

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 14950 - AIRCRAFT
PASSENGER BOARDING
BRIDGES**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The scope of the work includes the turn-key installation of two (2) new “low range” Apron-Drive type units, provided and installed at the Duluth International Airport, Duluth, Minnesota. The proposer shall verify all field conditions prior to bidding and is responsible for any engineering, purchasing, co-ordination, obtaining permits and other related items in order to provide two (2) complete, installed, and operational PBB’s.
- B. Provide new, completely operational telescoping three-tunnel type passenger boarding bridges (PBB) to connect the airport terminal building gate to the aircraft for the purpose of convenient and controlled method for passenger boarding as specified herein and as indicated on the data sheets.
- C. The PBBs shall be 2 or 3-tunnel (as indicated on drawings and specifications) apron drive type to service the aircraft fleet mix as indicated on the drawings without the removal of bolts and/or hardware.
- D. The PBB’s shall have a RJ compatible articulating floor and also provide a gang plank bridge span.
- E. The PBBs shall be adaptable for reuse at the future Replacement Terminal and should include provisions for future 400 Hz ground power and pre-conditioned air equipment.
- F. Provide standard PBB Towbar, PBB Jackstand.

1.3 SUBMITTALS

- G. The Contractor shall submit complete and detailed shop drawings and specifications for the new PBB units and items to be refurbished in the existing PBB unit to the Architect-Engineer for review. An index prepared in sequential order listing all drawings, sketches, details, and materials to be submitted shall be provided. All drawings, sketches, details and materials shall be submitted in English language, in United States units, including dimensions, volumes, weights and forces. The use of the metric or SI units is not acceptable.

- H. Shop drawings shall show the following:
1. Interior elements:
 - a. Interior scheme of each bridge model including all components.
 - b. Transition details.
 - c. Wall finish attachment.
 - d. Light fixture details and layout.
 - e. Joint details.
 - f. Loading bridge dimensions and general arrangement drawings.
 - g. Tunnel floor finish.
 - h. Cab floor finish.
 - i. Interior walls and ceilings finishes.
 - j. Carpet edging details, including lines of demarcation between carpeted and hard surfaced floor at wall areas and treatment at doors, thresholds and doors to terminal building.
 2. Exterior elements:
 - a. General bridge layout.
 - b. Exterior sketch of each bridge element.
 - c. Graphics.
 - d. Paint finishes.
 - e. Handrails and ladder to roof.
 - f. Flashing (building to passenger loading bridge).
 - g. Flashing (bridge segments).
 - h. Cab door seal.
 - i. Ramp service stairway.
 3. Cab features:
 - a. Operator's cone of visibility from control console.
 - b. Control panel location and functional layout.
 - c. View panels.
 - d. Safety devices.
 - e. Interface with aircraft.
 - f. Modifications necessary for appropriate mating with required aircraft types (including auto-leveling devices).
 - g. Safety strips.
 - h. Signage (exterior).
 - i. Signage and plaques (interior).
 4. Appearance and Safety Markings:
 - a. Color and finish, exterior.
 5. Finish Samples:
 - a. Provide samples of all interior and exterior passenger boarding bridge finishes.

I. Engineering Calculations:

The Contractor shall submit to the Architect-Engineer structural calculations and power requirement computations including the following:

1. Electrical power and control schematic diagrams.
2. Hydraulic schematics.
3. Structural drawings including all pertinent calculations which shall be signed and sealed by a professional Engineer licensed in the State of Minnesota.
4. Interface requirements for existing foundations and buildings supplied utilities.

J. Electrical Disconnect and Control Panels:

1. Provide complete details on the electrical disconnect and controls panel.

K. Maintenance Manuals:

1. The Contractor shall provide 30 days prior to acceptance inspections of each loading bridge, 2 copies of technical manuals per each loading bridge. The shop drawings and manuals shall reflect the exact construction (not typical construction) of each unit including manufacturer's part number and pictorial drawings for each item.
2. The technical manuals shall contain the following information:
 - a. Description and operation.
 - b. Maintenance instructions including troubleshooting/ diagnostics guidelines.
 - c. Overhaul instructions.
 - d. List of parts and part numbers including manufacturer's name and part number, as well as the supplier's name and part number.
 - e. Illustrated parts list.
 - f. Recommended spare parts list and source.
3. Manual shall be compact and produced in such a manner that the maintenance personnel can easily refer to any of its pages or schematics while standing on the apron while subjected to jet blast, wind, etc. All binder punch holes shall be reinforced by proper material to prevent tearing.
4. Electrical drawings shall reflect the wiring for each unit as it has been constructed and not general drawings. Place 1 set of drawings in control console of the bridge and 1 in the manual.

1.4 PERFORMANCE REQUIREMENTS

A. Industry Standards:

1. The Passenger Boarding Bridge (PBB) shall be designed in accordance with good engineering practices and the standards developed and adopted by the passenger boarding bridge industry. Particular attention will be given to keeping components simple rugged and easily accessible for routine maintenance, including lubrication component exchange and ease of adjustment. All access panels and openings shall be sized to accommodate the component being changed or adjusted, as well as the equipment and personnel necessary to accomplish the work.

A. Structural Loads:

1. The passenger boarding bridge will support the following loads. The design will be based on the combination, which imposes the most adverse loading. In addition to the dead loads and strain caused by movement, the entire passenger boarding bridge shall support:

A. Floor Live Loads: 30 pounds per square foot (191 kg per square meter).

B. Wind Loads:

1. Retracted and Stowed: 25 pounds per square foot (120 kg per square meter).
2. Operational: 12.5 pounds per square foot (61 kg per square meter).
3. Seismic Loads: The PBB shall be designed to withstand the earthquake induced forces.

D. Roof Live Loads: 25 pounds per square foot.

2. The structural design shall provide sufficient torsional rigidity to avoid excessive sway when the passenger boarding bridge is brought to a stop.
3. All mechanisms for actuating, guiding and restraining the passenger boarding bridge 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.

C. Environmental Considerations:

1. Passenger boarding bridge shall operate satisfactorily under ambient temperature conditions of -40 degrees F (-40 degrees C) to 125 degrees F (52 degrees C), with wind up to 60 mph (96.56 kph).
2. All components and materials shall be individually and collectively designed or selected for long service life under such conditions.

A. Power Characteristics:

1. The passenger boarding bridge shall operate on 480 V.A.C., 3 phase, 60 Hz. Electrical power, and separate ground (4 wire). The 480 V.A.C. shall be transformed to 120/240 V.A.C. for lighting and controls.

1.5 QUALITY ASSURANCE

- A. The Contractor shall verify that no asbestos products, components or additives have been used in this work or supplied to the job.
- B. Manufacturer: Minimum of ten years successful experience in the design, fabrication and installation of similar passenger boarding bridges.
- C. Installer: Either passenger boarding bridge manufacturer or a licensee of the manufacturer with no less than 10 years experience in the installation of comparable passenger boarding bridges.
- D. Regulatory Requirements: Conform to the following codes and standards:
 - 1. AISC – American Institute of Steel Construction
 - 2. ASME – American Society of Mechanical Engineers
 - 3. ASTM A36 – Specification for Carbon Structural Steel
 - 4. ASTM A53 – Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 5. ASTM A307 – Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - 6. ASTM A311 Grade 1018 and Grade 1144 Hinge Pins
 - 7. ASTM A325 – Specification for Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength or SAE-J429 Grade 5 or 8.
 - 8. ASTM A490 – Specification for Heat-Treated Steel, Structural Bolts, 150 ksi Minimum Tensile Strength
 - 9. ASTM A500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 - 10. ASTM A514 and A517– Specification for High-Yield Strength, Quenches and Tempered Alloy Steel Plate, Suitable for Welding
 - 11. ASTM A1011 – Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon Structural, High-Strength Low-Alloy with Improved Formability
 - 12. AWS – American Welding Society
 - 13. NEC – National Electric Code
 - 14. NEMA – National Electrical Manufacturers Association
 - 15. NPA – National Plywood Association
 - 16. SAE – Society of Automotive Engineers
 - 17. SSPC – Structural Steel Painting Council

1.6 WARRANTY

Warranty shall include all parts, labor, travel time, and expenses necessary for remedial repairs or replacement of defective or malfunctioning bridge units or defective system components.

- A. Manufacturer shall guarantee all components and accessories comply fully with the Contract Documents and are free from defects in material and workmanship, under normal use, for a period of twelve (12) months from the date of acceptance by the Owner with the following exceptions.

1. The design of the PBB structure, shell, mechanical assemblies, and electrical systems shall be designed with a life expectancy of 20 years with the exception of normal maintenance components.
 2. Paint coatings shall not peel, blister, chip, crack, check, and shall not chalk more than represented by a No. 8 rating based on ASTM D659 for a period of ten (10) years.
 3. Vertical Drive components and assemblies shall have a minimum of a 10 year design life and associated warranty.
 4. Door closures shall have an extended warranty as provided by the manufacturer, with a design life of 10 years against failure. Extended warranty shall be included in the Operation and Maintenance Manual.
 5. Warranty shall include the performance of all Service Bulletins by the PBB manufacturer issued by the manufacturer during the warranty period.
- B. All work by the Contractor within this warranty period shall be provided without cost to the Owner and shall include all labor and necessary materials required to replace defective material and workmanship. If a component is replaced, the warranty period begins again as if the part were new.
- C. Contract shall warrant that the equipment and all components and accessories furnished in connection therewith, shall comply fully with contract documents; be free of any defect in design, material, or workmanship; be new and of good quality; and free and clear from any liens, encumbrances and title defects.

1.7 MAINTENANCE

- C. Preventive maintenance: Prior to formal acceptance and during the on-airport storage and installation, the Contractor shall be responsible for the preventive maintenance and general protection from deterioration of the passenger loading bridge. After formal acceptance, the Owner shall be responsible for all preventive maintenance, in accordance with manufacturer's manual.
- D. Corrective maintenance: The Contractor shall be responsible for all corrective maintenance, under the terms of the guarantee - (parts and labor) for 1 year from date of acceptance of the passenger loading bridge. Corrective maintenance shall include all maintenance except minor and routine adjustments and lubrication. In the event that the Contractor fails to respond within 24 hours to correct a maintenance occurrence (and expediently perform whatever repairs necessary to restore the loading bridge into service), the Owner reserves the right to perform (with its own maintenance forces or otherwise) such corrective maintenance work and the Contractor shall reimburse the Owner whatever expenses incurred by the Owner in performing such corrective maintenance work.
- E. The Contractor shall provide the maintenance personnel of the Owner with service bulletins outlining product improvement data resulting from continuing field operation experiences.

1.8 PERMITS

- A. Project Permits: The PBB Contractor shall be responsible to apply for and obtain all required permits, including the FAA Crane Permit, if a deviation from the current permit is desired. The FAA Crane permit may entail a 30 to 60 day lead time, so immediate application is required by the PBB Vendor. All airport required special permit requirements/conditions are the responsibility of the PBB manufacturer.

1.9 AIRPORT SECURITY

- A. The PBB Contractor shall be responsible for determining and complying with Airport Security, Badging and Vehicle access requirements. PBB Contractor shall not rely on Owner's representatives for airport access/escorts. No extension of the performance period will be allowed due to the Contractor's ability to comply with Airport Security requirements.

1.10 PROJECT/SITE CONDITIONS

- A. The Contract Documents indicate the location of each passenger loading bridge foundation and types of aircraft at each gate. The Contractor shall be responsible to verify all locations (rotunda foundation, aircraft position, for the various types of aircraft serviced at each gate, etc.) and advise the Architect-Engineer of any conflict or code violation (such as excessive slope, etc.) prior to beginning the fabrication of the passenger loading bridges.
- B. Contractor shall visit the site and familiarize himself regarding the existing conditions at the project site.
- C. Foundation anchor nuts shall be provided by PBB Manufacturer, coordinate anchor bolt size and pattern with existing terminal building.

Part 2 – Products

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:
 1. Passenger Boarding Bridge:
 - a) FMC –Jetway Systems (basis of design for PBB Data sheets)
 - b) ThyssenKrupp Airport Systems

2.2 PASSENGER BOARDING BRIDGE (PBB)

- A. General: Passenger Boarding Bridge (PBB) specified shall be complete with requirements of this section.
 1. The PBB shall be apron drive type with two or three tunnels as indicated on the drawings.
 2. All door locks are to be Best brand.
 3. Intended Aircraft; See PBB Data Sheets for specific fleet mix requirements.
- B. Rotunda Assembly: The rotunda assembly shall be made up of a corridor, rotunda and support pedestal. The assembly shall be designed so that it does not transmit any live or dead loads or vibrations to the terminal building.

1. The rotunda assembly shall be designed at the terminal end pivot for passenger boarding bridge's vertical and horizon motion. As the main pivot for passenger boarding bridge, the rotunda assembly shall allow the passenger boarding bridge to rotate a total of 175 degrees, 87 ½ degrees clockwise and 87 ½ degrees counter clockwise for the corridor center line.
 2. Slope, over-travel and operational swing limits shall be located on the rotunda assembly. Slope limits shall be adjustable up to 8.33 percent for both up and down slopes. This limit shall be adjustable to meet local operating conditions and requirements.
 3. Over-travel swing limit shall be provided. When activated, limit switch shall cut off all power preventing bridge from traveling further. Rotunda frame shall be equipped with rubber bumper type mechanical stops, or electrical limit switches, to prevent collapse of telescoping tunnel sections.
 4. A potentiometer, or limit switches, shall be provided at rotunda, which senses the position of the passenger boarding bridge and sounds a warning buzzer at control console prior to activation of the over-travel swing limit. Actuation of the warning buzzer shall be adjustable within the over-travel limit envelope and shall signal rotational operational limits.
 5. Corridor: The corridor interface between the rotunda and the terminal building shall have a minimum inside clear width of 4'-11" and minimum clear height of 7'-6" for a minimum of 15 inches. Corridor design shall allow installation of flexible weather seals and floor threshold to the face of the building.
 6. Rotunda: Rotunda floor shall remain stationary and level at all times and provide a smooth transition between the terminal and telescoping tunnels. Flap type seals shall be provided for weather protection between the rotunda and the hinged telescoping tunnel section.
 7. Support Pedestal: Support pedestal shall provide the structural support for the passenger boarding bridge. The support column shall rest on a foundation and anchor bolt pattern that is supplied by others. The pedestal shall be custom built to meet specific site conditions.
 - a. The electrical disconnect panel, mounted on the pedestal, shall provide the electrical disconnects and transformers required to adapt specified terminal power to the passenger boarding bridge's electrical requirements.
- C. Tunnel Assembly: Tunnel assembly connects the rotunda assembly and aircraft cab assembly.
1. Telescoping tunnels shall be rectangular in cross section. The tunnel with the largest cross section shall be closest to the aircraft.
 2. The exterior roof, and floor panels of the telescoping tunnel sections shall be manufactured from corrugated, or galvanized flat steel panels attached to a framework of angle and tubing. These panels are formed, welded, sealed and painted to form the tunnel enclosure. Roof shall be flat to prevent the collection of water.

3. Solid-Sided PBB: The exterior sides of the telescoping tunnel sections shall be manufactured from corrugated, or galvanized flat steel panels attached to a framework of angle and tubing. These panels are formed, welded, sealed and painted to form the tunnel enclosure.
4. Hinged transition ramps shall accommodate the difference in elevation where telescoping tunnel sections overlap.
5. Minimum interior clear dimensions are as follows:

Minimum Floor Width: 4'-10" (1473mm)
 Minimum Interior Height: 6'-11" (2134mm)
 Minimum Inter-Tunnel Ramp Width: 4'-8" (1422mm)
 Minimum Corridor Width: 4'-4-1/2" (1334mm)

6. The telescoping tunnels shall be equipped with an under bridge mounted exterior electrical cable conveyance system. This system is accessible to maintenance personnel for inspection or cable addition at all passenger boarding bridge positions and operations conditions. Access to the conveyance system shall not impede passenger traffic or passenger boarding bridge operation. The system shall be capable of supporting a combination of cables and hoses with a maximum weight of 12 pounds per square foot (17.9 kg per meter) and a maximum cross-sectional area of 12 square inches (7742 sq mm) consisting of two 6 square inch (3871 sq mm) areas. The largest tunnel shall be equipped with an aluminum or galvanized wire way to continue electrical cable routing beyond the electrical cable conveyance system

D. Aircraft Cab:

1. The aircraft cab shall be designed to rotate 135 degrees. Rotation is 95 degrees counterclockwise and 40 degrees clockwise from tunnel centerline.
2. The cab shall be rotated at a speed of 138 degrees per minute (2.41 degrees/sec). Limit switches and physical stops shall control the rotation limits.
3. The cab shall be equipped with a forward facing control console. The console shall be located behind laminated glass windows. Operation of the passenger boarding bridge will be accomplished without opening the weather doors. Visibility shall be provided with vision panels in the cab side-coiling curtains and windows located in front and to the left and right of the operator.
4. An electric roll up door is to be installed on the right side of the operators control console to secure the passenger boarding bridge from unauthorized access and seal in the interior of the passenger boarding bridge from adverse weather conditions when the door is closed. The minimum clear width of the weather door is 5'-0" and the minimum door height is 7'-8 1/2".
5. A full width spacer shall be located at the aircraft end of the cab floor. The spacer material shall meet the fire protection specifications of NFPA-415 shall be flexible and non-abrasive to prevent scratching or other damage to aircraft fuselage.

6. The aircraft end of the cab shall be equipped with a cab floor that adjusts to the optimum relative to the aircraft doorsill. The floor shall be actuated and independently adjustable to adapt to all aircraft doorsills. It shall be designed to 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 $+10\%$.
 7. A double hinge floor shall be included in the system to provide a smooth transition between the level floor and the tunnel section. The transition floor shall provide a smooth platform sloped in the direction of the passenger traffic flow. No raised surfaces which may introduce a tripping hazard to the passenger shall be permitted.
 8. Exterior floodlights shall be provided for nighttime operation to illuminate the apron area ahead of the passenger boarding bridge. A floodlight shall also be provided to illuminate the drive column wheel bogey area. This light shall be located under the tunnel section.
 9. A weatherproof fluorescent fixture shall be provided outside the weather doors to illuminate the cab-aircraft interface.
 10. A ventilator shall be mounted on the cab bubble roof, which exhausts hot air from the passenger boarding bridge. The damper shall be gravity operated. The exhaust fan control shall be console operated. Ventilator shall be 1500 CFM model.
- E. Aircraft Closure: The aircraft end of the cab shall be equipped with a folding bellows aircraft closure. The closure, when fitted against the fuselage, shall surround both the open aircraft door and the doorway to protect passengers from the elements. Covering shall not absorb water, shall be highly tear resistant and shall remain flexible from -31 degrees F (-35 degrees C) to 127 degrees F (52.8 degrees C). The aircraft enclosure color shall be black or dark gray.
1. Each side of the aircraft closure shall independently seal against aircraft contours.
 2. If necessary, pressure sensitive switches shall be incorporated into the closure mechanisms to prevent excessive pressure on the aircraft.
 3. The contacting seal shall be a soft material to prevent scratching or damage to the aircraft skin. The seals that contact the aircraft shall be designed for easy replacement.
- F. Service Access: A service door, landing and stair leading to the apron areas shall constitute the service access. Service access shall be located on the right hand side of the cab end of the passenger boarding bridge; it provides access between the passenger boarding bridge and apron for authorized personnel.
1. Service door shall be steel, hollow core with wire glass window, and meets or exceeds the 3/4-hour fire rating per ASTM E 152. The minimum door width is 3 feet 0 inches, (914 mm) wide and 6 feet 8 inches (2032mm) high. Door shall be equipped with heavy-duty commercial-type hardware (Best Brand core) and automatic door closure. The door shall open outward onto the service stair landing. A cipher lock is to be provided on the exterior and knob on the interior. A 30-inch (762mm) stainless steel kick plate shall cover the lower inside portion of both interior and exterior sides of the door.
 2. Service stair landing shall be parallel to the adjacent tunnel floor. The landing shall be made of hot dipped galvanized steel, open mesh grating. The landing shall be

protected on the open sides by galvanized steel handrails, which meet OSHA standards. A switch operated, full cut-off luminaire shall be provided above the landing.

3. Service stair shall be equipped with self-adjusting risers and treads made from expanded metal with a serrated edge for a gripping surface. All steps shall have an equal rise. The tread width shall be 28 inches (711 mm) and the maximum tread height shall be 9-1/2 inches (241 mm). The service stair shall be protected on each side by handrails designed to meet OSHA standards. The entire service stair assembly shall be galvanized steel. The service stair assembly accessible to ramp service personnel at all operational heights and positions of the passenger boarding bridge.
- G. Control Station: The control station shall be located at the aircraft end of the passenger boarding bridge. It shall provide the operator with a control console, service utilities, and control interlocks required to accomplish passenger boarding bridge operation. Station shall be positioned on the left side of the cab and oriented to position the operator facing forward in full view of the aircraft during maneuvering and docking operations.
1. Control Console: The control console shall be located –in the operator compartment and shall be protected from the outside environment.
 - a. Controls: All passenger boarding bridge motion controls shall be momentary contact type (deadman) controls. All of the motion controls shall be designed to be relative to the function of the passenger boarding bridge being controlled, i.e., raise and lower functions, the “raise” push button will be located above the “lower” push button. The control console shall include the following controls-.
 - 1) A three-position master key switch used to select "OFF", "OPERATE", or "AUTO" (automatic leveling). The key may be removed only in the "OFF" or "AUTO" positions,
 - 2) A 4- way lever arm or "joystick" to control forward and reverse and steering motions. As the joystick is moved progressively forward or back, passenger boarding bridge speed increases proportionally with the position of the joystick. Steering, left or right, may be accomplished at the same time as forward and reverse motions. An interlock shall prevent the passenger boarding bridge from being driven forward when the aircraft closure is deployed.
 - 3) Push button switches for raising and lowering the cab end of the passenger boarding bridge.
 - 4) Push button switches for cab rotation, left or right.
 - 5) Push button(s) to deploy the bellows-type aircraft closure.
 - 6) Switch for floodlights that illuminate the apron area under the aircraft and drive column undercarriage.
 - 7) Digital position indicator
 - 8) Switch to change the cab floor level adjustment from an automatic operation to a manual operation,
 - 9) Relative motion push-button switch to control the cab floor level adjustment while in the manual mode.
 - 10) Emergency stop button, which shuts down all passenger boarding bridge movement when pressed.
 - 11) Lamp test button to allow function testing of all indicator lights.
 - 12) Switch for cab light to illuminate the area forward of the cab door.

- 13) Horn button to alert that the bridge is about to move.
- b. Indicators: The control console shall have indicators that display the current passenger boarding bridge status. The passenger boarding bridge status indicators shall be as follows:
 - 1) Digital position indicator to display the relative vertical position of the lift column. This indicator is used to vertically pre-position the passenger boarding bridge prior to the arrival of the aircraft.
 - 2) Wheel position indicator, which displays wheel orientation with respect to the operator's position. A wheel position indicator maintains correct wheel orientation while cab is being rotated.
 - 3) An amber light to indicate auto-leveling system is energized and functioning.
 - 4) A red light and audible warning to indicate the auto leveler sustained travel timer has tripped.
 - 5) A red light to indicate the passenger boarding bridge has reached the operational horizontal rotation limits. This light is preceded by an audible warning.
 - 6) A red light to indicate drive wheels have reached an over steer condition.
 - 7) A red light to indicate aircraft closure is deployed.
 - 8) A red light to indicate vertical drive column fault (for electromechanical lift).
 - 9) A green light to indicate power is on.
 - c. A flashing amber beacon shall be mounted under the cab. The beacon shall indicate that power is on and the passenger boarding bridge may move at any moment.
 - d. An audible warning bell shall be mounted on the underside of the cab and shall ring when the passenger boarding bridge is moving. The bell sound loudness shall be at least 92 db at 10 feet.
2. Utilities:
 - a. A six pair (twelve conductor) wire outlet for the installation of telephone or intercom equipment shall be located on left side wall adjacent to the control console.
 - b. Duplex outlets (unswitched 120 volt, single phase, 15 ampere) shall be located on the side wall of the control console, on the lower portion of the drive column (GFI), and in the rotunda corridor.
3. Control Features and Interlocks
 - a. Mechanical interlocks shall be provided to prevent damage to control circuits or passenger boarding bridge components by selecting opposite motions simultaneously. For example, depressing the up button prevents depressing the down button.
 - b. When the master key switch is in the "OFF" or "AUTO" position, the controls for horizontal and vertical movement, steering, aircraft closure and cab rotation shall be inoperative.

H. Automatic Leveling: The passenger boarding bridge shall be equipped with an automatic leveling system, allowing the passenger, boarding bridge to adjust to changes in the aircraft elevation that occur during aircraft loading and unloading, The system shall function with equal reliability for all aircraft contours. The auto leveler shall be located on the right side of the cab and in full view of the operator at the control console

1. The auto leveler shall be engaged when the master key switch is positioned to "AUTO".
2. The auto leveler circuit shall include a sustained travel timer, Timer shall limit auto level operation shall be adjustable from 1.6 seconds to a maximum of 6 seconds. If the operation exceeds the set time limit a fault condition is assumed, all motor power shall be disconnected; audible and visual alarms shall be energized.
3. The main auto level-sensing switch is activated by a 5-degree or more auto level wheel rotation.

I. Drive Column- The drive column shall provide the vertical and horizontal motion for the passenger boarding bridge. The drive column and control systems shall be designed for smooth, quiet operation. The vertical and horizontal movements shall be operable at the same time. The drive column shall be divided into two major components: Vertical Drive and Horizontal Drive.

1. Vertical Drive:

Hydraulic Lift System:

The passenger boarding bridge shall move vertically by means of two extra capacity hydraulic ram assemblies,

- a. Each ram is independent of the other and shall be capable of supporting the passenger boarding bridge under full design load. The design shall provide 100% redundancy,
- b. The lift cylinders are equipped with internally mounted pilot operated check valves that prevent the bridge from descending in the event of fluid loss or other system failure,
- c. Mechanical stops in the cylinders shall be provided to prevent over-travel of the lift column. The system shall not be damaged if the bridge is raised or lowered into the cylinder stops
- d. The vertical travel speed shall be 2.5 feet per minute, measured at the spacer.

Electro-Mechanical Lift System:

- a. The lift mechanism shall consist of two (2) re-circulating ball bearing screw assemblies. Each assembly shall be independent of the other, with individual motors, and be capable of supporting the bridge under full design load and raising and lowering the bridges at and approximate speed of 2 feet, 6 inches per minute measured at the cab bumper. The ball nut of this assembly shall be

equipped with wiper brushes to remove grit or dirt from screw threads and a self-locking Acme type thread to prevent unit collapse in the event of a ball nut failure.

- b. The vertical drive motors shall be fitted with spring-applied brakes that release only when electric power is applied and vertical motion, up or down, is signaled from operator's console or the auto-leveler system.
 - c. The brakes shall hold securely at all elevations, without creeping, whether the bridge is in operation or not.
 - d. The fault detector circuit shall shut down the electrical power to the vertical drive motors and set the brakes independently of the operator. This shall occur if the bridge is in the vertical operate mode and there is differential motion at the ball screws.
2. Horizontal Drive: A variable speed, electromechanical drive system shall provide horizontal travel.
- a. Solid tires shall be aircraft casings with high wear tread design.
 - b. Drive wheels shall be driven independently by electric motors with integral brakes. A solid-state controller shall be provided for drive wheel speed control. Horizontal speed shall vary from 0 to 90 feet (27.4m) per minute.
 - c. A steer angle of 180 degrees shall be possible.
 - d. A regenerative braking system shall allow the passenger boarding bridge to come to smooth controlled stops. Integral spring-applied electrically released brakes shall be provided with each drive motor. The brakes shall lock the passenger boarding bridge in place when it is not being driven horizontally.
 - e. Horizontal drive motors shall be equipped with manual brake releases, allowing the passenger boarding bridge to be towed in the event of a power failure.
 - f. Tow lugs shall be a component of the lower wheel frame.
- J. Interior Finishes: The interior finish of the passenger boarding bridge shall be designed to be durable and easy to clean.
- 1. Ceiling should be continuous coil coat painted galvanized sheets or brushed finish aluminum planks. Planks shall run perpendicular to the tunnel centerline and continuously from wall to wall,
 - 2. Interior light fixtures shall be recessed linear fluorescent type and blend with the ceiling design, Light fixtures shall run perpendicular at 6'-0" ft on center (maximum). Fixtures shall be 1'-0" wide (maximum) by 3'-0" long (minimum) The average light intensity at the floor shall be 18-foot candles (194 lux) (minimum). Fixture trim shall be painted black or shall match ceiling finish,
 - 3. Light fixture in the rotunda shall be a flush mounted fluorescent type.

4. Single three-way switches shall be located in the rotunda and on wall near the service door at the aircraft cab. These switches shall control interior tunnel, bubble and rotunda lights and the weatherproof fluorescent cab floodlight.
5. To the ends of the ceiling panels and the top edge of the wall panels, aluminum corner molding shall be used.
6. Insulation in the ceiling shall be 1 1/2-inch (12.7mm) thick, fire resistant
7. Sub floor in the cab and bubble area shall be smooth galvanealed steel or 3/4 inch (19mm) marine grade plywood with high resistance to moisture and moisture damage. Sub floor in the remainder of the passenger boarding bridge 3/4-inch (19mm) thick moisture resistant, fire retardant plywood or oriented strand board-exposure 1, made with exterior phenolic resin adhesive, or smooth galvanealed steel.
8. Ribbed rubber 3/16 inch (4.76mm) thick shall be applied to the floor from the aircraft and of the passenger boarding bridge to the terminal side of the service door.
9. Passenger boarding bridge interior floor covering, other than covered in the cab and bubble area shall be embossed rubber tile, color and pattern to be selected by the Architect from manufacturer's standards, provided and install by the passenger boarding bridge manufacturer.
11. The tunnel wall treatment shall consist of floor to ceiling glazing and finish panel. Glazing shall be per Glazing Specification Section
Wall treatments in the pivoting sections (rotunda and cab support) shall be galvanized steel slats.

K. Other Surfaces Exposed to Passengers:

The coating system shall be specifically designed to provide long-term protection from the harmful affects of corrosion on passenger boarding bridges:

1. A prime coat of Epoxy followed by a topcoat of Polyurethane for a combined average dry film thickness of 7 mils (175 microns).
2. A topcoat Polyurethane that is available in a wide variety of standard colors. Custom colors are also available per contractual agreement.
3. Exceptional performance in all environments.
4. Normal life expectancy is 10-15 years with proper maintenance, which consists of monthly inspection and repair of scratches, broken film, or delamination. Semi-annual power washing is also recommended.
5. These coatings are environmentally friendly due to very low VOC (Volatile Organic Compounds) in the primer and the topcoat.

I. INTERIOR COATING SYSTEM – Surface Preparation

1. Clean area to be painted in accordance with SSPC-SP1, solvent cleaning. This specification calls for the removal of all visible oil, grease, dirt, loose mill scale, rust, and loose paint.
2. Surface must be dry immediately prior to application of paint. There must also be at least a 5 point differential between the atmospheric temperature and dew point before painting can commence.

A. Coating Description

1. American Coatings Rustlok 8000 Series
2. American Coatings SU Series Polyurethane
 - a. 60% solids color base (Part A)
 - b. 60% solids urethane catalyst (Part B)
 - c. Mix just prior to application per manufacturer's instructions

B. Application Requirements.

1. Apply to a total dry film thickness of 6-7 mils (150-175 microns).
2. Allow to dry per manufacturer's instructions prior to application of topcoat.

C. Inspection Criteria

1. Take five random film build readings per 100 square feet (9.3 sq. meters) of coverage area to verify correct millage.
2. Minimum acceptable dry film thickness is 3 mils (75 microns).

II. EXTERIOR COATING SYSTEM

A. Surface Preparation – Hot Roll / Cold Roll Steel Only

1. Clean area to be coated in accordance with SSPC-SP6, commercial blast cleaning. This specification calls for the removal of all rust, mill scale, paint, and other foreign matter except for any slight staining of same in less than one third of each square inch of blasted area.
2. The anchor pattern shall be no less than 1.5 mils (37.5 microns) nor more than 2.5 mils (62.5 microns).
3. Surface must be dry and free of any foreign matter to include blast debris prior to coating.

B. Surface Preparation – Galvanized Steel Panels Only

1. Clean area to be coated in accordance with SSPC-SP1, solvent cleaning.
 2. Do not blast or utilize any chemical cleaning product that could inhibit proper adhesion to the galvanized surface.
 3. Surface must be dry prior to coating application. There must be at least a 5 point differential between the atmospheric temperature and dew point.
- C. Coating Description – Primer - Hot Roll / Cold Roll Steel Only
1. 80% volume of solids Epoxy Primer
 2. American Coatings Rustlock 8000 Series Epoxy (Two Components)
 - a. 80% solids epoxy primer base (Part A)
 - b. 80% solids epoxy catalyst (Part B)
 - c. Mix just prior to application per manufacturer's instructions.
- D. Application Requirements
1. Apply to a total dry film thickness of 3-5 mils (75-125 microns).
 2. Allow to dry per manufacturer's instructions prior to topcoat application.
- E. Inspection Criteria
1. Take five random millage readings per 100 square feet (9.3 meters) of coverage area.
 2. Minimum average dry film thickness is 4 mils (100 microns).
- F. Coating Description – Topcoat – All Surfaces
1. Aliphatic Polyurethane color coat with satin gloss finish (60-65 @ 60 degree gloss meter).
 2. American Coatings SU Series High Solids Polyurethane
 - a. High solids urethane color coat (Part A)
 - b. High solids urethane catalyst (Part B)
 - c. Mix just prior to application per manufacturer's instructions.
- G Application Requirements
1. Apply to a total dry film thickness of 2-4 mils (50-100 microns).
 2. Allow to dry per manufacturer's instructions.

H. Inspection Criteria

1. Take five random millage readings per 100 square feet (9.3 meters) of coverage area
2. Minimum total average dry film thickness is 7 mils (175 microns) for carbon steel surfaces and 7 mils (175 microns) for galvanized steel surfaces.

III. PRE-PAINTED ITEMS

- A. Purchased components that are factory painted shall be repainted. Typical items include the hydraulic power unit, cab rotate drive motor, hydraulic drive motor, control power transformer, control console, limit switches, electrical junction boxes, conduit, etc.
- B. The finish color for the above items will be the individual manufacturer's standard.
- C. The finish color of the hydraulic unit is gray.
- D. The finish color of the control console is beige.

FIRE PROTECTIVE COATING – Fixed and Rotating Cab Floors only

- A. Surface Preparation
 1. Cab floors must be primed per exterior coating application procedures.
 2. Surface must be dry prior to coating application. There must be at least a 5 point differential between the atmospheric temperature and dew point.
- B. Coating Description
 1. Fire Protective Epoxy Coating
 2. Thermo Lag 220
- C. Application Requirements
 1. Apply to a total dry film thickness of 7-8 mils (175-250 microns).
 2. Allow to dry per manufacturer's instructions prior to topcoat application.
- D. Inspection Criteria
 1. Take five random millage readings per 100 square feet (9.3 meters) of coverage area.
 2. Minimum average dry film thickness is 13 mils (325 microns).

IV. COATING REPAIR PROCEDURE

- A. Surface Preparation

1. Prepare area to be painted using wire brush or power tool to remove any loose paint or other foreign matter.
2. Clean area to be painted by wiping with a general cleaning solution to minimize presence of rust, oil, grease, or other contaminants.
3. Surface must be dry prior to paint application.

B. Application Requirements

1. If damage is to bare metal, apply Rustlock primer in accordance with above sections. An alternative primer selection is American Coatings' AK 11187 Phenolic primer if recoat time is a consideration.
2. Apply urethane topcoat in accordance with above sections.
3. Verify total film builds meet specification requirements.

2.3 TOW BAR AND TOW BAR ATTACHMENT

The PBB shall have provision for attaching a standard tow bar to move the bridge in the event of motor/power failure. Provide one (1) standard towbar capable of connecting to a standard Tug vehicle shall be provided to facilitate towing of the PBB in the event of power failure. The Tow Bars shall be painted Safety Yellow.

2.4 STANDARD JACK STAND

Provide one (1) standard PBB Jack Stand. The Jack Stand shall be capable of bearing the maximum load of the PBB's. The Jack Stand shall be equipped with adjustable height caster wheels and a handle bar allowing a person to maneuver the stand. When not in use the Jack Stand shall be capable of being securely parked by means of a wheel locking (braking) system. The Jack Stand shall bear directly on the apron when supporting the weight of a PBB. The Jack Stand shall distribute the weight of the PBB as to assure that excessive loading of the apron shall not occur. The Jack Stands shall be painted Safety Yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that the following are of proper size and type to receive the Passenger Boarding Bridge (PBB):
1. Foundations including anchor bolt patterns,
 2. Electrical work including electrical Power, emergency power and circuit protection.
 3. Location of assigned gates and aircraft parking positions,

- B. Report conditions detrimental to proper and timely completion of the installation of the passenger boarding bridge.

3.2 PREPARATION

- A. Furnish all anchors, inserts and the like required to install the passenger boarding bridges
- B. Arrange for temporary electrical power for installation through the Owner.

3.3 INSTALLATION/APPLICATION/ERECTION

- A. Installation shall be provided either by the passenger boarding bridge manufacturer or a licensee of the manufacturer,
- B. Coordinate installation of passenger boarding bridge with Owner and General Contractor.
- C. Installation shall be provided in strict compliance with all governing regulations.
- D. Installation shall conform to the manufacturer's recommendations and to the standards established by the industry.
- E. All permanent utility connections shall be the responsibility of the installer, connections will be provided in a weather tight condition.
- F. The rotunda corridor of the passenger boarding bridge will be flashed to the exterior face of the concourse. The flashing will provide a neat and weather tight condition.
- H. Structural Support Elements
 - 1. Verify the design dimensions from the top of the foundation to the floor of the terminal building door sill at each gate location.
 - 2. All anchor bolts shall be properly protected from bending and damage during and after construction. All anchor bolts shall be double nutted, with 3 full threads minimum showing. The Contractor shall install anchor and leveling nuts, provide an appropriate size flat washer to cover the slotted opening in PBB support column base plate and provide proper installation of the nuts as required to complete the installation. After installation, tack weld the anchor nuts to the base. All zinc coating removed or damaged by welding or by any other reason shall be cleaned and repaired with galvanizing repair primer meeting the requirements of Federal Specifications TT-P-641 G(1), Type II. Anchor bolts are provided by others.
 - 3. An approved non-shrinking grout shall be used underneath the column base plate and leveling plate and fill all anchor bolt pipe sleeves. Grout shall be nonferrous to avoid unsightly rust marks. Form all grout pours. The grouting

shall be done to ACI standards. Grouting by dry packing and filling the center area with bags and blocks is not acceptable.

3.4 FIELD QUALITY CONTROL

- A. Acceptance testing, perform tests with the Owner present prior to placing the passenger boarding bridge in service.
- B. Adjust the passenger boarding bridge for proper and smooth operation

3.5 PROTECTION AND CLEANING

- A. Protect the passenger boarding bridge from time of installation until acceptance by the Owner.
- B. All finish surfaces shall be delivered to the Owner free of any soil or damage.
- C. Repair or replace any damage to the passenger boarding bridge prior to Owner acceptance.

3.6 MANUALS

- A. Operation and Maintenance Manuals shall be provided and be prepared in accordance with Air Transport Association (ATA) Specification 101. Included in the manuals shall be preventative maintenance requirements and problem solving procedures.
- B. Manuals Shall be Furnished According to the Following Schedule:
 - 1. One passenger boarding bridge: Three Operation and Maintenance Manuals.
 - 2. Two passenger boarding bridges: Four Operation and Maintenance Manuals.
 - 3. Three boarding bridges or more: Five Operation and Maintenance Manuals

3.7 DEMONSTRATION AND TRAINING

- A. The Contractor shall provide as a minimum 8 hours of operator and 8 hours of maintenance training, in separate sessions by a qualified Manufacturer's representative. Training shall be conducted at the installation site and in classrooms as designated and provided for by the Owner and airlines. Maintenance training shall include proper demonstration of cut-away models of critical parts, full instruction on proper maintenance and trouble shooting, instructions on proper use of manuals, etc. Operation training shall include proper training of the operators on correct bridge operations to avoid damaging the equipment by improper use of the controls. The Contractor shall provide a complete operation training program and maintenance training program both recorded on separate video tapes to enable the Owner to train additional employees in the future.
- B. Training shall be conducted by the Contractor utilizing prepared texts, slides, actual passenger boarding bridges and other instructional material as appropriate.
- C. The Contractor shall, upon completion of the training program, provide the airline and Owner with 2 operating instruction manuals and 2 maintenance manuals for each passenger boarding bridge.

- D. Training dates shall be mutually agreed upon by the Contractor, airlines and the Owner and shall be at dates prior to bridges going into regular operational service.
- E. The airlines and Owner will assign persons or companies to be trained.

2.5 SPARE PARTS

The Contractor shall furnish, not less than 45 days prior to completion of a passenger loading bridge, a list of suggested spare parts, including prices and sources, to the Architect/Engineer for review by the Owner. Spare parts as recommended in this context are those items which are necessary to maintain in stores in order to maintain service availability of bridges.

2.6 APPENDIX "A"

- A. See attached Appendix "A" for standard performance and procedure checklist.

APPENDIX "A"

**STANDARD PERFORMANCE
AND
ACCEPTANCE TEST PROCEDURES
FOR APRON DRIVE LOADING BRIDGES**

STANDARD PERFORMANCE TEST PROCEDURES

Preliminary/Final Inspection (circle one) Date _____

Loading Bridge Gate Number: _____

Airline Served: _____

Airline/Airport Representative present during demonstration: _____

Architect/Engineer's Representative present during demonstration: _____

Owner's Representative present during demonstration: _____

A. ELECTRICAL INSTALLATION

General: Prior to connecting power supply, check all circuits as follows:

		<u>Functioning Properly</u>	<u>Malfunctioning</u>
1.	Insulation resistance	_____	_____
2.	Continuity	_____	_____
3.	Polarity	_____	_____
4.	Earth loop resistance from each main part of the ground connection with building ground	_____	_____
5.	Disconnect operation	_____	_____

		<u>Functioning Properly</u>	<u>Malfunctioning</u>
--	--	---------------------------------	-----------------------

B. FUNCTIONAL TESTS

1.	Electrical: Demonstrate the following:		
a.	Emergency lights	_____	_____
b.	Emergency stops	_____	_____
c.	Warning lights	_____	_____
d.	Obstruction lights	_____	_____
e.	Floodlights	_____	_____
f.	Bogie visual alarms	_____	_____
g.	Bridge lighting	_____	_____
h.	Stair lighting	_____	_____
i.	Heatable window (if fitted)	_____	_____
j.	Key switch for manual and automatic operation	_____	_____
k.	Height indicator	_____	_____
l.	Signal lamps	_____	_____
m.	Main control panel	_____	_____
n.	Cabin floor heater	_____	_____
o.	Selector switches:		
	1) Lifting/lowering	_____	_____
	2) Cabin rotation	_____	_____
	3) Wheels - steer right/left	_____	_____
	4) Bridge - extend/retract	_____	_____
	5) Emergency back-off	_____	_____

- | | | | |
|-----------|---|-------|-------|
| | 6) Main/Aux changeover switch
(if fitted) | _____ | _____ |
| p. | Safety interlocks: | | |
| | 1) Maintenance switches | _____ | _____ |
| | 2) Main panel isolator | _____ | _____ |
| | 3) Safety barrier (if fitted) | _____ | _____ |
| q. | Fault Monitoring (if fitted) | | |
| 2. | Mechanical: Demonstrate the following: | | |
| a. | Cabin window shutters (if fitted) | _____ | _____ |
| b. | Door closer on service door | _____ | _____ |
| c. | Tires | _____ | _____ |
| d. | Self sustaining elevation screw | _____ | _____ |
| C. | <u>OPERATION TESTS (ALL DONE TWICE)</u> | | |
| 1. | Extension/Retraction | | |
| a. | Extension limit switch No. 1 | _____ | _____ |
| b. | Extension limit switch No. 2 | _____ | _____ |
| c. | Retraction limit switch No. 1 | _____ | _____ |
| d. | Retraction limit switch No. 2 | _____ | _____ |
| e. | Speed reduced (if fitted) | _____ | _____ |
| 2. | Lifting/Lowering | | |
| a. | Height switch No. 1 fully extended | _____ | _____ |
| b. | Height switch No. 2 fully extended | _____ | _____ |
| c. | Lower switch No. 1 fully extended | _____ | _____ |
| d. | Lower switch No. 2 fully extended | _____ | _____ |
| e. | Height switch No. 1 fully retracted | _____ | _____ |
| f. | Height switch No. 2 fully retracted | _____ | _____ |
| g. | Lower switch No. 1 fully retracted | _____ | _____ |
| h. | Lower switch No. 2 fully retracted | _____ | _____ |
| i. | Inclination switch bridge up
fully retracted | _____ | _____ |
| j. | Inclination switch bridge down
fully retracted | _____ | _____ |
| 3. | Rotation (Bridges) | | |
| a. | Approach switches left hand | _____ | _____ |
| b. | Approach switches right hand | _____ | _____ |
| c. | Check slow-down or supplementary
switches as above | _____ | _____ |
| d. | Ultimate limit switches L/R | _____ | _____ |
| 4. | Rotation (Cabin) | | |
| a. | Limit switch left hand | _____ | _____ |
| b. | Limit switch right hand | _____ | _____ |
| 5. | Canopy | | |
| a. | Extension, check both side
switches | _____ | _____ |
| b. | Retraction, check both side
switches | _____ | _____ |

END OF SECTION 14950