PASSENGER BOARDING BRIDGE
AT
SYRACUSE HANCOCK INTERNATIONAL AIRPORT
SYRACUSE, NEW YORK

ADDENDUM #3

JULY 28, 2015

To All Holders of Contract Documents:

Your attention is directed to the following interpretations of, changes in, and additions to the Contract Documents for the above-referenced project. All bid adjustments caused by the content of the Addendum shall include the cost of materials and labor related to the items herein and for any subsequent adjustments to the contract documents to accommodate the work stated herein.

This Addendum is part of the Contract Documents in accordance with the provisions of the specification section 20-17. Contractors shall be responsible for the full context of changes, interpretations, and clarifications to both the drawings and specifications and shall take the same into consideration when preparing their bids. Indicate receipt of this Addendum in the space provided within the Proposal.

This addendum consists of 2 page(s) and 1 attachment(s).

SPECIFICATIONS

1. **DELETE SECTION 144010 AND SUBSTITUTE WITH REVISED** attached SECTION 144010 – PASSENGER BOARDING BRIDGE REV1 in its entirety.

CLARIFICATIONS

QUESTIONS:

1. General Provision Section 80-08 – Failure to complete on time
   This section states, “For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of this section) the sum of **ONE THOUSAND FIVE HUNDRED DOLLARS** ($1,500.00) will be deducted from any money due or to become due the Contractor or his or her surety.”
   We respectfully request liquidated damages be capped at 10%of the contract value.

   **ANSWER:**
   No changes to the amount of liquidated damages will be considered for this contract. Assessment of liquidated damages is at the discretion of the Owner and would be contingent upon the Contractor’s adherence to their schedule and subsequent progression of work; ref Section 80-03, 80-05. Temporary suspension(s) of work and modification to Contract Time limit may be considered after contract award.
2. **General Provision Section 90-06 – Partial Payments**
Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the Engineer, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications.”
Please confirm it will be acceptable to include progress billings for engineering, material, and labor incurred during the manufacturing process and prior to delivery.

**ANSWER:**
Progress payments must be coordinated through the General & Electrical Contractors.

3. **General Provision Section 30-05 – Requirements of contract bonds**
Please confirm standard AIA Payment and Performance Bond forms will be acceptable.

**ANSWER:**
Yes.

4. **Drawing # A-101 – We understand that you are looking for a Glass Walled PBB on Gate 1. Are you looking for a Glass or a Steel Walled Extended Corridor (Walkway) at the Gate?**

**Q.** Please provide clarification on the material for the Extended Corridor.

**ANSWER:**
Steel walled extended corridor (walkway)

[Signature]

Jeff Palin P.E.

**END OF ADDENDUM #3**
SECTION 144010 - PASSENGER BOARDING BRIDGE (REV 1)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This specification covers the general specifications for a PLC controlled, apron drive, glass walled, truss style, passenger boarding bridge (PBB) with electro-mechanical drive and lift systems.

B. The PBB covered by this specification is designed to extend from a terminal departure lounge doorway to an aircraft boarding door. This design enables passengers to enplane and deplane during normal or emergency operations while providing an environment that is protected from hazardous and atmospheric conditions.

1.3 DESIGN CRITERIA

A. The PBB shall be designed in accordance with good engineering practices and the standards developed to assure safe, efficient, and practical designs in keeping with standards that have been adopted by the passenger loading bridge industries.

B. The PBB shall be designed to support an aircraft mix form a CRJ-200 up to a B-757 size aircraft. Final PBB design determination of the min aircraft size shall allow for the PBB to be fully lowered without impact of the PCA unit.

C. Terminal door threshold elevation shown is based off of concrete apron. Concrete apron slopes away from the terminal at a slope of .5%.

1.4 CODE COMPLIANCE

A. The PBB shall be designed to conform to all applicable Federal, State, ADA, and Municipal codes and regulations that apply to the installation site. The bridge design and construction shall comply with the latest edition of the following codes:

NEC - National Electric Code
AISC - American Institute of Steel Construction
ASME - American Society of Mechanical Engineers
CWB - Canadian Welding Bureau (AWS equivalent)
NEMA - National Electrical Manufacturers Association
OSHA – Occupational Safety and Health Administration
SAE – Society of Automotive Engineers
NFPA 415 – National Fire Protection Agency

1.5 OPERATION AND MAINTENANCE MANUALS AND TRAINING

PASSENGER BOARDING BRIDGE
A. Two (2) Operation and Maintenance Manual and two (2) Operation and Maintenance Training Manual shall be supplied with each PBB. Included within the manuals are preventative maintenance requirements and problem solving procedures.

B. Eight (8) hours of operator and eight (8) hours of maintenance training shall be provided at a time convenient to the Owner but no later than the operational date of the bridge.

1.5 DELIVERY AND STORAGE

A. The transportation and installation of the PBB shall be included as part of the provisions for this specification.

1.6 FINAL ACCEPTANCE INSPECTION

A. The PBB manufacturer will make certain that the PBB is complete in all respects and operating properly, that all deficiencies noted in the Conditional Acceptance Inspection are corrected, and that all training is accomplished prior to requesting the Owner’s Project Manager to witness and make the final acceptance inspection test. Upon satisfactory completion of this inspection, a Certificate of Customer Acceptance will be issued.

1.7 WARRANTY

A. The PBB manufacturer shall provide a twelve (12) month full labor and material warranty against defects in material or workmanship from the date of Final Acceptance by the Owner. All work will be provided without cost to the Owner and shall include all labor and materials necessary to replace/repair defective material and workmanship.

PART 2 STRUCTURAL DESIGN & FINISHES

2.1 GENERAL DESIGN

A. The PBB allows for movement in the following manner: The PBB shall extend / retract, swing laterally, move vertically, and be equipped with a rotating cab. The PBB extend / retract and lateral swing motion shall be accomplished by use of a wheel bogie device. The tunnel sections shall be sectioned, with the largest tunnel section being closest to the aircraft. The PBB shall be capable of moving in two axes simultaneously.

Bridge horizontal movement shall be smooth, continuously variable and controlled by the extent of depression of the operator control stick. The bridge shall automatically enter a slowdown mode of approximately 3 inches (7.5 cm/s) per second when the PBB approaches the aircraft. Slow down shall be activated via sensors.

B. Typical construction of the PBB consists of (extending, in sequence from the terminal face) a rotunda, a fixed “A” tunnel, a telescoping “B” tunnel, and on 3-tunnel models, a telescoping “C” tunnel, terminating in a cab. The “B” tunnel shall have the largest cross section dimensions of the PBB tunnel sections for a 2-tunnel model and the “C” tunnel shall have the largest cross section dimensions of the PBB tunnel sections for a 3-tunnel model.

PASSENGER BOARDING BRIDGE
2.1.1 STRUCTURAL LOADS

A. The PBB shall support the following loads. These loads may be applied in total or in part, singularly or simultaneously. The design is based on the combination that imposes the most adverse loading condition. In addition to the dead loads and strain caused by movement, the entire passenger boarding bridge will support:
   1. A live load of 80 pounds per square foot.
   2. An operational wind load of 25 pounds per square foot (122 kg/m²) or an approximate wind velocity of 90.0 mph (145 km/h)
   3. A retracted and stowed wind load of 25 pounds per square foot (122 kg/m²) or an approximate wind velocity of 90.0 mph (145 km/h)
   4. A roof load (snow load) of 50 pounds per square foot.

B. The structural design shall provide for sufficient torsional rigidity to avoid excessive sway when the PBB is brought to a gradual stop.

C. All mechanisms for actuating, guiding and restraining the PBB and its components shall be designed so that no noise, sway or sense of insecurity is apparent to passengers. No operating vibrations or loads shall be transmitted to the terminal building.

D. The PBB is designed to accommodate the added loads of 400 Hz ground power equipment, 28 Volt DC equipment, and/or pre-conditioned air (PCA) equipment. The 400 Hz unit is undercarriage or side mounted and the 28VDC unit is side mounted. A combination 400 Hz / 28V DC unit is available. The PCA is undercarriage mounted.

2.1.2 ENVIRONMENTAL CONSIDERATIONS

A. The PBB shall operate satisfactorily under ambient temperatures from $-40^\circ F (-40^\circ C)$ to $125^\circ F (52^\circ C)$. All of the PBB components and materials either individually or collectively shall be designed or selected for long service life under such conditions.

B. The PBB assembly shall be designed to provide a clean, structurally sound, comfortable, and functional transition between the aircraft and the terminal building.

C. The entire PBB shall be weatherproof and any equipment or controls that are exposed to the weather are weatherproof type or housed in weatherproof boxes (NEMA 4 enclosures).

2.1.3 SUPPORT

A. The PBB shall be supported from beneath by dual structural columns affixed to the drive wheel bogey system and the pedestal located underneath the rotunda assembly.

2.1.4 BUILDING CONNECTION

PASSSENGER BOARDING BRIDGE
A. The PBB is designated as equipment and as such receives no structural support from the air terminal building to which it is attached.

B. An aluminum metal threshold diamond checker plate shall be installed over the gap between the terminal building and the adjacent bridge interface. Interior metal and exterior flexible flashing shall be used between the bridge and the building to provide a waterproof connection.

C. The bridge interface shall be designed to fit a maximum terminal door size of 48 inches (1219 mm) by 90 inches (2286 mm).

2.2 PBB MAIN COMPONENTS

2.3.1 ROTUNDA ASSEMBLY:

A. The rotunda assembly is designed as the self-supporting terminal end pivot for the PBB's vertical and horizontal motion. The assembly is designed so that there are no terminal connections that can transmit any loads or vibrations to the building. The rotunda assembly is made up of a corridor, rotunda and support column. As the main pivot for the PBB, the rotunda assembly allows the PBB to swing through a range of 175 degrees: 87.5 degrees clockwise and 87.5 degrees counterclockwise from the corridor centerline. The rotunda shall be capable of mounting to a caisson foundation or to a spread-footing pad-type foundation as applicable. Final foundation design shall be based on approved manufacture loading requirements. The rotunda frame shall be equipped with a rubber-bumper mechanical stop or limit switches to prevent over-retraction of the PBB tunnel sections.

B. Slope, over-travel, and operational swing limits are located on the rotunda assembly. Slope limits are adjustable up to 10% (5.71°) for both up and down PBB slopes. This limit is adjustable to meet local operating conditions and requirements.

C. Limits to PBB movement will be staged. Limits to PBB travel will be set / activated using software and / or electrical limit devices followed by mechanically activated limit switches. Activation of limits will prevent PBB motion in the direction of the activated limit. The field adjustable, over-travel swing limit switches are located on the rotunda (these switches are adjustable to meet local conditions). When the limit is actuated, PBB drive in that direction is disabled with the PBB still being able to move in the opposite direction. Activation of the ultimate or mechanical swing limit switch will disable all control power. Maintenance personnel will be required to enable control power and move the PBB away from the swing limit.

D. The design of the corridor allows the installation of flexible weather seals and a floor threshold to the face of the terminal building or fixed passageway without reliance on the terminal to provide any degree of structural support. Flap type seals provide weather protection between the rotunda and the hinged telescoping tunnel section.

E. The corridor or fixed walkway is the interface between the rotunda and the terminal building. The inside clear width of the corridor shall not be less than 4'-4 1/2" (1334 mm). The clear height shall not be less than 7'-7" (2311 mm). Corridor Length approximately 12'.
F. The support column rests on a foundation as detailed on the Contract Drawings. Final foundation design shall be based on approved manufacture loading requirements. Provide additional support as required to support fix walkway.

G. The rotunda floor remains stationary (does not rotate with PBB swing motion) and level through all PBB movements. The rotunda bearing shall be either a turret style with lifetime guaranty or a flanged, bronze bearing to support vertical loads. A separate bronze sleeve bearing will also be used. The bronze sleeve bearing and bronze flanged bearing will prevent overturning of the bridge. The bearing system will be designed such that the bearing is accessible for lubrication. The bearing system will be designed such that a catastrophic bearing failure will not result in a toppling or fall of the boarding bridge. Rotunda column and rotunda bearings shall not be secured using bolts. Turret-type bearings shall not be used in the rotunda.

2.3.2 TELESCOPIC TUNNEL ASSEMBLY

A. All tunnels are rectangular in cross section. The tunnels shall be constructed using a truss structure. The roof panels shall be constructed from sheet steel. A steel sheet or corrugated steel panel shall be placed exterior of the floor material. The roof panels shall be constructed of continuously welded seams. The steel roof shall be capable of supporting personnel, pre-conditioned air units, 400 Hz ground power units, ventilators, roof-top air-conditioners, and other ancillary devices without the need for additional catwalks about the equipment or external support devices other than mounting brackets. The steel roof shall be constructed to facilitate water drainage from the roof of the bridge. Minimum interior clear dimensions are as follows:

- Minimum Floor Width: 4' - 11 1/2" 
- Minimum Interior Height: 7' - 0 1/2" 
- Minimum Inter-tunnel Ramp Width: 4' - 9 1/2" 
- Minimum Corridor Width: 4' - 4 1/2"

B. A transition ramp accommodates the difference in elevation where telescoping tunnel sections overlap. A yellow trim band shall be installed on each transition ramp nosing. The tunnel floor of the PBB shall slope as it approaches the transition ramp to minimize transition ramp slope. The transition ramp slope shall not exceed 3° when measured with respect to the tunnel centerline. Running the entire length of the sloped for of the transition ramp shall be transition ramp handrails. The handrails for the A-tunnel handrail shall be attached to the tunnel walls. The handrails for the B-tunnel handrail shall be attached to the tunnel header. Or approved equal.

C. The walls of the telescoping tunnel sections shall be designed using heavy duty horizontal structural tubes and angles that are combined to form built-up members that are positioned at the roof and floor. The horizontal tubes shall be welded together with diagonal truss type connecting tubes to develop a heavy-duty truss wall design. Structural tubes shall be selected to minimize corrosion and water accumulation. Tie rod designs shall not be permitted. The tube design shall produce a clean, open truss design providing a less restricted view of the apron activities for passengers. The truss structure shall be of a Truss design with zero eccentricity – the centerline of all cords, diagonals, and struts shall converge on and be spaced with the apex of the Pratt Truss diagonals.

PASSENGER BOARDING BRIDGE
The roof of each tunnel section is designed to provide a flat, smooth, profile that is slightly crowned in the center to facilitate water run-off. The crown shall be not less than \( \frac{3}{4} \) inch (19mm). All vertical loads of the PBB shall be carried by a roller mechanism located at the top and bottom section of the tunnel walls.

The walls of the tunnel sections shall be clad with double-pane glass. The glass panels are installed such that there is adequate space between the interior of the glass panels and the structural tubing to allow thorough cleaning. The design shall allow for the differential expansion of the glass or steel wall, molding, Mullions, and truss structure of the bridge such that no abnormal stresses are placed upon any single member or assembly of the boarding bridge. The glass shall be secured to the boarding bridge using a non-load bearing strut spaced with the apex of the tunnel diagonals. The glass shall consist of two \( \frac{3}{4} \) inch (6mm) panes of tempered glass laminated together with PVB (polyvinylbutyral) material.

D. The PBB telescoping tunnels shall be equipped with an exterior, under-the-bridge mounted, electrical cable conveyance system. The cable shall be accessible to maintenance personnel for inspection or the addition of cables. Access to the cable conveyance system shall not impede passenger flow through the PBB. The cables shall be supported close to the bottom of the PBB. The distance between the bottom of the PBB and the cable carrying device shall not exceed 300 mm at any point along the underside of the PBB. Cables or cable carrying devices shall not be mounted on the roof or along the side-walls of the PBB except to service roof mounted ancillary equipment.

2.3.3 SERVICE ACCESS

A. A service door, landing and stair leading to the apron area constitute the service access. The service access is located on the right hand side of the cab end of the PBB. It provides access between the PBB and apron for authorized personnel. The transition from the service landing, through the service door to the PBB interior shall be smooth and flat, free of any step or ledge between the bridge interior floor and the service landing.

B. The service door shall be steel, hollow core, with a wire glass window, 30 inches (762mm) in width. The door is equipped with medium-duty commercial-type hardware and automatic door closure. The door opens outward onto the landing.

C. The service stair landing is made of hot dipped galvanized steel, with open mesh grating walking surface. The landing is protected on the open sides by galvanized steel handrails. A switch operated light is provided above the landing. An exterior incandescent light fixture shall be provided above the service door and landing.

D. The service stair is equipped with self-adjusting risers and tread, which is expanded metal. All steps have an equal rise. The tread width is 28" (711 mm) and the maximum tread rise is 9 1/2" (241 mm). The length of the stair stringers varies depending on the type of aircraft serviced. The service stair is equipped with handrails. The entire service stair assembly is galvanized steel. The service stair is accessible to ramp service personnel at all operational heights and positions of the PBB.
2.3.4 OPERATOR STATION

A. The aircraft end of the cab shall be equipped with a three layer folding bellows aircraft closure (canopy). When fitted against the fuselage, the canopy surrounds both the open aircraft door and the doorway to provide shelter for the passengers transferring between the PBB and the aircraft.

B. The interior and exterior gray covering shall not absorb water and shall be highly tear resistant. The contacting seal shall be made of soft material to prevent scratching or damage to the aircraft skin.

C. A wear and UV resistant material shall form the interior and exterior surface of the canopy. The middle surface of the canopy shall be a flame retardant material compliant with NFPA 415 requirements.

D. The canopy system shall use one winch and one gas charged shock per side.

2.3.5 CONTROL STATION

A. The control station is located in the cab at the aircraft end of the PBB. It provides the operator with a control console and service utilities required to accomplish PBB operation. This station is positioned on the left side of the cab and oriented to position the operator facing forward in full view of the aircraft during PBB maneuvering and docking operations. An operator of average height shall have an unobstructed view of the boarding bridge cab spacer that contacts the aircraft fuselage during bridge operations.

B. The control console shall be located in the operator compartment and shall be protected from the outside environment. The control console shall contain a Human Machine Interface (HMI) consisting of a graphical display providing the operator with control interfaces, bridge set up displays, maintenance / diagnostic information, wheel position information, and fault / limit / status messages as described in the following sections. PBB functions and information systems shall be controlled using a Beckoff Programmable Logic Controller (PLC). The PLC system used shall comply with IEC 1131. Bridge movement in the horizontal shall be controlled by a variable control stick (Joystick).

C. The PLC shall be designed to allow networking of the boarding bridges and appropriately equipped ancillary equipment, such as pre-conditioned air units and 400 Hertz converters, to a common remote monitoring station using Ethernet protocols and appropriate hardware.

D. An Operator, Maintenance or Administration Password shall be required to access PBB operations or maintenance activities. Passwords shall be used to control access to bridge functions, set ups, maintenance and diagnostic screens and password maintenance. The PBB shall have three levels of passwords. Level I (Ten (10) Operator passwords), level II (One (1) Maintenance) and level III (one (1) Administrative password).

a. Operator Passwords allow access all Aircraft docking functions.
b. Maintenance Password allows access to all Operator and Maintenance/Setup functions.
c. Administrative Password allows access to all Operator, Maintenance/Setup and view and edit passwords.

E. All bridge motion controls shall be momentary, contact-type (deadman) pushbuttons or joystick. All of the motion controls shall be designed to be relative to the function of the PBB being controlled, i.e., raise and lower functions, the “raise” push button will be located above the “lower” push button.

F. A LogOn, LogOff and Auto Level Mode selection shall be used to select “OFF”, “OPERATE” or “AUTO” (automatic leveling). A valid password must be entered to exit Auto Level Mode.

G. A lever arm or “joystick” controls horizontal motions: extend / retract and left / right. As the control stick is moved progressively from the neutral position, bridge speed increases proportionally with the position of the joystick. Control options are available allowing for other steering methods - such as a combination of joystick and left / right steer buttons (Conventional steering) with an option for Point-N-Go steering (4-quad joystick plus an Extend position sensor required with this option).

H. An interlock prevents the PBB from being driven forward when the aircraft closure is deployed.

I. The cab floor of the PBB shall be adjustable allowing the floor to be aligned with the centerline of the aircraft. HMI touch buttons for raising and lowering (tilting) the cab floor of the PBB shall be available on the HMI.

J. Push button switches for cab rotation, left or right, shall be available at the control console.

K. The control console shall contain HMI touch buttons for independent adjustment of the left and right side of the bellows-type aircraft closure. The aircraft closure shall be powered for extend and retract operations. The aircraft closure left and right sides shall either be independently activated and articulated or dual activation with the touch of a single touch button, with an option for automatic canopy deployment when in Auto Level Mode.

L. The control console shall be equipped with an emergency push button switch for discontinuing all bridge movement. This button shall be labeled “Stop”.

M. HMI touch buttons in conjunction with a valid Password shall control the PBB operating mode. The three modes available from the touch screen shall be “Auto” for Auto Level Mode, “Operate” for manual operation, and “Off” to discontinue bridge operations.

N. Auto Level: Touching the “Auto Level Mode” touch button shall initiate the auto level sequence. The auto level arm extends toward the aircraft, and the system performs an automatic check (test nod) of the auto level system to verify that the aircraft sensor has made contact with the aircraft and that the auto level control system is functional. Upon completion of the verification process, a message shall be displayed indicating that the PBB is in “Auto Level Mode”.

PAASSENGER BOARDING BRIDGE

144010-8
The auto level arm shall be located on the right side of the PBB cab area, inside the canopy closure area, in full view of the PBB Operator. When in auto level mode, the PBB shall allow only vertical travel, canopy, cab rotation and horizontal travel become inactive. In auto level mode, the PBB shall automatically follow the vertical movement of the parked aircraft. To exit auto level mode and return to manual mode, the operator must touch the auto level mode touch button and enter a valid password.

O. Manual Mode: Logging on using a valid password, or exit auto level mode using a valid password enables all bridge movements – extend/retract, vertical, floor movement, and cab rotation – provided there are no faults or activated limits. In operate mode, all bridge movement shall be initiated by the operator. The appropriate pushbuttons shall be lighted to indicate those functions available, and a message on the HMI panel shall be displayed indicating the PBB is in Operate Mode. An infrared sensor shall slow the bridge as it approaches the aircraft when in operate mode.

P. Off Mode: The operator must touch the “Logoff” touch button to exit the Main Screen and return to the LogOn Screen. All PBB functions except lighting shall be disabled.

Q. Cab Floor Auto/Manual: Touching the Cab Floor Auto/Manual touch button shall allow control of the cab floor to be toggled between the automatic and manual modes of operation. Text on the touch button shall indicate cab floor mode. Upon selection of cab floor manual mode, two additional pushbuttons become active enabling the manual movement of the cab floor – up or down. Touching the Up button shall move the right side of the cab floor in the up direction. Touching the Down button shall lower the right side of the cab floor. When the PBB is “Auto Level Mode”, all cab floor movement shall be disabled and the touch buttons shall NOT be visible. The Cab Floor mode of operation previously selected when the auto level mode of operation was energized shall be reactivated when the auto level mode is deactivated.

R. Canopy Actuation: The aircraft canopy closure shall be capable dual activation of both canopies simultaneous or independent activation of the right or left Canopy Up or Down. Canopy actuation shall be active only in Operate Mode. When the PBB is in Auto Level Mode both canopy touch buttons shall be NOT visible. Therefore, the canopies must be deployed prior to entering auto level mode. The left and right side canopy actuator motors shall be independently controlled by limit switches that sense both the pressure against the aircraft, and operational range limits to provide positioning of the canopy to the aircraft and prevent over extension or retraction of the canopy closures.

S. Floodlights: A HMI touch button shall be provided to allow control of the three apron floodlights that shall be located on the underside of the PBB. These floodlights shall be positioned to illuminate the apron for a distance of approximately 10 m or 30 feet forward of the PBB, and around the wheel carriage area. Touching the Floodlight touch button will toggle the apron flood lighting on and off.

T. Travel Bell: A momentary HMI touch button shall be provided to allow manual activation of the travel warning bell. When touched, the travel bell shall be activated until the button is released. (The travel warning bell sounds automatically when the PBB moving.)
U. Options: Provide option for a cold weather package. Including provisions for control buttons on the HMI to allow additional PBB features to be selected. These features include selections such as floor heating, window heating, additional lighting, etc. The PLC of the PBB shall have sufficient capacity for controlling added options.

V. Indicators: The following indicators are present in both auto level and manual modes.

1. Vertical Height: The current vertical height of the aircraft measured from apron or ground level shall be measured and indicated. The measurement shall be displayed in feet or meters depending on customer preference.

2. Bridge Length: Bridge length shall be measured and indicated between the rotunda center line and the outer edge of the cab spacer. The status panel shall display the linear distance accurately regardless of the rotational position of the cab. The measurement shall be displayed in feet or meters depending on customer preference. Changing the display from feet to meters shall be accomplished by using a toggle touch switch located in the Options screen under the Maintenance/Set Up program.

3. Rotational Angle: The rotational angle of the bridge shall be displayed. The zero data point shall be identified when the tunnel centerline shall be positioned parallel to the rotunda corridor centerline. The display identifies angular counterclockwise (left) rotation in positive (+) degrees, and clockwise (right) rotation in negative degrees from the centerline axis.

4. Cab Rotation Angle: The cab rotation angle shall be measured and indicated. The zero data point shall be identified when the aircraft spacer shall be positioned perpendicular to the telescoping tunnel centerline. The display shall indicate counterclockwise (left) rotation in positive (+) degrees and clockwise (right) rotation in negative degrees from the centerline axis.

5. Wheel Position Angle: The wheel position angle shall be measured and indicated. Zero degrees shall be identified when wheel carriage drive wheels shall be positioned parallel to bridge telescoping tunnel centerline axis. The display will indicate counterclockwise (left) rotation in positive (+) degrees and clockwise (right) rotation in negative degrees from the centerline axis.

W. Flashing Travel Beacon: A flashing amber beacon shall be mounted under the cab. The beacon indicates that the PBB is in Operate (Manual) Mode and the bridge may move at any moment.

X. Warning Bell: An audible warning bell shall be mounted under the bridge on the wheel carriage and rings when the bridge moves horizontally.

Y. The HMI Message Display: The HMI provides status and fault information to the operator. A minimum of 100 Limit and 100 Fault messages shall be stored in permanent HMI memory. Standard HMI messages include the following:

Limit Messages:
Horizontal Extend Limit. Forward motion disabled.
Horizontal Retract Limit. Reverse motion disabled.
Vertical Up Limit reached. Drive PBB down.
Vertical Down Limit reached. Drive PBB up.
Cab Left Limit reached. Rotate cab right.
Cab Right Limit reached. Rotate cab left.
Left Swing Limit reached. Rotate PBB right.
Right Swing Limit reached. Rotate PBB left.
ACF Fault. Level floor manually.
Main contactor not energized. Check interlocks.
Limitis Disabled. Use caution while driving the PBB with the Limits disabled.
Slope Up Limit reached. Reverse and up motion disabled.
Slope Down Limit reached. Reverse and down motion disabled.
Slowdown Sensor Activated. PBB in Horizontal Slow-down. Speed reduced by \(\frac{1}{2}\).
Main Contactor Disabled. To reset Main Contactor you must log OFF then ON.
Cab Cable Hoist Down. Horizontal Motion Disabled. Raise Cab Hoist.
Tunnel Cable Hoist Down. Horizontal Motion Disable. Raise Tunnel Hoist.
400 Hz Unit On. Horizontal motion disabled. Raise hoist to enable Horizontal motion.
Wing Root Contacted. Raise Bridge

**Fault Messages:**
Horizontal Extend Ultimate Limit. Call Maintenance.
Horizontal Retract Ultimate. Call Maintenance.
Cab Left Ultimate Limit. Call Maintenance.
Cab Right Ultimate Limit. Call Maintenance.
Vertical Column Fault. Call Maintenance.
Left Vertical Overload activated. Call Maintenance.
Right Vertical Overload. Call Maintenance.
Main Contactor Weld Fault. Press E-Stop and Call Maintenance.
Cab Left Contactor Weld Fault. Call Maintenance.
Cab Right Contactor Weld Fault. Call Maintenance.

Z. HMI Calibrations (Maintenance or Admin Password Required for Access) for maintenance personnel shall include, as a minimum, the following:

**Calibration:**
Height Calibration
Cab Angle Calibration
Rotunda/Bridge Angle Calibration
Wheel Bogie Angle Calibration
Extension Calibration (optional)

**Analog Limit Setup:**
Vertical Up Limit Set
Vertical Down Limit Set
Cab Right Limit Set
Cab Left Limit Set
Swing Right Limit Set
Swing Left Limit Set
Extend Limit Set (optional)
Retract Limit Set (optional)

**Password Control:**
Change Passwords (Admin password required)

**Pre-position Setup:**
Set Pre-positioning Points (optional) (Extend Position Sensor Required)

**Optional Features:**
Others as required by options

**Adjustable Auto Level Timer:**
(1.0 – 10.0 Seconds)

AA. Other Control Console indicators shall include:

An amber light and a text message on the HMI indicate the auto-leveling system shall be energized and functioning.

A red light and a text message on the HMI and an audible warning indicate the auto leveler sustained travel timer has activated.

A red light and a text message on the HMI indicate the aircraft canopy is down. The canopy must be fully retracted before the PBB can be moved forward.

A red indicator and a text message on the HMI and audible alarm indicate vertical drive column faults.

BB. The Maintenance and Set-Up Screens:

1. HMI Screens: The PBB shall be designed to provide a quick method for programming the PLC to accept new operational parameters. The Maintenance / Set-up Screens shall allow maintenance personnel to complete initial set-up or reprogramming of the PBB operational parameters directly from the PBB HMI without the use of additional programming devices. These screens allow Bridge Position Calibration, Status Calibration, Date and Time Configuration, Feet/Meter Unit Selection, Auto Level timer setup and initial Bridge Operational Limit Set Up.

2. Status Calibration: The Status Calibration screen shall be provided to accommodate input of critical data used in establishing operational parameters for a particular gate location during the initial PBB set-up operation. The calibration includes the following data:

   - Feet/Meter Selection: A selection shall be provided to allow the linear measurements that shall be displayed on the main screen status display panel to be toggled providing either a feet or meter linear measurement read-out.
- Calibrate Height: The Calibrate Height screen provides the ability to establish a vertical data point that shall be used as the base for calculation of the vertical height measurements displayed on the screen. Upon selection of this screen, the operator must position the PBB to a level height. The vertical height between the apron and top of cab spacer shall then be physically measured and the data input into the PLC using the touch keys of the HMI panel.

- Calibrate Length (optional): The Calibrate Length screen shall provide the ability to establish a base data point that shall be used by the PLC to accurately identify the linear extended length of the PBB displayed on the screen. To calibrate the extension of the PBB, the operator must enter two data points, referred to as “far” and “near” extension points. Extend the PBB to the “far” point and measure this length from the Rotunda center point to the forward edge of the cab spacer. Then, enter this length using the appropriate touch keys. Next, retract the PBB to the second, or “near” point, and again measure this length as before. Enter this value. This completes the extension calibration. Extending the PBB to the maximum extend length and entering the name plate full extend length value then retracting the PBB to the minimum retract length and entering the nameplate retract length value, will not require a measurement when calibrating the PBB length.

- Bridge Limit Set-up: The Bridge Limit Set-up screen shall be used to establish the specific gate operational limits of PBB movement. These limits include cab rotate right, cab rotate left, bridge swing left, bridge swing right, bridge extension, bridge retraction, vertical up, and vertical down limits. Moving the PBB to the desired limit of travel and touching the appropriate touch key completes the setup of each of these limits. The maintenance personnel must be able to cancel limit setup if an incorrect position is selected.

2.3.6 CAB

A. The aircraft cab shall rotate 125 degrees. Rotation shall be 92.5 counterclockwise and 32.5 degrees clockwise. Limit switches and physical stops control the rotation limits.

B. The cab shall be equipped with a forward facing control console on the left side so as to provide maximum operator visibility. The console shall be located behind a laminated safety glass window. Operation of the PBB can be accomplished without opening the cab weathering door. Additional visibility shall be obtained through the wire glass vision panels in the cab located to the front, left and right of the operator.
C. A weather door is provided at the aircraft end of the cab to seal and secure the interior when the PBB is not in use. Single or double swinging weather doors shall be installed on the right side of the operators control console to secure the PBB from unauthorized access, and seal the interior of the PBB from adverse weather conditions when the door shall be closed. The upper portion of each door shall be equipped with a safety glass window to enhance visibility.

D. A full width spacer shall be located at the aircraft end of the cab floor. The spacer material shall be sufficiently flexible and non-abrasive to prevent scratching or other damage to the aircraft fuselage.

E. The aircraft end of the cab is equipped with a cab floor that adjusts to the level position relative to the tarmac. The floor is actuated and independently adjustable to adapt to the slope of aircraft door sills. It is designed to level automatically to the tarmac and is equipped with a manual override control switch. The floor is capable of providing a level surface adjacent to the aircraft door sill for PBB slopes from -10% to +10%.

A double hinge floor shall be included in the system to provide a smooth transition between the level floor and the tunnel section. The double-hinged cab floor provides a smooth platform. The maximum slope of the floor shall be limited to plus or minus 6.5 degrees (11.4% or 1:8.78). There shall be no raised surfaces, which may introduce a tripping hazard to the passenger. Adjacent surfaces shall be at the same level regardless of the position of the cab floor or the PBB. Seams slip plates, plate covers, and other tripping hazards shall not be permitted in the cab floor. The cab floor shall present a smooth, seamless surface from the spacer to the weather doors and to both the left and right side canopy areas.

F. Two exterior floodlights shall be provided to illuminate the apron directly ahead of the PBB. A third floodlight shall be provided to illuminate the drive column wheel carriage. This light shall be located under the tunnel section.

G. A weatherproof fluorescent fixture shall be provided outside the cab swinging weather door to illuminate the cab-aircraft interface.

2.3.7 AIRCRAFT CLOSURE

A. The aircraft end of the cab is equipped with an actuated, self conforming canopy. This canopy shall conform to multiple fuselage configurations while providing excellent protection to the passenger. The covering shall not absorb water, is highly tear resistant, and remains flexible from -31°F (-35°C) to 127°F (52.8°C). The aircraft closure color is gray. The interior clear width of the PBB canopy shall be sufficiently wide to accommodate all aircraft doors and fuselage types as listed in the specification. The horizontal drive shall be powered by an AC electric motor directly connected to each of the drive wheels. The horizontal drive system shall have a variable speed capability and by ramping the inverter the PBB will have smooth, controlled starts and stops.
B. Each side of the aircraft closure shall be independently actuated to seal against the aircraft. Pressure sensitive switches shall be incorporated into the closure mechanism. These shall prevent excess pressure from applying to the aircraft. The contacting seal shall be soft material. The seals shall be segmented and attached to the main canopy section with Velcro-type fastener strips. The canopy closure shall be made of two layers of material. The outer layer shall be a weather and UV resistant vinyl material. The canopy shall not make contact with aircraft windscreens.

2.3.8 DRIVE COLUMN

A. The drive column is fabricated from a min of 200mm (inner) and 260mm (outer) steel tubes and provides the vertical and horizontal motion for the PBB. The vertical and horizontal movements can both be operated at the same time. Directional and speed inputs shall originate with a control joystick.

B. Vertical Drive: The PBB is moved vertically by means of two re-circulating ball bearing screw assemblies.

C. Ball Screw Vertical Drive: The PBB shall be equipped with two ball screw activated / driven vertical lift columns. Each ball screw vertical drive assembly is independent with individual motors and brakes. Each assembly is capable of supporting the PBB under full design load, providing 100% redundancy.

D. Horizontal Drive: A variable speed, electro-mechanical drive system shall provide horizontal travel. The tires used on the horizontal drive system shall be aircraft grade tires. The AC horizontal drive system uses AC gear motors with integral brakes. The AC motors shall be driven by solid state, variable frequency motor controllers. The AC drive system shall provide high efficiency, smooth performance, and good component availability. The horizontal drive motors direct drive to a gear box or chain driven with motors mounted on top of the axle box to allow easy access and servicing.

The controller provides a variable frequency signal to provide adjustable speeds from 0 to 27.4 m or 90 feet per minute. The controller can be adjusted to provide optimum responsiveness to the horizontal controls. The controller shall include diagnostics to assist with trouble shooting. The PBB shall be capable of steer past 90° to the left. A total steer angle of 200° shall be possible in place and in motion (90° to the right and 110° to the left).

A regenerative braking system shall be used allowing the PBB to come to smooth controlled stops. Integral spring-applied, electrically-released brakes shall be provided with each drive motor. The brakes lock the PBB in place when electrical power is disconnected. This shall occur when the joystick is in the neutral position or when normal operating power shall be discontinued.

The horizontal drive motors shall be equipped with manual brake releases. These allow the PBB to be towed in the event of power failure. Tow lugs shall be a component of the lower wheel frame. The horizontal drive wheel system shall be equipped with limit switches and mechanical stops to prevent over steer. A wheel position potentiometer monitors rotational alignment with the bridge and provides operational wheel bogey limits. Wheel bogie position shall be indicated on the HMI.
2.4 INTERIOR FINISHES

A. The interior finish of the PBB is designed to be durable and easy to clean.

B. The interior tunnel light fixtures are 2' by 4' (610 mm x 1220 mm) with fluorescent lamps. The fixtures are recessed and blend with the ceiling design. The fixtures run centered along the centerline of the PBB tunnel. The average light intensity at the floor is 18-footcandles (194 lux). Fixture trim is white. Emergency lighting shall be supplied by emergency fluorescent ballasts. Emergency ballasts shall be distributed evenly throughout the bridge. Each emergency ballast shall illuminate one fluorescent tube per lamp fixture for a minimum of 90 minutes. Lighting intensity levels vary significantly with changes in interior colors.

C. Three-way switches are located in the rotunda and on the wall near the service door. These switches control interior tunnel and rotunda lights. The cab floodlight, mounted outside the cab weather door, is controlled by the key switch position.

D. Ribbed rubber is applied to the floor from the aircraft end of the PBB to the terminal side of the service door.

E. Wall treatments in the pivoting sections (rotunda and cab support) shall consist of galvanized steel slats.

F. Insulation panels in the ceiling min of ½ inch (12.7mm) thick.

2.5 PAINT

A. Surface Preparation: The surface is dry abrasive blast cleaned in accordance with SSPC SP-6 (Commercial Blast) to obtain a 1.5-3 mils (38-76 micron) angular profile.

B. Prime Operation: One coat of Zinc Epoxy Primer is applied at a dry film thickness of 3-5 mils (51-76-microns) to all areas per manufacturer specification.

C. Finish Coat: One coat of Aliphatic Polyurethane topcoat is applied at a dry film thickness of 2-4 mils (51-102 microns) to all visible areas per manufacturer specifications.

D. The minimum total dry film thickness is 11 mils (280 micron).

PART 3 ELECTRICAL SYSTEMS AND CONTROLS

3.1 POWER AND WIRING REQUIREMENTS

A. The standard bridge main power circuit shall be a 480 volt, 60 A, 60 Hz, 3 phase, 3 wire with ground. This requirement shall be for the base bridge only and does not include any additional power need for heating options or ancillary equipment.

B. A contractor supplied fused disconnect shall be provided with the required power at the PBB structural base.

END OF SECTION

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