400 Hz frequency converter, bridge lights, VOIP telephone and controls, preconditioned air system, and bridge sign light. Cables shall be flexible copper. Plastic tie-wraps are not allowed on the project. The Contractor shall use Adel clamps for all cable attachment and bundling. Refer to the Utilities section within this specification for further information.

8. The control cables for the air handling units shall be installed into the bridge wiring during bridge factory fabrication. Cables for the temperature sensor as well as the cable for the air handling unit pushbutton control shall be provided and installed by the passenger boarding bridge manufacturer for installation and incorporation by the passenger boarding bridge. Flush mounted 2”x 4” junction boxes shall be installed in the PBB cab for the cabin temperature sensor (“Occupied/Unoccupied” switch and the "On/Off" switch). The cabin temperature sensor bypass switch and the bypass potentiometer shall be installed in the PBB control panel. Bypass switch shall be key operated. Provide 26 keys.

9. Rotunda Column Grounding: Provide a grounding stud on the rotunda base plate and attach to new or existing grounding system rod in accordance with NEC and local codes. Rotunda base anchor bolts are not ground rods and shall not be considered as such.

10. Electrical Components:
   a. General: All electrical equipment and components shall be manufactured in Inch-Pound units and conform to recommendations and standards listed in the Quality Assurance Article.
   b. Electrical Junctions: All electrical junction points and connections within the boarding bridge shall be made directly to terminal strips, no splices are allowed.
      (1) Power cables shall be hardwired from the passenger boarding bridge directly to a distribution panel mounted at the terminal.
(2) Electrical or communication service conduit shall not be permitted on the exterior sides of the passenger boarding bridge.

(3) All cables and wiring shall be installed in cable carrying devices approved by the Owner's Authorized Representative (OAR).

(4) All electrical switch and receptacle device plate covers shall be stainless steel and shall match the device configurations, and on exposed wiring shall exactly fit the outlet box dimensions.

c. All electrical circuitry shall be successfully tested before the unit leaves the manufacturer's plant.

d. Primary Power: The main primary power "ON" indicator light shall be located on the operator's control panel adjacent to the power "ON/OFF" controls.

e. Anti-Chafing Devices: Whenever electrical cables and/or plumbing fixtures are required to slide or move, anti-chafing devices shall be provided. Acceptable anti-chafing devices include grommets, flexible sleeves and jackets, and other similar approved devices.

f. Identify all cables with wire/cable identification bands on both ends. Bands shall be pre-numbered plastic coated style or type-on style with clear plastic self-adhesive cover flap, numbered to show circuit identification numbers indicated on shop drawings.

g. All J-boxes shall be labeled with engraved placards to indicate usage (i.e., 400Hz, AHU, Bridge Power).

h. Breakers in the raceways or J-box shall be re-settable from a locked box located on the side of the bridge, accessible from the service stairs and labeled appropriately.

11. Electrical Control Elements:

a. Primary power for the PBB will be supplied from the Terminal Building by a 480/277 volt, three phase, 60 Hz, 200 amp or 400-amp distribution panel with circuit breaker mounted on the exterior of the building. Transformers shall be supplied and installed by the Contractor. Power for the PBB shall be separately supplied from breakers within the panel through rotunda mounted disconnects. Include a separate disconnect switch for each service at the rotunda and provide separate power cabling from the rotunda to the cab for bridge power.

b. The electrical disconnect panel and transformer shall adapt the specified terminal power to the PBB's electrical requirements, shall be provided and installed by the Contractor, and shall be mounted on the rotunda support column.

c. The transformer and separate circuit breakers for lighting and control power shall be mounted in the power control panel provided by the Contractor.
d. It shall be the responsibility of the Contractor to advise the Owner concerning the primary power requirements.

e. In case of power failure, power to energize the PBB shall be available on a manual selective basis as determined by the Owner’s operational procedures. This emergency power supply is selected via manual switches inside the terminal building.

f. The Contractor shall check and verify the quality of the PBB’s power supply and its suitability for use with solid state equipment, or other system components that are sensitive to the quality of power supply.

g. The PBB electrical/electronic components and systems shall be designed to operate in the lightning environment of the Orlando area. The manufacturer will provide necessary lightning suppression equipment to ensure continued, safe operation of all provided equipment in the Orlando area weather environment.

h. PBB’s utilizing solid state equipment or other system components sensitive to the quality of the power supply shall be provided with surge protection which shall protect the fastest logic circuits and loads, even if destroyed, providing protection for all modes (normal, common, metallic, transverse or longitudinal). The surge protector shall be located in the equipment cabinet and the Contractor shall provide a new ground, if needed for the system.

H. Communications and Security Characteristics:

1. Comply with specification section 27 10 00 for all voice/data communications cabling and specification 28 23 00 for security camera connectivity.

   a. Cables in the PBB shall be outside plant (OSP) rated.
   b. Furnish and install twelve (12) OSP-rated Category 6 cables with overall foil shield (F/UTP).
      (1) Refer to section 2.6 M. within this document for connected devices.
      (2) PBB manufacturer to provide a minimum of 15 feet of extra cable (for each cable run) at the building interface for connection to the building system. The total required length shall be coordinated by the PBB manufacturer with the building low voltage contractor.
   c. Voice/data communications cabling shall not share raceway with current-carrying electrical conductors.
   d. Voice/Data communications cabling shall be installed as part of PBB factory fabrication.

2. A low voltage communications panel.
   a. Shall be located at the cab end of the PBB and shall be accessible from the cab interior.
   b. Can be separate or a section in one of the PBB control cabinets.
      (1) Must be lockable.
      (2) Lock must be independent of control cabinet locks.
c. Panel shall have an eight (8) port CAT6 Ethernet patch panel.
d. Enough Cat6 cable shall be provided in the panel to allow for future connection of up to two (2) cameras and one (1) WIFI device on the ceiling of the cab (minimum 15 feet each cable).

3. Manufacturer to coordinate all cable lengths, transitions, and terminations from building interface to end device.

4. All connections at the building interface shall be provided with harsh environment quick disconnect connectors.

5. Access Control Systems:
   a. Furnish and install one (1) Belden Cable #9841 for use with the PACS. Cable shall be routed from the building interface to a junction box mounted near the control panel.
   b. Building interface junction box shall have a minimum of 15 feet of spare cable for connection to the building. The total required length shall be coordinated by the PBB manufacturer with the building low voltage contractor.
   c. Junction box at the control panel shall be a deep single gang box ready to accept the access control card reader.
   d. All access control items and installations shall be coordinated with the building security contractor.

6. Wireless Access Point:
   a. Provide conduit, weather proof housing, and mounting structure for the installation of an Aruba AP-365 Omni-Directional access point.
   b. Location of the antenna shall be on the exterior front of the PBB cab roof.
   c. Conduit shall be routed from the antenna weather proof housing to the low voltage communications panel in the cab of the PBB.
   d. Antenna will be purchased by GOAA and installed by the building low voltage contractor.

I. Mechanical Characteristics:

1. Mechanical and Hydraulic Design and Components:
   a. Only standard components readily available in the continental United States, manufactured in Inch-Pound standard units and conforming to recommendations and standards listed in the Quality Assurance Article shall be used.
   b. All operating mechanical and hydraulic components shall be assembled and tested before the unit leaves the manufacturer's plant. The Owner's Authorized Representative (OAR) may witness testing.
   c. Hydraulic cylinders shall be designed for seal replacement by maintenance technicians.
   d. Drip pans shall be provided under all hydraulic components to prevent hydraulic fluid from dripping on the pavement.

2.4 PERFORMANCE REQUIREMENTS

A. Aircraft: Unless otherwise directed by Owner's Authorized Representative (OAR), the boarding bridge shall be capable of accommodating the first and, if applicable, second forward door of the aircraft as shown on the drawings. The telescoping
tunnel shall permit servicing of all commercial jet aircraft as indicated on the drawings.

1. Maximum height above the apron at cab floor level: 25'-0".
2. Minimum height above the apron at cab floor level: 12'-0".

B. Telescoping Tunnel Slope: Maximum slope shall be 8.33% (1:12) measured from the terminal rotunda center point to the center point of the adjustable cab floor (except at the transition ramps), for each aircraft type serviced.

C. Cab Rotation: The cab shall be designed to rotate a total of 125° (90°-95° counterclockwise and 30°-35° clockwise from center) at a maximum speed of 145° per minute in either direction.

D. Bridge Rotation: The rotunda shall permit the entire unit to rotate 175° (87.5° clockwise and 87.5° counterclockwise).

E. Drive Wheel Rotation: Steer angle shall be 180° in place and in motion. Steer speed shall be between 9° and 14° per second.

F. Vertical Lift Speed: 2.5 feet per minute (fpm) to 4 fpm as measured at the cab spacer.

G. Drive Speed: The drive system shall permit the unit to extend/retract and rotate to any point within its operating envelope at a variable speed between 0 and 90 fpm.

H. Deceleration: The horizontal drive system shall include a decelerator device to reduce or eliminate shocks when approaching maximum extension, or when horizontal travel is stopped or reversed suddenly, for protection of the equipment and passenger boarding bridge operator.

2.5 STRUCTURAL DESIGN AND SUPPORT ELEMENTS

A. Loads: In addition to the dead loads and dynamic effects caused by movement, the entire passenger boarding bridge shall support the following minimum loads, unless the governing building code prescribes more severe requirements. These loads may be applied in total or in part, singularly or simultaneously. The design shall be based on the combination that imposes the most adverse loading.

1. Dead loads shall be determined by the weight of the structural system and any fixed materials (partitions, ceilings, etc.)

2. Live loads (Extended or Retracted): FLOORS 40 lb. per sq. ft. ROOFS 25 lb. per sq. ft., 250 pounds concentrated load anywhere in the roof.

3. Wind loads: Per ASCE-7-10, V=170 mph for Category IV buildings. Wind pressures on the structure shall be determined in accordance with ASCE 7-10 Sections 27.3.2 and 27.4.1 for Main Wind Resisting Systems and in
accordance with ASCE 7-10 Sections 30.3.2 and 30.4.2 for components and cladding.

4. Equipment minimum loads (approximate):
   a. PCA AHU at rotunda end: 3,500 lbs.
   b. 400 Hz 90 KVA Power Unit: 2,750 lbs.
   c. 400 Hz 180 KVA Power Unit: 2,750 lbs.
   d. 400 Hz Cable Hoist: 600 lbs.
   e. PBB air handling unit: 1500 lbs.
   f. Duct work for air systems.
   g. Potable Water Cabinet: 500 lbs.

5. The structural design shall provide sufficient torsion rigidity to minimize sway when the boarding bridge is brought to a gradual stop.

6. All mechanisms for actuating, guiding and restraining the boarding bridge and its components shall be designed to minimize the noise, deflection, and vibration apparent to passengers. No operating vibrations or loads shall be transmitted to the terminal building.

7. Fixed Ground Services Trunk: The passenger boarding bridge shall be structurally capable of supporting installation of a fixed ground services trunk to carry preconditioned air ducts and related components. The total combined weight for all systems will not exceed forty (40) pounds per linear foot. These systems may be installed on the side or underneath the passenger boarding bridge. The Contractor shall install the PCA/AHU system on the PBBs.

8. The Contractor shall verify the structural suitability of the design of the PBB rotunda foundation. This verification shall be based on the information received from the foundation's structural engineer and based on actual field measurements. The Contractor shall advise the Owner's representative of any deficiencies or conflicts prior to beginning the fabrication of the PBBs.

2.6 BRIDGE ASSEMBLY ELEMENTS

A. Rotunda Assembly:

1. Corridor:
   a. The rotunda entry corridor shall be a fixed rectangular tunnel at a constant height that connects the terminal building or fixed walkway with the rotunda.
b. The rotunda entry corridor shall be cantilevered from the rotunda column to the terminal building face or the mating frame of the fixed walkway.

c. Provide flashing to create a weather-tight connection between the rotunda entry corridor and the terminal building or fixed walkway. Flashing shall be sloped so as not to trap or pond water. Flashing shall also be installed on the interior. Flashing shall be continuous to provide a weather tight seal around the entire periphery between the bridge and the building, and to allow independent thermal movement of building structure, and shall meet the requirement of the NFPA 415, current edition.

2. Rotunda:

a. The rotunda shall be a cylindrical structure supported on a tubular column. The rotunda floor shall remain level at all positions and shall be installed at the same elevation as the terminal.

b. Flap type seals (dual) shall be provided for complete weather tightness between the rotunda and the hinged telescoping tunnels.

c. Rotunda side curtain shall be galvanized steel and provided with adjustable tensioning devices, positive tracking system, and interior weather seals. Covers shall be full length with galvanized or stainless steel hinged access panel to allow access to curtain idled barrel grease fittings.

d. Provide interior metal flashing to allow bridge movement.

e. Provide flashing to create a weather-tight connection between the rotunda entry corridor and the terminal. Flashing shall be sloped so as not to trap or pond water. Flashing shall also be installed on the interior. Flashing shall be continuous to provide a weather tight seal around the entire periphery between the bridge and the building, and to allow independent thermal movement of building structure, and shall meet the requirement of the NFPA 415, current edition.

f. Terminal Door Threshold: Install a threshold at the terminal door/boarding bridge interface that allows for bridge movement. The threshold shall be aluminum diamond plate.

g. Striker plate on the side door shall be installed as to avoid damaging/scratching of paint when the door opens/closes.

3. Support Column: The rotunda column shall not be anchored or secured to the terminal building, nor shall it transmit any live or dead loads or vibrations to the terminal building. An industry standard #7, 8-anchor bolt foundation pattern or 16 bolt pattern shall be used.

B. Telescoping Tunnels:

1. Telescoping tunnels shall be rectangular in cross-section, constructed of 14- gauge (or stronger) corrugated or smooth sided metal panels and hinged at the rotunda end for vertical motion. Minimum inside dimensions of the telescoping tunnels, not including handrails, shall be:
a. Minimum Interior Width: 4’-10”
b. Minimum Interior Height: 6’-10”
c. Minimum Transition Ramp Width: 4’-8”

2. Where telescoping sections overlap, low angle transition ramps shall be provided to accommodate the difference in elevation. The inner tunnel transition ramp shall be hinged and slope shall be less than 3° relative to the tunnel centerline slope. Means shall be provided to adjust and maintain the ramp lip clearance to preclude flooring wear. Where the design permits the ramp lip to ride the flooring, it shall be sheathed in a smooth Teflon or similar low friction material to minimize wear.

3. Provide and install overhead uneven surface caution signs at each transition ramp.

4. Provide flat roof tunnel or method to create a flat roof tunnel with adequate provisions for water to run off. Appropriate measures must be taken to ensure no water collection/pooling on any point of the PBB roof, even when the bridge is at its lower extremes.

5. Design the telescoping tunnels and all other elements of the structure to resist the accumulation of water at low points and pockets in the structure. Drain holes shall be provided where necessary to drain collection points in any operating height. Drains from internal gutters shall be carried clear of the structure and shall be sized to prevent blockage by accumulated debris. Install yellow/black safety tape (or paint) in all interior gutters.

6. Provide mechanical stops with elastomeric bumpers to prevent over-travel in the event of limit switch failure.

7. Maintain clearance between the telescoping tunnels such that no soiling or wear of the interior surfaces occurs as the result of movement.

8. Utilize flap-type seals (dual) between the individual tunnel assemblies to provide a weather tight seal and to prevent the entrance of fire and/or smoke in the event of an apron fire. Exterior seals shall utilize EPDM rubber and ALFA fire material.

9. The telescoping tunnels shall be equipped with an exterior pantograph style electrical cable conveyance system mounted on the side of the passenger boarding bridge. This system must be accessible to maintenance personnel for inspection. Plastic tie-wraps are not allowed on the project. The Contractor shall use Adel clamps for all cable attachment and bundling. These shall be installed on the right side of the PBB unless it would restrict or interfere with movement of the bridge in relation to specific terminal building components.

10. Provide stainless steel safety cables installed on top of bridge for service mechanic to connect with the safety harness.
C. Fixed Walkways:

1. Fixed walkways shall be of similar construction to that of the telescoping tunnels.

2. Minimum inside dimensions of the fixed walkway, not including handrails, shall be:
   a. Minimum Height: 7'-7"
   b. Minimum Width: 5'-7"

3. Fixed walkways shall be supported by and cantilevered from the rotunda column, except where support columns are indicated on the drawings.

4. Fixed walkways shall be anchored or secured to the terminal building face by structural steel supports angles designed and provided by the Contractor only where indicated on the drawings.

5. The fixed walkway for the PBB at gate 250A shall be designed to support a VDGS control / display unit.
   a. The support shall have a vertical six (6) inch diameter pole located as shown on the drawings.
   b. The top of the pole shall be seventeen (17) feet above the apron pavement with the top six (6) feet of the pole clear for mounting of the VDGS unit.
   c. Data and power conduit and cabling shall be provided. Connections to the power and data systems shall be coordinated with other parts of this specification along with the building and VDGS contractors.

D. Aircraft Cab:

1. The cab shall be equipped with a forward facing operator control station located behind a window to permit the operator full view of the aircraft contact area. Additional visibility shall be provided through windows on the left side of the control station.

2. Cab roll-up side curtains shall be galvanized or stainless steel. The left and right curtains shall be equipped with interior weather seals and shall be interchangeable. The exterior metal curtain covers shall be full length, hinged and galvanized or stainless steel.

3. Weather door: Cab shall be equipped with half glass “French” style doors installed to seal the interior from outside weather conditions when the doors are closed. The minimum opening width shall be 43-inches and minimum height shall be 7'-1". Operations of the PBB shall be possible without opening the door.
4. The cab shall be rotated by a gear motor and chain drive operating on the circumference of the fixed circular floor section of the PBB cab. Adjustable limit switches and fixed physical stops shall control the limits of rotation.

5. Articulating Cab Floor: The aircraft end of the cab shall be provided with an automatic level device when the cab is rotated at an angle up to 95° off the centerline of the bridge tunnels.
   a. The articulating cab floor shall level automatically and shall be equipped with a manual override control switch. The floor shall be capable of providing a level surface adjacent to the aircraft doorsill for passenger boarding bridge slopes from -10% to +10%.
   b. No portion of the cab floor shall exceed 8.33% slope in the direction of expected passenger traffic.
   c. The system shall include a double hinge floor. The maximum slope of this floor shall be limited to +/- 6.5° (11.4%).

6. Spacer: Provide a spacer spanning the full outside width of the boarding bridge cab opening, along the front edge of the cab floor at the point of contact with the aircraft.
   a. Spacer installation and material shall not mark the aircraft skin, and shall prevent any damage or abrasion of the aircraft skin when the bridge is in contact with the aircraft.
   b. The spacer shall provide bodily support when stepped upon, and shall have a Shore A Durometer hardness of 70 +/- 5 when measured in accordance with ASTM D2240.
   c. The spacer material shall be an EPDM, or other suitable polymer, compounded to meet the fireproofing requirements of NFPA 415.
   d. Passenger boarding bridge motion control or limit devices mounted on the spacer shall be located at the extreme outboard ends or continuously across the spacer's face along its centerline.
   e. Provide Safety Track or 3M anti-skid on C-channel between the cab floor and spacer.
   f. No metal trim or structural element shall be capable of contacting the aircraft fuselage outside the canopy padding and/or spacer.
   g. All bridges shall be provided to accommodate the door of all aircraft indicated in the gate schedule as shown on the drawings. Provide cutout in the cab spacer to miss the B737 Pitot tube. Provide 747 floor modification as may be necessary.

7. VDGS Operator Panel: Install operator panel as furnished by Division 27 VDGS provider. Refer to specification section 27 10 20 for additional information. Refer to Utilities paragraph within this specification for connectivity requirements.
**E. Aircraft Closure (Canopy):**

1. The aircraft end of the cab shall be equipped with an adjustable closure with folded accordion bellows to make a weather-tight seal against the aircraft. Canopy frame shall be seven bow system. Provide inner liner curtain that covers the canopy frame members.

2. The closure shall be able to enclose both the open aircraft door and doorway of all aircraft indicated at each gate.

3. The entire Aircraft Closure shall be designed to be water-resistant, withstand weathering, remain elastic and flexible between -25°F and 125°F, be tear-resistant, and meet fire resistance requirements of NFPA 415. The aircraft closure color shall be gray.

4. Each side of the canopy arms should independently seal to conform to critical aircraft contours to provide a weather-tight seal. The mechanism shall be designed to preclude excessive pressure on the aircraft fuselage. Arms must be protected so as not to cause wear/grease stains on the interior walls of the canopy.

5. Cushion pad seals shall be provided at the point of contact between the canopy and aircraft fuselage to prevent denting and/or scratching of the aircraft skin or cabin and cockpit windows. This includes damage to rain diverters or troughs that may be located over the doors. The pads shall be reduced in thickness to account for Pitot tubes. The seals that contact the aircraft shall be segmented and attached to the main closure assembly by Velcro-type fastener strips.

6. Canopy supports or stiffening rods shall be thoroughly padded to prevent contact with the aircraft and protect canopy material when in its retracted position. The padding shall be firmly attached in such a manner that it will not slip, turn, twist, or distort from repeated usage. Allow replacement of the padding sides and top, and any inserts in sections, without replacing the entire canopy.

7. Changes in the position of the aircraft and/or passenger boarding bridge while the canopy is in contact with the fuselage shall not cause excessive loads to be exerted on the aircraft skin. Pressure exerted by closure against the aircraft fuselage shall not exceed 2 psig. Dependence upon the automatic leveling device to prevent such an occurrence is not acceptable.

8. Any chains, cables, or electrical wire that penetrates the floor or wall structure shall have adequate clearance, be protected, and securely fastened.

9. Cab seal shall be resilient bellows type. Tarpaulin types are not acceptable.
10. The canopy, when in its retracted position, shall be protected by a hood or other device to prevent water from laying in the folds of the canopy material when the bridge is not in use. Exterior liner shall include a third strap made from the same material and size as the existing end straps at center of top canopy liner, or other suitable method to prevent water ponding.

F. Service Assembly:

1. Provide a service door, stair and landing located on the right side of the cab. Door shall open outward.

2. Service door: The service door shall be hollow core, steel construction and shall meet or exceed a 3/4-hour fire rating. It shall be of a standard size with nominal dimensions of 2'-6" x 6'-8" with half wire mesh upper window.

   a. The door shall be provided with a Simplex Lock Set model # L1000 with five button combination lock with interior push plate and exterior pull handle and plate. If a key is required for the removal of the Lock Set, all lock cores shall be keyed the same.

   b. Provide and install a 30" x 28" stainless steel kick plate on both sides of the door.

   c. The door hardware shall be heavy duty industrial-type (using zinc plated or stainless steel standard U.S. hinges and finish hardware), and it shall be provided with an automatic heavy duty door closer installed on inside of the door.

   d. A door stop shall be provided to prevent damage to the passage set and/or door. Provide a latch to hold door in open position located on the second railing up from the floor.

   e. The door shall be constructed so the door and its components can be removed and reset or replaced for maintenance.

3. Service Platform: The service platform shall be constructed of open mesh (gripstrut) steel grating equipped with tubular steel handrails on the outside perimeter in accordance with OSHA Standards. All bridges shall be fitted with an access ladder with safety cage to the cab roof, accessible from the service landing platform. Cab roof handrails shall be included with the access ladder. All steel material shall have galvanized dipped finish. Platform and access ladder is required even if roof access is not required for regular maintenance. All PBB’s shall be equipped with stainless steel roof tie-off cables that run from the cab roof to the terminal for tying off to when working on roof (must be provided in all areas not protected by hand rail).

4. A photoelectric operated weatherproof light shall be provided above the landing which shall consist of a LED fixture installed in such a manner as to optimally illuminate the stairway and landing when actuated by a photoelectric switch.
5. Service Stairs: The service stair assembly shall be galvanized steel and equipped with equal self-adjusting risers with open mesh steel treads (gripstrut) and supported at the apron on minimum 6-inch diameter wheels.

   a. The wheels shall have solid rubber tires designed to operate on concrete or asphalt pavement in elevated temperature conditions.
   b. All steps shall have an equal rise, with a tread width of 28 inches and a minimum depth of 9-1/2 inches.
   c. Both sides of the stair shall be equipped with tubular galvanized steel handrails of proper height to comply with applicable building codes and OSHA Standards.
   d. Clear width between handrails shall be a minimum of 31 inches.
   e. The service stair shall be fully usable at all boarding bridge elevations and positions.

6. Baggage Handling

   a. Baggage Conveyor – A motorized baggage conveyor will be attached to the PBB/ service stairs with a structurally sound fastening system.

      (1) Baggage conveyor shall have the same minimum width as required of baggage slides and must be supported on the bottom end by rubber casters or wheels and automatically adjust to move with the PBB both horizontally and vertically.
      (2) Baggage conveyor shall be adjustable so that baggage personnel may raise or lower the conveyor rubber belt surface.
      (3) Baggage conveyor shall be equipped with all necessary items (trays and flip down side) for conveyance of motorized wheelchairs.
      (4) Baggage conveyor shall be capable of handling up to 500 lbs. of baggage or motorized equipment.
      (5) Baggage conveyor shall have controls at the both ends of the unit to allow baggage personnel to turn the device on or off, reverse the direction of the belt, and also have an ‘E-Stop’ function to stop the device in case of an emergency.
      (6) Baggage conveyor shall be powered from the PBB and operate on 120 VAC power and shall in no way impact the operation of the loading bridge if the conveyor is inoperable.
      (7) Baggage conveyor shall have a timer or time out function that will detect inactivity or provide for timed operation and turn off power to the unit accordingly.
      (8) Baggage conveyor lengths shall be chosen based on the PBB model and the aircraft serviced at the particular gate to avoid excessive angles.
(9) Baggage conveyor shall be designed for ease of maintenance from the ramp level for ease of repair, replacement, adjustment or inspection of belts, rollers, idler arms, and any other mechanical, electronic or electrical components.

7. Service/maintenance stair and cab roof handrails shall be provided for OSHA- approved access to service equipment.

G. Drive Column: The drive systems shall be either hydraulic or electro-mechanical and meet the criteria listed below:

1. Vertical Drive- Hydraulic:
   a. The hydraulic pump and motor drive for vertical travel of the bridge shall be an integral part of the drive wheel assembly, accommodate and weight of the bridge, and operate smoothly and quietly.
   b. The hydraulic power system shall permit simultaneous vertical travel and horizontal travel and steering.
   c. The hydraulic power system shall utilize a heavy-duty oil-based hydraulic fluid with corrosion inhibitors.
   d. The operating temperature environment shall determine hydraulic oil viscosity. Coordinate hydraulic oil requirements with the manufacturer based on the Orlando environment.
   e. All hydraulic components shall be designed for maximum corrosion resistance and compatibility with the hydraulic fluid used.
   f. Vertical travel shall occur by driving two hydraulic cylinders to the desired height by means of solenoid-operated hydraulic valves.
   
g. Hydraulic cylinder rods shall be chrome plated. The hydraulic cylinders shall be equipped with a vertical drive pump brake (pilot-operated check valves) which automatically releases when hydraulic pump(s) are in operation and vertical motion, up or down, is signaled from the operator's console or from the auto-level circuit.
   h. Vertical rate of travel shall be adjustable from 2.0 to 3.6 feet per minute.
   i. Pilot-operated check valves located at hydraulic cylinders shall prevent bridge downward movement in the event of a total hydraulic system failure, including rupture of any hydraulic hose in the system.
   j. Each drive column shall be designed to support the full weight of the bridge if the other should fail.
   k. Provide manual vent valves at the high points of the vertical drive system to bleed air from the hydraulic system.
2. **Vertical Drive- Electro-Mechanical:**

   a. The bridge shall be moved vertically by means of two re-circulating ball bearing screw assemblies. Each assembly shall be independent of the other, with individual motors. Each assembly shall be capable of supporting the passenger boarding bridge under full design load. The lifting mechanism shall hold its position at any elevation within the travel range with or without power supplied.

   b. The ball screw ball nut shall be equipped with wiper brushes to remove grit or dirt from screw threads and a self-locking acme-type thread which will prevent unit collapse in the event of ball nut failure.

   c. The vertical drive motors shall be AC induction motors with integral reducer and brake. The brakes shall be spring-applied and electrically released only when signal is received from the operator's console or the auto-level system.

   d. The brakes shall hold securely at all elevations, without creeping, whether the bridge is in operation or not.

   e. A fault detector shall sense differential motion of the ball screw assemblies. The fault detector circuit shall shut down the electrical power to the vertical drive motors and set the brakes independently of the operator if a fault is detected.

   f. A tapered collar that prevents the screw from disengaging the ball nut shall be attached to the ball screw's lower end.

   g. Boarding bridge vertical rate of travel shall be a constant speed.

   h. Reference stripes shall be painted or mechanically fastened on the inner tube(s) to indicate column travel limits, both high and low.

   i. Backup emergency plunger-type limit switches shall be provided in the vertical circuit, for both high and low limits.

   j. Inspection holes in each column tube shall be provided to allow baroscopic inspection of the ball screw surface. All holes shall be aligned in inner and outer column tubes. Cover plates shall be provided in outer tube.

3. **Horizontal Drive - Electro-Mechanical:**

   a. A variable speed electro-mechanical drive system shall provide horizontal travel of the passenger boarding bridge. The drive shall be two-wheeled with solid rubber tires.

   b. An AC gear motor shall independently drive each wheel. The gear motors shall be provided with integral brakes. Solid-state variable frequency motor controllers shall drive the AC motors. The controller shall provide built-in diagnostics to assist in trouble shooting.
c. A regenerative braking system shall allow the bridge to come to a smooth, controlled stop. Integral electrically-released spring actuated brakes shall be provided with each drive motor and shall lock the bridge in place whenever electrical power is cut off, either by moving the control lever to the neutral position or if power fails.

d. Provide a manual override to release drive wheel brakes to permit towing the passenger boarding bridge into or out of position on the apron in case of power failure. The override system shall be mechanically interlocked to preclude normal operation with the brakes locked out.

e. Connection lugs shall be provided to allow the bridges to be towed in the event of power failures.

f. Provide positive identification for both the front and backsides of the wheel bogie. Such identification shall be clearly readable by the operator while operating the control panel. Include instrumentation (a wheel bogey position indicator) on the control console.

4. Wheels and Tires:

   a. Passenger boarding bridge wheels and tires shall be of sufficient width and surface quality to preclude damage to apron pavement and shall be designed to operate on Portland cement or asphalt pavement.

   b. The tires shall be solid rubber type suitable for use by passenger boarding bridges. Tires shall be manufactured of a rubber compound that will not chip or fray at the edges, and not be affected or damaged due to contact with oil, lubricating and hydraulic fluids, and/or fuels from aircraft and servicing equipment, including Skydrol hydraulic fluid.

   c. Each tire shall have a wheel loading, under full, dead and live loading, not to exceed 300 psi. Only the wheel to axle hub bolts/nuts shall be able to be removed while the wheel is mounted on the wheel bogie.

   d. The wheel and tire changing procedures shall be specified in the Maintenance Manual.

H. Controls: All operations of the Passenger Boarding Bridge shall be controlled by a PLC manufactured by Allen – Bradley (alternative PLCs can be suggested to the Owner for consideration.)

1. Control Station General Requirements:

   a. Locate all passenger boarding bridge operator controls on the bridge cab control console in a position that provides maximum operator visibility as the bridge is maneuvered near the aircraft with the cab weather door closed.
b. Locate the operator control station to provide adequate space for the operator and maintenance access to the electrical control components as required by voltage classification in the National Electrical Code.

2. Control Console: The control console shall be located in the operator compartment and protected from the outside environment. The control console shall be tamper and theft proof. Provide two door locks, top and bottom, and hold open gas shock. Provide hinged console face and support rod.

a. Provide lighted and labeled controls for all switches and indicators. Console shall have a lamp test button to test all console lamps and alarms. Lamp test shall be enabled in the operator switch "OFF" position only and shall supply 110 volts or 24VDC to console lamps. All console lamps shall be LED.

b. Controls: All passenger boarding bridge motion controls shall be the momentary contact (dead man) type. All motion controls shall be located to be relative to the function of the passenger boarding bridge being controlled (i.e., with raise and lower functions, the "RAISE" push button will be located above the "LOWER" push button). The control console includes the following control switches and indications. All switches shall be Cutler Hammer or Square D with engraved lens. A touch screen located on the control panel is acceptable for various secondary functions.

(1) Master Control Switch, Off/Operate/Auto (Automatic Leveling) Card reader must capture user who initiates use of the PBB/auto level as well as user who terminates use of the PBB/auto level.
   • Provide interfacing for PACS card reader. Provide all necessary connections, switches, cabling and programming to utilize the PACS card reader to enable PBB control.
   • PACS card reader shall remove the requirement for a key for normal operation of the PBB.
   • Provide support to the owner within the service agreement and/or warranty to assist with this type of control interface.
   • Require a maintenance access/override to be utilized should a card reader fail.

(2) Power On (Green illuminated) (Black Button).

(3) Cab Rotate Left and Right (White illuminated) (Black Button).

(4) Canopy Up/Down Left Side (White Illuminated) (Green Button/Arrow).
(5) Canopy Up/Down Right Side (White illuminated) (Green Button/Arrow).
(6) Cab Floor in Auto On/Off (White illuminated) (Black ON Button, Red OFF Button).
(7) Cab Floor in Manual Tilt Left or Right (White illuminated).
(8) Travel Warning Bell (Blue Button).
(9) Steering Left of Right (White illuminated) (Blue Button Arrow).
(10) Forward or Reverse Spring Loaded 2-way Joystick.
(11) Spring Loaded 4-way Quad Joystick.
(12) Vertical Up or Down (White illuminated) (Blue Button/Arrow).
(13) Lamp Test (Black Button).
(14) Flood Lights On/Off (White illuminated) (Black ON Button, Red OFF Button).
(16) 400 Hz Cable Hoist Deployed Light (Yellow lens illuminated).
(17) 400 Hz On Light (Red lens illuminated) (Horizontal drive interlock applied and alarm).
(18) Warning Alarm for 400Hz Failure.
(19) Warning Alarm for Auto Level Failure.
(20) Oversteer Alarm (Red lens illuminated) if oversteer is possible without use of a mechanical lock.
(21) Door Open Alarm Blank White (White illuminated).
(22) Lift Column Fault (Red illuminated).
(23) Canopy Down (Red illuminated).
(24) Auto Level On (Yellow illuminated).
(25) Auto Level Alarm (Red illuminated).
(26) Swing Limit Warning (Red illuminated).
(27) Swing Digital Readout (Black Button).
(28) Height Meter and Swing Read Meter (LED).
(29) Wheel Position Indicator, showing arrow and wheels.
(30) Emergency Stop (Red Button).
(31) Preconditioned Air in use (Green).
(32) Pair cabin temperature by-pass switch.
(33) PCAir cabin by-pass temperature potentiometer.
(34) Maintenance Override Key Switch.

c. Labeling: All switches and/or push buttons shall be labeled. Each function shall be spelled out (i.e. "Canopy", "Extend", "Retract").
d. Warning devices:

(1) Swing Limits.
(2) Slope Limits.
(3) Auto Level (Red Strobe Light- Failure Indicator).
(4) Vertical Column Fault lighted indicator/alarm on Control Console.
(5) Over steer.
(6) Warning Rotating Beacon or strobe beacon under cab when bridge is in Operation Mode only.
(7) 110-volt Travel Alarm Bell.

3. Hydraulic Manual Control System for Emergency Use: Each passenger boarding bridge which uses a hydraulic motion or lift control system shall be equipped with a manual control (dead man type) system to permit bridge operation at ground level in the event of a complete control system failure. The controls shall be located in a safe area so the operator has a clear unobstructed view of the aircraft spacer interface, and the passenger boarding bridge will not injure the operator in any way while manually maneuvering the passenger boarding bridge at ground level.

4. Interlocks:

a. General: The control system logic shall preclude damage to circuits or mechanical systems due to simultaneous contrary control signals or an otherwise unsafe control signal combination.

b. Contrary Control Signal Interlock: All boarding bridge motion shall be precluded whenever contrary control signals (i.e., extend and retract) are activated simultaneously.

c. Control Console Doors: Provide safety interlock switches on all control console doors; upper console, console face and console front door.

d. Canopy Interlock: Interlock shall prevent all forward or reverse horizontal drive operation when canopy is lowered. All passenger boarding bridge motion, except auto-leveling, shall be possible only when the canopy is in a fully retracted position. Provide for a dead man- type mechanical override to permit the retraction only in case of mechanical emergency or bridge failure with the canopy not in the fully retracted position.

e. 400 Hz Interlock: Interlock shall prevent horizontal drive operation when the 400 Hz unit is engaged, and the hoist is lowered. The control console shall be equipped with warning horn and flashing light to indicate when:

(1) Bridge operation is attempted and 400 Hz hoist is lowered.
(2) 400 Hz cable is engaged and the unit is operating (to be independent of each other).
f. The passenger boarding bridge shall provide a dry contact interface that is interconnected by a signal provided by the PCA Unit. The horizontal drive system shall then be interlocked to preclude passenger boarding bridge movement if the PCA is in "run" operation. PBB manufacturer shall coordinate this interconnection with the PCA Unit and the PBB shall provide all specified interconnections between the PBB and the PCA system.

5. Limit Switches: Electrical limit switches shall be provided on all passenger boarding bridge movement actuator systems, cab spacer and canopy system. These shall include fail-safe proximity limit switches activated near the end of horizontal and vertical travel. These switches shall de-energize their respective actuator systems when contacted.
   a. Bridge extension and retraction: Provide two limit switches, one for slow down and one for stop.
   b. Cab rotation: Provide limit switches to control the extremes of cab rotation.
   c. Drive wheel: Provide limit switches to control over steer of drive wheels.
   d. Rotunda rotation: The rotunda shall be equipped with adjustable limit switches to control the traversable area of the bridge. If the bridge activates the limit switch, all power shall be disconnected, stopping the bridge. The limit switch located on the rotunda shall only be reset locally when activated.
   e. When the 400 Hz power is energized all bridge motion (except for auto leveling) shall be precluded. (Option must be available for specific air carrier needs to reprogram this function.)
   f. Upper Console: Cabinet or housing for AC drive packs shall be:
      (1) Waterproof.
      (2) Equipped with a service light.
      (3) Equipped with a thermostatically controlled heat strip.

6. Building Management System (BMS) Interface: The PBB, GPU and PCA control PLCs shall be connected to the building network. Refer to section 2.6 M. within this specification for connectivity requirements. Communication with the BMS shall be via the PBB, GPU or PCA control PLC manufacturer’s standard communications protocol over Ethernet (example: Modbus over Ethernet). All PLC alarms and status messages shall be able to be monitored remotely via this connection. The following alarms and operational statuses specifically shall be programmed into the BMS for monitoring for each PBB:
   a. Auto Level Alarm.
   b. All Anti-Collision Alarms.
   c. PBB On.
   d. PBB in Auto.
e. PBB general trouble Alarm.
f. PBB in Maintenance Override.
g. GPU On / Off.
h. GPU Power Output (KW).
i. PCA On / Off.
j. PCA Mode Wide body, Narrow Body, etc.)
k. PCA Output Pressure.
l. PCA Output Temperature.
m. All GPU, PCAir, PBB failure alarms, faults and diagnostic issues must be transmitted in real time.
n. Equipment status
o. Up to five additional points as may be requested by the owner.

7. Anti-Collision System: For PBBs that are to be used in combination with another PBB to service the same aircraft, or PBBs that could impact each other, anti-collision system(s) shall be installed.
   a. This system shall be of the manufacturer’s standard design. The system shall use any combination of proximity detection devices or PBB position indicators as required to ensure bridge separation.
   b. The system shall place the PBB in slow down mode when approaching the neighboring bridge. The distance required shall be as recommended by the manufacturer but in no case shall be less than 10 feet.
   c. The system shall stop the PBB before a collision occurs. The distance required shall be as recommended by the manufacturer but in no case shall allow the PBBs to contact each other even if the PBB is rocking due to momentum.

I. Automatic Leveling:

1. Passenger boarding bridge shall be equipped with an automatic leveling device. The auto-leveling system shall automatically respond to intermittent changes in aircraft elevation that occur during aircraft loading and unloading to maintain a constant relationship between the aircraft floor and the boarding bridge floor. The auto-leveling system shall function with equal reliability for all aircraft contours.
   a. The auto-leveling system shall be engaged when the master control is positioned to "AUTO".
   b. The leveling system shall not exert any stress on the boarding bridge.
   c. The leveling device actuating mechanism or sensor which contacts the aircraft shall be located on the right side of the cab behind the canopy actuator covers.
   d. The leveling system shall function reliably on all aircraft specified regardless of door location, fuselage contour, and aircraft door sill.
height and shall allow a required range of adjustment for
designated aircraft movement up or down.

e. The auto-leveler circuit shall include an adjustable solid-state
sustained travel timer. The timer shall limit the automatic leveler's
continuous response in either direction to an adjustable range from
1.6 to 6 seconds. A fault condition shall be identified when the
timer has tripped. Upon sensing of a fault condition, all motor
power shall be disconnected, and audible and visual alarms shall
be energized.

f. The circuitry shall include an audible alarm and a red warning light
at the control station, and the rotunda and a red strobe light on the
exterior base of the PBB in the general ramp area, which shall
produce a distinctively different sound than any other on the
passenger boarding bridge. These warning systems shall be
automatically activated by any movement of the PBB except when
in the auto level mode.

g. The orange rotating beacon shall illuminate when the key switch is
in the "Operate" position.

h. When the timer circuit is interrupted, the vertical lift system shall
automatically be locked in position and de-energized, and a vertical
travel brake automatically engaged.

J. Lighting:

1. All PBB lighting fixtures shall utilize LED technology and fixtures for light
sources. References to incandescent or other light sources within this
document are only to be used for approximate light output values. Design
enhancements such as custom interior lighting effects that may lead to an
enhanced customer/passenger experience may be considered by the
Owner.

2. Exterior Lighting:
   a. Service platform light shall be controlled by a photo cell mounted
      on the exterior of the PBB.
   b. Cab exterior LED light.
   c. Exterior flood lights: Weatherproof
   d. Provide two (2) adjustable flood lights with safety cages having a
      minimum intensity of three hundred (300) watts each (LED
equivalent) and located on the exterior base of the bridge-
head/cab, and controlled from the control panel. An additional
flood light shall illuminate the area around the drive column and be
controlled by the photo cell for the service platform light.
   e. Provide a lit gate identification sign consistent with signs installed
on loading bridges recently installed in the Orlando North Terminal
with contrasting colors.
3. Interior Lighting: Provide separate lighting circuits for the PBB. Each shall be controlled independently by motion detectors located at the cab and rotunda for apron drive bridges. All receptacle device plate covers shall be stainless steel. Lights shall be placed every eight (8) feet in the boarding bridge and oriented so there will be no conflicts with the installation of the bridge cooling system ductwork.

   a. Lamps: LED fixtures and bulbs.
   b. Controller shall be provided for O°F cold weather rated applications.
   c. Tunnel: LED fixtures and bulbs.
   d. Rotunda: LED fixtures and bulbs.
   e. Cab: Console LED fixtures and bulbs

4. Emergency lighting controller shall be provided in the following locations to operate when bridge power is lost. The red power indicating light shall be located in the tunnel light fixture.

   a. Rotunda ceiling light.
   b. A-tunnel middle and end.
   c. B-tunnel middle and end.
   d. C-tunnel middle and end.
   e. Cab external light.

5. Emergency LED Lamp Power Supply: Provide self-contained battery powered inverter unit for direct mounting in designated LED fixtures. Provide unit with 120Vac input, fully automatic two rate charger, nickel-cadmium battery, automatic low voltage battery disconnect, AC "ON" pilot light, and test switch. Unit shall automatically transfer to battery supply on loss of normal AC power and operate one 4-foot LED fixture with a minimum output of 1100 lumens for 1-1/2 hours.

6. Illumination Level: Intensity of illumination will be measured at the floor.

   a. Tunnel and Cab: 25 foot-candles average.
   b. Cab lighting: Twenty (20) foot-candles. Control panel area shall have sixty (60) foot-candles. It shall be possible for the operator to turn off cab lights at the control console to eliminate glare when positioning the bridge to the aircraft during hours of darkness.

7. All lighting fixtures shall have adequate access for replacement and fixture cleaning.

8. Provide 120V, 20-amp electrical circuit with conductors terminated in a weatherproof junction box located on the underside of the cab.

9. Provide electrical circuit to extend the building lighting circuit to power a bridge mounted sign located at the cab end. Provide a 277 volt, 20-amp circuit and conductors from the face of the terminal building under the
passenger boarding bridge to the weatherproof junction box located on the underside of the cab.

10. A minimum of eight (8) spare conductors shall be provided from the rotunda to the control panel for future systems. In addition, provide and install two (2) 12-pair sheaved control cables (22-gauge wire) from a weatherproof junction box under the rotunda to weatherproof box under the cab for the PCA system, such as cabin temperature control sensor, jumbo gates wiring for the second hose damper, etc. Coordinate number, locations and routing with Owner's representative.

K. Insulation:

1. Insulation shall be provided in the walls and ceiling.

2. Insulation materials shall not be exposed to the weather or applied with glues or tape.

3. All insulation materials shall be covered with appropriate weather resistant finish material.

4. Insulation shall be installed full width of ceiling with all areas insulated. Insulation shall butt against light frame edges with separate piece over light fixture.

5. The design shall eliminate the possibility of condensation in the insulation that might cause unsightly water stains appearing on the interior finished surfaces and rust at the interface of the insulation and outer shell.

6. The use of asbestos or asbestos products as an insulation material or for any other use is not permitted.

L. Windows: Provide windows as follows:

1. Cab: Provide clear safety glass front window to permit operator at control console full view of the aircraft contact area. Provided a wire reinforced safety glass window to the left side of the control station.

2. Cab roll up side curtains: Provide two wire-reinforced glass windows in every other panel, 1/4" thick x 1-3/4" wide x 12" long. The windows shall be in the low normal positions on the right side and high normal position on the left side.

3. Service door: Equip the door with a 1/4" thick x 14-7/8" wide x 2' 5-7/8" high wire reinforced glass window.

4. The manufacturer may propose the use of windows as a customer enhanced experience in the fixed bridges or passenger boarding bridges and/or tunnels for the owner's consideration.
M. Utilities:

1. The apron drive bridges telescoping tunnels shall be furnished with an under bridge cable assembly consisting of twelve (12) Category 6 cables from cab to rotunda. Connect from rotunda to communications enclosure provided at the exterior terminal wall. Terminate cables as specified below.
   a. Telephone: One (1) of the Category 6 cables shall be reserved for a VoIP telephone. Terminate cable in cab near console on wall. An RJ-45 outlet for the installation of telephone or intercom equipment shall be in an enclosure located on left side wall adjacent to the control console no higher than 54 inches above the floor or as dictated by ADA requirements. Telephone instrument to be furnished by the Authority.
   b. Video Surveillance Cameras: Two (2) of the Category 6 cables shall be reserved for security cameras.
      (1) One (1) cable shall be used for the Authority security camera.
      (2) One (1) cable shall be used for future airline camera.
      (3) Both camera cables shall be routed to the communications panel in the cab and terminated in the patch panel.
      (4) Furnish and install a 4”x4” ceiling-mounted backbox to support an Authority security camera. Conduit shall be routed to the communications panel in the cab. Route security camera cable in conduit to the backbox from the communications panel. Terminate cable in an RJ-45 connector. Refer to security drawings for camera location within the PBB.
   c. VDGS Operator Station: (1) of the Category 6 cables shall be reserved for the VDGS operator station. Coordinate with the work of Division 27 to determine termination type and location.
   d. BMS Interface: One (1) of the Category 6 cables shall be reserved for the PBB control PLC connection. An RJ-45 outlet shall be installed in the PLC enclosure for connection to the PLC. Connection between the PLC and RJ-45 connector shall be via a standard Category 6 jumper cable
   e. PCA: One (1) of the Category 6 cables shall be reserved for the PCA control PLC connection. An RJ-45 outlet shall be installed in the PLC enclosure for connection to the PLC. Connection between the PLC and RJ-45 connector shall be via a standard Category 6 jumper cable.
   f. 400 Hz: One (1) of the Category 6 cables shall be reserved for the 400 Hz control PLC connection. An RJ-45 outlet shall be installed in the PLC enclosure for connection to the PLC. Connection between the PLC and RJ-45 connector shall be via a standard Category 6 jumper cable.
   g. WIFI Antenna: One (1) of the Category 6 cables shall be reserved for the WIFI antenna. Cable shall be routed to the antenna via the communications panel located in the cab. The cable shall be terminated in the communications panel and then routed to the WIFI antenna.
h. Bag Tag Printer: One (1) of the Category 6 cables shall be reserved for a bag tag printer. Cable shall be routed to and terminated in the communications panel located in the PBB cab.

i. Spare Cables: Remaining three (3) Category 6 cables shall be routed to and terminated in the communications panel located in the PBB cab.

2. Convenience Outlets: On a dedicated circuit, Ground Fault Interrupter (GFI) duplex outlets (unswitched 120 volt, 1 phase, 15 amp) shall be located as follows:

a. A and C Tunnels.

b. Left side wall of the cab, adjacent to the operator's control console.

c. Rotunda.

d. Fixed tunnel

e. Drive column wheel carriage crossbeam.

f. As may be needed for the KCI (or approved alternate) bridge belt loader

3. The apron drive bridge telescoping tunnels shall be equipped with a Pantograph style cable carrier transport system, for the 60 Hz power transmission cables to the 400 Hz frequency converter mounted under the aircraft cab, boarding bridge power PCA control cable, and preconditioned air unit power receptacle. The cable transport system shall be mounted on the exterior sides or top of the PBB. This system must be accessible to maintenance personnel for inspection.

2.7 ACCESSORIES

A. Cab Safety Chain: Provide cab safety chain installed forward of the cab doors with red plastic sleeve.

B. Mirrors: Provide two 18-inch circular convex safety mirrors with stainless steel backing. Locate on the left side of the cab to enable the operator to have full view of the apron and drive wheels and on service platform railing to allow operator to view the bottom of the service stairs from the control console.

C. Handrails: Handrails shall be Americans with Disabilities Act (ADA) compliant (1-1/4" to 1-1/2" O.D.), mounted at a height of 34" to 38" above floor surface, with a minimum clearance from the sidewall of 1-112" and with return ends. Provide handrails in the following locations:

1. A-tunnel, full length on the right side and left side.

2. Transition ramp areas, both sides of the tunnel. The handrail shall extend over the transition ramps and shall be sloped at a uniform dimension above the ramp.
D. Guardrail: Provide a guardrail of the same size and shape as the handrails located at the junction of the “A” and “B” tunnels. The guardrail is to be positioned such that it diverts people from encountering the horizontal air conditioning duct installed at the ceiling of the “A” tunnel.

E. Jack Stand: Provide three (3) standard jack stand structures suitable to straddle and support the boarding bridge from the ground. It shall be designed to support the weight of the bridge for servicing undercarriage components, and the cab lifting mechanisms. Furnish all jack stands with hydraulic jacks (if necessary). The jack stands shall be delivered prior to substantial completion.

F. Tow Bar: Provide one tow bar designed and constructed to be stored, transported and connected to the boarding bridge undercarriage for towing of a disabled unit. Tow bar shall be configured for connection to a standard height hitch on a pickup truck.

G. Gate Sign: Provide outdoor lighting and signage for sign as indicated, complete with wiring and circuit over current protection and disconnect.

H. Pre-Conditioned Air and Bridge Cooling: Pre-conditioned air (Air Handlers) and bridge cooling systems (PCAir) shall be provided in accordance with specification section 23 90 00 – Pre-Conditioned Air Units and Specialties. Suggested mounting locations are as shown on the plans but PBB manufacturer specific standard mounting shall be acceptable. All mounting brackets and weldments required for the installation of the equipment shall be performed in the factory prior to shipment of the equipment.

I. 400 Hz Ground Power Units (GPU): 400 Hz GPUs shall be provided in accordance with specification section 26 61 00 – 400HZ Frequency Converters. Suggested mounting locations are as shown on the plans but PBB manufacturer specific standard mounting shall be acceptable. All mounting brackets and weldments required for the installation of the equipment shall be performed in the factory prior to shipment of the equipment.

J. Potable Water Cabinets: Potable water cabinets shall be provided in accordance with specification section 22 37 00 – Potable Water Cabinet. The potable water cabinet shall be mounted on PBB. Suggested mounting locations are as shown on the plans but PBB manufacturer specific standard mounting shall be acceptable. All mounting brackets and weldments required for the installation of the equipment shall be performed in the factory prior to shipment of the equipment.

K. Provide a KCI (or owner alternate approved) passenger boarding bridge belt loader for each bridge installed.

L. Hurricane Tie Downs:

1. The Contractor shall provide hurricane tie down requirement details and verify their location as shown on the plans in accordance with the PBB
manufacturer’s recommendation and adjust as necessary.

2. The PBB manufacturer shall provide a complete hurricane tie-down appurtenance kit for each PBB, including equipment and incidentals needed to tie-down the PBB in hurricane wind loads up to 170 miles per hour.

2.8 FINISHES

A. Exterior Paint System: All exterior steel surfaces shall be protected from corrosion by the following:

1. Surface Preparation: De-burr and remove all weld splatter and dingle berries, also grind excessive/rough welds smooth, and round sharp edges and corners. Contaminants (oil, grease, dirt, etc.) shall be removed from surfaces in accordance with SSPC-SPI (Solvent Cleaning) requirements and appropriate SSPC commentaries. Exterior steel surfaces shall be dry abrasive blast cleaned with garnet grit in accordance with SSPC-SP6 (Commercial Blast Cleaning) or better to obtain an angular 1-3 mils profile depth. If steel is not new or is corroded, blast to SSPC-PC 10 standard. Thoroughly clean with dry high pressure air to remove dust and grit, then mask all necessary areas before priming. The blast cleaned surface must be primed soon enough to prevent corrosion form occurring on the profile.

2. Prime Coat: Apply one coat of Sherwin-Williams chromate free High Build Epoxy Primer E65AC8/E65AC12 (or equivalent) or American Coatings Rustlock 8010 Series Epoxy-two component (or equivalent) at a dry film thickness of 12 mils to the exterior surfaces, per manufacturers' instructions in the Product Data sheet. Follow all manufacturers' handling and curing instructions.

3. Finish Coat: Apply one coat of Sherwin-Williams "POLANE H" polyurethane (or equivalent) or American Coatings WB Series Roof Mastic (or equivalent) for the roof topcoat and American Coatings SU Series (or equivalent) for all other surfaces; finish paint to a dry film thickness of 12 mils, per manufacturers' instructions in the Product Data sheet. Follow all manufacturers' handling and curing instructions. Color in accordance with table below.

4. Sealer Finish Coat: Minimum 6 mil DFT.

5. Total exterior dry film thickness: 30 mils minimum.

6. Colors and finishes shall be selected by the Owner from full color range.

7. All exterior finishes shall be warranted for a period of five (5) years for the date of Final Acceptance.

8. Approved Manufacturers:
a. Products manufactured by Sherwin-Williams are listed in order to establish a level of quality and performance required on this project.

b. Equivalent materials manufactured by American Coatings, Carboline or Tnemec may be submitted for approval by the Owner, providing they are of the same generic type as the specified products and meet or exceed the ASTM performance criteria of the specific projects.

B. Exposed Interior Paint System:

1. Surface Preparation: De-burr and remove all weld splatter and dingle berries, also grind excessive/rough welds smooth, and round sharp edges and corners. Contaminants (oil, grease, dirt, etc.) shall be removed from surfaces in accordance with SSPC-SP1 (Solvent Cleaning) requirements and appropriate SSPC commentaries. Mechanical clean in accordance with SSPC-SP3 (Power Tool Cleaning) to remove loose scale and contaminants from the surfaces where required. The cab surface shall be dry abrasive blast cleaned with garnet grit in accordance with SSPC-SP6 (Commercial Blast Cleaning) or better to obtain an angular at 1-3 mils profile depth. If steel is not new or is corroded, blast to SSPC-PC 10 standard. Thoroughly clean with dry high pressure air to remove dust and grit. Then mask all necessary areas before priming. The blast cleaned surface must be primed soon enough to prevent corrosion form occurring on the profile.

2. Prime Coat: Apply one coat of Sherwin-Williams chromate free High Build Epoxy Primer E65AC8/E65AC12 (or equivalent) or American Coatings Rustlock 8010 Series Epoxy-two component (or equivalent) at a dry film thickness of 12 mils to the cab surfaces, per manufacturers' instructions in the Product Data sheet. Follow all manufacturers' handling and curing instructions.

3. Finish Coat: Apply one coat of Sherwin-Williams "POLANE H" polyurethane (or equivalent) or American Coatings SU Series (or equivalent) finish paint to a dry film thickness of 12 mils, per manufacturers' instructions in the Product Data sheet. Follow all manufacturers' handling and curing instructions. Color in accordance with table below.

4. Sealer Finish Coat: Minimum 6 mil DFT.

5. Total interior dry film thickness: 30 mils minimum.

6. Colors and finishes shall be selected by the Owner from full color range.

7. Approved Manufacturers:

a. Products manufactured by Sherwin-Williams are listed in order to establish a level of quality and performance required on this project.
b. Equivalent materials manufactured by American Coatings, Carboline or Tnemec may be submitted for approval by the Owner, providing they are of the same generic type as the specified products and meet or exceed the ASTM performance criteria of the specific projects.

C. Non-Exposed Interior Paint System:

1. Surface Preparation: Contaminants (oil, grease, dirt, etc.) shall be removed from surfaces in accordance with SSPC-SP1 (Solvent Cleaning) requirements and appropriate SSPC commentaries. The minimum surface preparation for all non-exposed interior surfaces shall be in accordance with SSPC-SP3 (Power Tool Cleaning) at 1-3 mils profile depth. Thoroughly clean with dry high pressure air to remove dust and loose scale. The mask all necessary areas before priming.

2. Primer Coat: Apply one coat of Sherwin-Williams corrosion resistant lead and chromate free, Kern AQUA 70P (or equivalent) metal primer at a dry film thickness of 4-6 mils, per manufacturers' instructions in the Product Data Sheet. Follow all manufacturers' handling and curing instructions.

3. Approved Manufacturers:
   a. Products manufactured by Sherwin-Williams are listed in order to establish a level of quality and performance required on this project.
   b. Equivalent materials manufactured by American Coatings, Carboline or Tnemec may be submitted for approval by the Owner, providing they are of the same generic type as the specified products and meet or exceed the ASTM performance criteria of the specific projects.

4. Small Miscellaneous Assemblies:
   a. Dry abrasive blast clean in accordance with SSPC-SP 6 or better or obtain a 0.5-1.5 mil profile. If steel is not new or is corroded, blast to SSPC-PC 10 standard.
   b. Apply one coat of MORTON INTL. Corvel Zinc Rich, Gray, Epoxy 3/4 Powder 13-7007 (or equivalent) heated to 350 F for 35 minutes at 4-6 mils.

D. Exterior colors and finishes shall be as follows (Owner to select color from full range of custom color chart):

1. All PBB's to be painted with exterior colors as determined by the Owner.
2. Tunnels, cab, sides, underside GOAA Arctic White
3. Roof White non-skid
4. Cab curtain side covers GOAA Arctic White
5. Service stairs, landing & handrails Galvanized Steel
6. Upper lift column section, outer tubes: GOAA Arctic White
7. Inner-tubes, lower drive column section & rotunda support column below the bearing: GOAA Arctic White
8. Aircraft closure hood & side skirts: Grey
9. Cab area forward of the cab doors, actuator covers and the outside door face: GOAA Arctic White

E. Interior colors and finishes shall be as follows:

1. Wall trim: Aluminum/Black Centers
2. Tunnel end trim: Color selected by Owner
3. Ceiling to wall trim: Flat Black
4. Kick plate: Flat Black
5. B&C Tunnel Rain Gutters: Flat Black w/ Yellow & Black Zebra tape/paint
6. Flooring molding: Aluminum Clear Anodized
7. Cab floor: Black Ribbed Rubber
8. Ceilings (All) 7 ¼”: Aluminum (brushed) or of coiled coated galvanealed steel sheet Color to be selected by the Owner
9. Rotunda & cab walls: Color to be selected by the Owner
10. Flooring: Mohawk MCR-191 Round Profile Gauge 3.00mm 65025-123, norament round 0733, Steel Blue or owner approved similar product.

11. Interior Tunnel Walls:
    a. Interior wall treatment shall consist of 3/8-inch thick fire-rated particle board sandwiched between two high pressure laminates (Wilson Art Color Product, Nevamar, Formica or approved equal) wall panels laminated on both sides to prevent bowing, four feet on centers with aluminum trim and recessed black accent strips or 20 gauge (minimum) coiled coated galvanealed flat steel panels four feet on centers with trim finished in accordance with the specified exposed interior paint system. Provide water drain holes in the bottom J-channel.
    b. The finished product shall carry a UL label and shall meet the flame spread test as listed in ASTM E84.
    c. The design shall allow each panel to be removed individually.
    d. Owner to select color and finish from full range of premium and custom color chart.

12. Interior Floor:
a. Tunnel floors shall be constructed of minimum 3/8-inch aluminum or smooth galvannealed steel.

b. The cab, cab bubble, and rotunda floors shall be constructed of minimum 3/8-inch aluminum or smooth galvannealed steel.

c. Transition ramps shall be constructed of 3/8-inch aluminum or galvanized steel. Transition ramps shall be hinged. A tunnel ramp shall be full width of tunnel. Nosing on ramps shall have abrasive anti-skid surface. Ramps shall slope starting in each tunnel to meet ADA slope requirements. Ramps shall not cut or mark the tunnel floor the ramp is riding over. Ramps shall be covered with 1/4-inch ribbed rubber matting with yellow chamfered edge.

d. Tunnels and rotunda floors, except as noted, shall be covered with selected rubber flooring.

e. Cab Floor Finish: One-quarter inch ribbed fire-resistant black rubber with anti-skid surface shall be installed from terminal side of service door to the aircraft spacer assembly. Rain gutter ends, door threshold and rubber matting seams shall be sealed with black silicone.

f. Gutters: Install yellow/black safety tape/paint in all gutters.

13. Interior Ceiling:

a. All ceiling areas shall be finished with linear solid metal-faced panels (matching the width of the light fixtures) or painted 20 gauge (minimum) coiled coated galvannealed steel panels running the width of the bridge. Panels shall be separated by approximately ½ to ¾ -inch black reveals. Panels shall be brushed aluminum tile or if utilizing aluminum or coiled coated galvannealed steel panels, finished in accordance with the specified exposed interior paint system. Owner shall make selection of either the brushed finish or the painted finish. The panels located at the ends of the light fixtures shall have a black finish to match the fixtures.

b. The aluminum corner molding that finishes the ends of the ceiling panels and top edge of the wall panels is painted black to match the light fixture.

14. Interior flashing shall be 1-inch wide x 1/8-inch thick with flat felt backing.

15. Architectural Metal and Trim Items: Anodized aluminum and other galvanized, aluminum, or stainless steel trim items shall have a satin finish.

16. Paints and flooring adhesives shall have a maximum VOC of 3.5 lbs. /gal for field applied applications. Stated VOC shall be un-thinned maximum as certified by the manufacturer.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. The Contract Documents indicate the location of each aircraft position at each gate. The Contractor shall be responsible for verifying all locations of aircraft positions for the various types of aircraft serviced at each gate, and advise the Owner's Representative of any conflict or code violations prior to beginning the fabrication of the passenger boarding bridge. Any modification to the Documents as necessary to eliminate conflicts or code violations will be made by the Owner's Authorized Representative (OAR).

2. Verify the exact terminal building door sill and bridge foundation elevation, and foundation bolt patterns and dimensions at each gate prior to preparation of shop drawings. Notify the Owner's Authorized Representative (OAR) of any discrepancies with Contract Documents or passenger boarding bridge requirements.

3. Verify apron elevations at each bridge location. Coordinate these elevations with the bridge operation requirements, layout and maximum slope.

3.2 INSTALLATION

A. Structural Support Elements:

1. All anchor bolts are existing or provided by others in the foundation construction, and shall be protected from bending and damage during PBB installation. After installation, tack weld the anchor nuts to the base or provide two nuts. All zinc coating removed or damaged by welding or any other means shall be cleaned and repaired with galvanizing repair primer meeting the requirements of Federal Specification TT-P-641 G (1), Type II.

2. An approved non-shrink grout shall be used underneath the column base plate and leveling-plate. Grout shall be a no-iron mix to avoid rust marks. Grouting of the rotunda base plate shall be formed and poured using the holes in the base plate. Grouting by dry packing and filling the center area with bags and blocks will not be acceptable. The grouting shall be done to American Concrete Institute or structural standards and as approved by the Owner's Representative.

   a. Grout shall be 3-inches minimum and 7-inches maximum.

   b. Setting of rotunda requires a leveling nut and washer on each anchor bolt on the underside of the rotunda base plate and one or two nuts and one washer on the top.
3. Flooring Installation: The Contractor shall furnish all flooring and install the flooring in strict accordance with the manufacturer's printed installation instructions and the following specifications.

a. Prior to installation, verify with the Owner’s Authorized Representative (OAR) all edging techniques, lines of demarcation between flooring and hard surfaced floor and wall areas, and treatment at doors and thresholds.

b. The contractor shall install the flooring by direct glue method, free of wrinkles.

c. Adhesive and primer shall be compatible.

d. Install edge strips where flooring abuts other flooring including door openings where thresholds are not indicated. Secure edge strips with countersunk flat head stainless steel screws at 12 inches on center maximum.

e. Finished appearance shall be smooth, level, free from misalignment, neatly cut and closely fitted at projections and openings, with joints as close and inconspicuous as possible.

f. After the flooring installation is complete, Contractor shall clean all drains, gutters and rain diverters to remove any excess material, construction debris and flooring cutouts, to provide an unobstructed free flowing drainage system.

g. Contractor to vacuum the flooring and cover with non-staining, protective materials.

4. During the on-site delivery, storage, and installation process, the Contractor shall be responsible for securing all PBB elements, tools and equipment against hurricane force winds.

3.3 FIELD QUALITY CONTROL

A. Inspection:

1. Preliminary Inspection:

a. Manufacturer's representative shall perform a functional inspection and demonstration of each unit at the installation site in the presence of the Owner's Representative.

b. Verification of compliance with this Specification shall be accomplished by inspection, review of data, demonstration, testing (if required), or combination of these.
2. Final Acceptance Inspection:
   a. Owner's Representative shall perform the final inspection of the unit after full compliance by the Contractor of all outstanding punch list items as determined from the preliminary inspection.
   b. Full acceptance of the unit shall be made in writing to the Contractor after satisfactory completion of all punch list items as determined by the Owner's Representative.

B. Manufacturer's Field Services:

1. Provide qualified manufacturer's technical representative and service personnel during the entire installation of the boarding bridge to assure a proper installation, and to ensure adequate and reliable field service support to correct any and all equipment failures that normally occur during the initial operating period.

2. In addition, this field service support representation shall be on-site from 3 a.m. to 12 a.m. midnight for three calendar days after each gate enters service as scheduled by the Owner. Thereafter in accordance with the warranty provisions of PART 1 - GENERAL 1.11 WARRANTY.

3. This representation shall be available to the Owner's Representative at no charge for the first 60 days after installation. The manufacturer's field service representative shall ensure the installer follows:
   a. The manufacturer's field installation manual.
   b. Compliance with all safety requirements.
   c. Accurate and complete reports and records maintenance.

END OF SECTION 34 77 12