ATTACHMENT B

PCA HANDLING EQUIPMENT – PAC 25

PART 1 – GENERAL

1.01 GENERAL DESCRIPTION

A. This section of the specifications covers the following types of air handling units:

1. Preconditioned Air High Pressure Air Handling Units.

B. It is the intent of the contract documents that the same equipment manufacturer, INET Airport Systems, Inc. shall be used for both the bridge air handling equipment and the controls and instrumentation (PC-Air).

1.02 REFERENCES

A. Applicable Standards:

1. Anti-Friction Bearing Manufacturers Association (AFBMA).

2. Air-Conditioning and Refrigeration Institute (ARI):

3. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):

   a. ASHRAE 70 - National Electrical Code.

5. National Electrical Manufacturer’s Association (NEMA).

6. Occupational Safety and Health Act (OSHA).

7. Underwriters Laboratories (UL).

8. Local Building Code.
1.03 SUBMITTALS

A. General:

1. The Proposer shall submit product data for selected models, including specialties, accessories, and the following:
   a. AHU performance curves with system operating conditions indicated.
   b. Motor ratings and electrical characteristics plus motor and fan accessories.
   c. Materials, gages and finishes.
   d. Dampers, including housings, linkages, and operators.
   e. Submit air filter manufacturer’s technical product data including dimensions, weights, required clearances and access, flow capacity including initial and final pressure drop at rated air flow, efficiency and test method, fire classification, and installation instructions.
   f. Unit air flow control, capacity control and defrost control.
   g. Flexible hoses.
   h. Hose storage basket
   i. Telescoping Bridge air ducts.
   j. Loading bridge interface with bridge air handlers: Installation details, field measurements, support details, etc.

2. Shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.

3. Wiring diagrams that detail power, signal, and control wiring. Differentiate between manufacturer-installed wiring and field installed wiring.

4. Maintenance data for air-handling units and filters, for inclusion in Operating and Maintenance Manual.

1.04 QUALITY ASSURANCE

A. ARI Compliance: Air filter equipment shall comply with ARI 850.

B. ASHRAE Compliance: Air filters shall comply with ASHRAE Standard 52 for method of testing, and for recording and calculating air flow rates.

C. NFPA Compliance: Comply with applicable portions of NFPA 70, for components and installation of air handing units.

D. NEMA Compliance: Motors, enclosures and electrical accessories shall comply with NEMA standards.

E. UL Compliance: Air Handler Units shall be UL-listed and labeled.

F. Comply with the all applicable Local Building Codes.
G. Previous Experience Qualifications

1. Proposer shall have a minimum of five (5) years past experience in the furnishing, design, installing, programming, testing, system start-up and training of Bridge air handling equipment and controls and instrumentation (PC-air).

2. Proposer shall have a minimum of five (5) prior similar installations within the previous 3 years at other airports of a size and complexity similar to the proposed project. The supplier shall also have been responsible for all phases of the project, including supplying equipment, installing, testing and responsibility for ultimate finished systems performance to the Owner.

3. The supplier shall supply and integrate the total control systems of the PC-Air equipment with system chillers, boilers, pumps and computer programs.

1.05 DELIVERY, STORAGE AND HANDLING

A. Lift and support units with the manufacturer's designated lifting or supporting points.

B. Provide units which do not require any disassembly and reassembly for movement into the final location following manufacturer's written instructions.

C. Deliver units as a factory-assembled unit to the extent allowable by shipping limitations, with protective crating and covering.

D. Store all equipment and material in suitable facilities until delivery and acceptance by the Owner.

PART 2 - PRODUCTS

2.01 GENERAL DESCRIPTION

A. Provide a compact, light-weight, and low-noise insulated, glycol air handling unit that can be mounted on the passenger loading bridge, such that the operational characteristics are as follows:

Unit Manufacturer: INET Airport Systems, Inc.
Unit Model No.: PAC-25I
Supply Air Flow: 244 lbs/min
Outlet Pressure at Max Air Flow: 28 in. water
Outlet Air Temp. at Max Air Flow: 25 deg. F. (assuming 20 deg. F. glycol supply to unit)
Blower Speed: 3450 rpm
HP Rating: 30 HP
Blower Type: Centrifugal
Max. EG/W Flow Rate: 32 gpm
Max. EG/W Pressure Drop: 30 psi
Electrical Characteristics: 480V/3-phase/60 Hz
Input Current at Max. Air: 100 Amps
Unit Dimensions: 103”x72”x41”
Operating Weight: 1850 lbs.

The bridge operational characteristics shall be unrestricted and the bridge's structural integrity shall be un-compromised by the PC-Air unit assembly. It is HAS intent to have the air handling unit hung underneath the bridge to the maximum extent possible. Acceptable location for mounting underneath the bridge is at the bridge rotunda.

B. The air handling unit at each gate shall have a minimum of two distinct assemblies:

1. A control assembly which contains the low voltage (Class II) logic and control circuits and,
2. A blower/coil unit containing a blower, inlet vane damper (or inlet butterfly damper), cooling coil, electric heat strips, filters, complete motor starting equipment, outlet plenum and condensate drain pan to provide the required cooled, ventilated or heated air to maintain the aircraft cabin temperature specified.

C. The air handing unit(s) shall have the capacity required to sufficiently cool the largest designed aircraft parked at each gate.

D. The blower shall be centrifugal type and sized for the appropriate constant volume airflow requirements. The unit size shall be selected so that the fan brake horsepower does not exceed the maximum required over the design operating range of the unit at the total static pressure.

E. Unit external static pressure shall be defined as the gauge pressure measured at the outlet of the air handling unit. The Proposer shall present the gauge pressure his air handling unit can produce at the outlet of the air handling unit and at the aircraft connection through 65 feet of hose and with an aircraft adapter nozzle in his submittal.

F. Horsepower shall be selected based on the Proposer's choice of equipment which affects the external resistance of the system. Proposer shall furnish the fan motor and unit size adequate for final total static pressure and maximum brake horsepower requirements.
G. Passenger Bridge cooling/heating shall be furnished as follows:

1. Each gate PCA system shall contain additional air ducts and a bridge air damper as required at the cab end of the bridge to supply pre-conditioned air from the specified telescoping air duct to the bridge tunnel. The bridge air shall operate to utilize the circulated air feature to allow manual selection of a precool/heat mode in which the air handler operates to deliver air to the cab end of the bridge prior to aircraft arrival. This will serve to pre-condition the bridge from possible soaked conditions to enhance de-planing passenger comfort.

2. The bridge pre-conditioning shall be activated by an ON push-button located just inside the terminal/bridge door, which shall energize the bridge AHU in the predetermined reduced operating mode, and at the same time activate an automatic damper at the cab end of the air delivery system to divert the supply air to the bridge cab (blocking flow through the normal supply hose). The air will circulate through the bridge to the bridge exhaust fan (provided by the boarding bridge manufacturers complete with starter) and continue until one of the following occurs:

   A) The OFF button is depressed at the terminal/bridge door.
   B) The aircraft arrives and ground crew depresses the standard ON button at the apron base of the bridge, at which point the AHU and delivery system restores to standard operation.
   C) An automatic 0-20 minute timer elapses its present time.

H. During bridge pre-conditioned air operations, the AHU controller shall automatically provide cooled or heated air based upon the local ambient air temperature at the gate using a reverse acting AHU outlet vs. inlet air temperature control ramp.

I. The construction of the unit shall be of a material sufficient to provide adequate structural rigidity of frame and enclosure; of a non-corrosive nature; and provided with thermal insulation for conditions encountered in normal usage. Equipment exterior shall be primed and painted to match bridge color. Equipment interior shall be manufacturer’s standard.

J. The maximum sound level for the air handling units at maximum cooling shall not exceed 91 DBA at a distance of 15 feet from the unit. Sound power level radiated by the unit outlet and at the unit inlet when the unit is operated at the designated capacity shall be furnished with the submittal.

K. No dirty filter indications shall be required. However, Proposer shall include in the O & M manual provisions for schedules, routine filter cleaning or replacement.

L. Capacity control and defrost control shall be identified and explained in the -submittal.
M. Provide hinged access doors for each air handler unit to provide access to the internal components that require routine maintenance and repair. Locate as required for proper access to the following:

1. Blower/dampers.
2. Filters.
3. Coils.

N. A condensate pump and drain pan shall be provided for each air handling unit. The condensate pump shall be lightweight, self-priming, and capable of running dry. Minimum pump rating shall be 3 gpm, 40-foot head, 1/3 hp or as required by the specific bridge configuration. Position the drain pan under the coil section. Drain pan shall be stainless steel. Condensate pump shall be provided with a summer/winter switch or internal float switch actuated assembly.

O. All air handling units shall be prepared with all necessary rails and mounting assemblies to be hung from the underside of the bridges.

P. All air handling units shall be provided with smoke detectors located in such a manner to sense the presence of smoke in the discharge air plenum. All smoke sensing lines from the plenum to the detector shall be furnished in such a manner as to prevent condensation at the smoke detector from cold discharge air.

2.02 AHU CONTROL ASSEMBLY (GEC):

The AHU controller assembly or gate equipment controller (GEC) shall be designed for mounting directly onto the blower/coil unit or for mounting remote from the blower/coil unit.

A. The air handler controller shall contain the following door mounted controls and displays:

1. ON and OFF push buttons, lighted. The ON push button shall be operable in the AHU manual mode only.
2. Summary FAULT indicator (overload).

B. The controller shall contain the following field interface connection points.

1. Connections for remote on/off pushbutton, aircraft type selector switch, cabin temperature sensor, bridge air damper and 400 Hz service cabinet wiring from passenger boarding bridge furnished control wiring across the bridge.
2. Connections for remote monitoring and control system (See Specification Section 15900 for definition).
3. Connection for loading bridge exhaust fan. Start/stop control and operating status.
C. A remote control station shall be provided for operator control of the AHU. The control station enclosure shall be rated NEMA 4X and shall contain the following operators:

1. Lighted ON push button.
2. Off push button.

D. The air handler controller shall utilize direct digital control (DDC) using microprocessor technology for all control, regulation, modulation, alarm shut-down, and response to/from remote signals.

E. The controller shall automatically control the AHU outlet air temperature in response to the cabin temperature as sensed by the companion cabin temperature sensor.

1. Narrow body aircraft:
   a. Narrow body selected or unit off: inlet air damper at minimum air flow.

G. The controller shall, in addition to the above functions, provide for local data display and program updates with laptop computer connected directly to the controller. This local connection to the gate controller shall also provide for operator connection to the entire PCA system acting as a remote host computer. In addition, the controller shall provide full networking capabilities and built-in control and monitoring communication means with remote devices including, as a minimum, the following points:

1. Air handler ON and OFF status and SUMMARY ALARM.
2. Designation of each alarm condition, by type. (blower overload, smoke detected, over-temperature).
3. Air outlet and ambient temperatures.
5. Position of air inlet damper or alternately, motor speed as % of full rated speed if VFD is used.
6. Totalized AHU running time.
7. Readout of, and control of, both cabin temperature set points in heating and cooling modes.
8. Readout of actual cabin temperature as measured by cabin temperature probe used by the controller logic.
9. Readout of, and control of, mode changeover points and slope versus ambient temperature (backup temperature control in event of cabin temperature sensor failure).
10. Nighttime cabin temperature set-up mode control including on/off control, set-up temperature setpoint, mode automatic start and stop times and remote override capabilities to adjust start and stop times.
11. 400 Hertz gate box on/off and fault status.
H. The AHU controller shall contain an internal read-time clock with battery of minimum 30 day life. The battery shall be capable of being changed without losing any internal history, such as total running time.

I. The controller shall be capable of stand-alone automatic operation in the event of failure of the data/control network.

J. The controller assembly shall be housed in NEMA 3R gasketed enclosure and be suitable for direct mounting on the blower/coil unit or remote mounted.

2.03 CABIN TEMPERATURE CONTROL

A. Each AHU Controller shall automatically maintain the set cabin temperature within ± 2°F. at the sensing point. This shall be by use of a small temperature probe connected to the system by way of a small cable and jack in the bridge cab.

B. The PCA Cabin Temperature Sensor assembly shall consist of a cord mounted sensor element mounted in a Delrin plastic housing and mating wall receptacle design for mounting in the cab of a passenger boarding bridge.

1. The sensor element shall be rated for ambient temperatures of -40°F, be an RTD or solid state element type and be fully compatible with the specified AHU controller.

2. The sensor shall be housed in the delrin plastic housing and provide full sealing of the sensor against all weather conditions. The upper end of the housing shall provide openings sufficient to provide necessary air flow across the sensor element while protecting the element from damage when in use or being stored. The sensor shall be connected to a neoprene retractable cable, 0.2” diameter, with three 2.3 AWC conductors. The cable length shall be approximately four feet retracted and twenty feet extended and be retained to the sensor housing by a screw-on type waterproof strain relief with O-ring seat. The receptacle mating end of the cable shall be terminated with a 90° angle, waterproof type plug with a screw cap for securing to the wall receptacle. The mating receptacle shall be mounted on a stainless steel cover plate. A bracket shall be provided in the bridge cap next to the cover plate for easy storage of the sensor assembly when not in use.

2.04 PCA AIR HANDLING UNITS - PERFORMANCE

A. All air handling units shall be capable of a one-hour pull down for their respective heat soaked aircraft.

2.05 BLOWER/COIL UNIT COMPONENTS

A. Casing: Manufacturer's standard casing construction, having corrosion protection
coating, and exterior finish. Where the air handler unit is provided as a utilized enclosure construction, casings shall have removable panels or access doors for inspection and access to internal parts, a minimum of 1-inch-thick thermal insulation, knockouts for electrical and exterior condensate drain connection, and lifting lugs.

B. Blower:
1. General: Provide blower that is factory fabricated and assembled, factory tested, and factory finished, with required capacities and characteristics.
2. Blower and Shafts: Statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower. Blower Shaft: Turned, ground, and polished steel designed to operate at no more than 70% of the first critical speed at the top of the speed range of the fan’s class.
3. Shaft Bearings: Provide bearings having a median life Rating Life (AFBMA L50) of 200,000 calculated in accordance with AFBMA 9 for ball bearings or AFBMA 11 for roller bearings.
4. Factory Finish:
   a. Exterior Sheet Metal Parts: Prime coating prior to final assembly. Final color to match bridge color, color chip to be provided to the manufacturer by the Owner.
   b. Interior Surfaces: Manufacturer’s standard finish is acceptable.
5. Blower: Forward-curved, centrifugal, direct-drive fans; and permanently lubricated motor bearings where bearings are not more accessible for greasing

C. Coils:
1. Aluminum plate fins and seamless copper tube type, minimum 5/8 inch O.D. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical or hydraulic-expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall have a galvanized steel casing. Fin spacing shall be 12 fins/inch on the first stage and 8 fins/inch on the second stage. Coils shall be mounted on the coil casing with same end connections accessible for service. Coils shall be removable from the unit. Coil section shall be completely insulated.
2. The number of tubes and fin spacing shall be submitted on coil selections made. Coils shall be constructed and tested in general accordance with ASHRAE 15 and ARI 410.
3. Coils shall be proof 400 psig and leak 250 psig tested with air pressure under water.

D. Airflow Control: Airflow control may be by inlet vane damper, butterfly damper, or variable speed control. As requested by the Director, Proposer shall describe proposed airflow control in shop drawing submittal.
E. Inlet Air Filters: Provide medium efficiency pleated disposable air filters suitable for installation in holding frames; two inch thick minimum narrow body units, four inch thick minimum for jumbo units; constructed of non-woven cotton fabric type. The enclosing frame shall be constructed of rigid, heavy duty, high wet-strength beverage board to the filter pack material. The filter media internal support shall have welded wire grid. Holding frames shall be fabricated metal construction complete. For all units, provide filters with rated face velocity of 500 fpm, initial resistance of not greater than 0.30 inches water gauge, final rated resistance of 0.50 inches water gauge and average resistance of 80%. The holding frame and filters shall be sized such that the rated face velocity of the filters is not exceeded at specified AHU mass flow and design inlet ambient temperature conditions.

F. Each AHU shall be provided with a single stage electric strip heater with associated plenum over-temperature safeties. The rating of the electric heat shall be 12 kW. Electric heating shall be used and controlled by the AHU controller as required by the sequence of operation.

2.06 AIR DELIVERY EQUIPMENT

A. All gates shall be provided with a single primary air delivery hose of sufficient length for connection from the telescoping air duct to the aircraft type(s) scheduled to be served at each gate. Each hose end shall be provided with an 8" aircraft PCA connection nozzle, INET Airport Systems, Inc., or equal approved for use by HAS. In addition, all gates shall be provided with MD-80 extension hoses of suitable length to reach the aircraft PCA connection with a quick connect fitting to a mate with the primary hose nozzle. The other end of the extension hose shall include a sewn "ell/reducer" hose to minimize kinking of the hose when connected to the MD-80 aircraft and terminated with the same type of nozzle as the primary hose.

B. Air flexible hose shall be of the lightweight insulated type, maximum thermal conductance of 1.28 BTU/Hr./Ft./°F., pressure rated for 50 inches of water maximum. Hose shall be flat when not in use, manufacturer by INET Airport Systems, Inc., 14 inch diameter flat type. Hose is to be supplied in sections of no more than 25 feet in length, connected by a closed nylon zipper device, or Velcro connectors with a 14 inch to 8 inch diameter reducing adaptor on the end section.

C. An INET Airport Systems, Inc. hose storage basket shall be provided and installed at an approved location at the end of each bridge, of sufficient size to easily store the required hose length.

D. Telescoping air duct shall be rigid cross-bridge, shall be foam core fiber glass with minimum 1/8" inner and outer fiberglass layer for rigid construction as manufactured by INET Airport Systems, Inc., Model No. TAD-253. Polyurethane insulation core shall be flame retardant. Telescoping section shall have Teflon bearings and foam seals to minimize air leaks. The number of telescoping sections shall match the
number of tunnels of the passenger boarding bridge at each gate. The telescoping air duct shall be of the type and design proven at similar airport installations at a minimum of 100 gates. Furnish telescoping duct with all brackets and supports as recommended by the manufacturer’s installation requirements.

E. Provide unit mounted or rotunda mounted disconnect switch at the engineer’s discretion.

2.07 AHU LIQUID-SIDE EQUIPMENT

A. EG/W Hoses
Flexible hoses shall be furnished from the building EG/W piping to the AHU supply and return connections. The hoses shall be of commercial quality, designed to handle EG/W fluid, and manufactured by Goodyear Petroleum Flexwing or similar approved quality. The EG/W hoses shall be provided with barbed male brass couplings attached to both ends. The couplings shall be double banded and rated to 150 psi. All fittings shall be of brass construction with clamps of stainless steel construction. The hoses shall be routed and supported in such a manner to allow for full bridge rotation without stress at the AHU connections. The flexible hoses shall be insulated with flexible foam-type expanded close-cell insulation and protective coating as specified in Section 15250, “Thermal Insulation.”

B. EG/W Control Valves
EG/W control valves shall be furnished for each AHU. The valves shall be controlled by the AHU controller as required by the sequence of operation and sized as required for AHU outlet temperature control. Valve actuators shall be suitable for outdoor operation in both Summer and Winter design conditions and shall be identical to the AHU inlet damper actuator for commonality of Owner spares.

C. Condensate Drain Hoses
A hose shall be provided to carry condensation produced by the AHU to a drain. The hose shall be 1/2” ID, reinforced PVC tubing and be constructed and routed to function under the design operating conditions. The PVC tubing shall transition to 1/2” copper pipe routed to a ramp drain. All condensate piping shall be insulated with flexible foam-type expanded close-cell insulation and protective coating as specified in Section 15250, THERMAL INSULATION.

2.08 PASSENGER BOARDING BRIDGE COORDINATION

A. The Proposer shall coordinate installation of the PCA gate equipment.

1. Bridge air inlet cutout with interior decorative grill.
2. Rotunda mounted exhaust fan with rotunda column mounted starter, starter to include provision for remote N.O. contact starting from the AHU controller
when the starter H-0-A switch is in the AUTO position.

3. All required stair landing extensions where required for any right-side mounted telescoping air duct.

4. Lighted “Bridge Air On” and “Bridge Air Off” pushbuttons to be located in the bridge rotunda area near the terminal door. Each pushbutton shall provide a single N.O. momentary contact. The indicator light shall be suitable for operation at 24V, AC or DC.

5. Factory installed control wires from a terminal box under the cab near the lift column to a terminal box on the face of the rotunda rigid frame. Control wires shall include two, twisted shielded pairs, #18 AWG and 20 #18 insulated conductors suitable for 24V AC or DC, all rated and routed as Class II control wiring.

6. Factory installation of the PCA Proposer supplied cabin temperature sensor wall plate in the bridge cab.

7. Rotunda Column Supports.


2.09 FIELD CABLEING

A. AHU Input Power

Furnish flexible power cable, type S.O. with ground conductor, from a fixed wiring point near the rotunda to the rotunda mounted AHU. Flexible cabling shall only be allowed where required for bridge movement and shall not be used for extending to the AHU disconnect switch where the disconnect is mounted on the building wall. Route and support flexible cable in such a manner to allow for full bridge rotation and elevating movement without interference or snagging with bridge equipment. Input power cable shall be sized for AHU input power requirements, Winter design. Furnish weather sealing hubs as required for connection to the AHU and at transition from fixed to flexible service.

Provide a separate raceway (fixed wiring), such as rigid galvanized steel conduit or as allowed by local code, across any walkways from the AHU disconnect switch to the rotunda area, extending AHU input power wiring with the same size and type used for the input to the AHU disconnect switch and terminating in a junction box.

B. Pushbutton Station

Control cabling to the lift column-mounted pushbutton shall be of the size, type and number of conductors required for the selected control system, suitable for outdoor service and of the flexibility required for routing and supporting to the bridge scissors. Furnish weather sealing hubs for cable entry into the station, bottom entry only allowed.
C. Network Cabling

PCA system network cabling shall extend from the building mounted network terminal box and shall be of the same size and type used for the system network. The cabling shall be continuous from the building terminal box to the AHU controller. Provide a separate raceway across any fixed walkways from the building terminal box to the rotunda and where required for the type of cable selected with flexible service from fixed wiring points to the rotunda mounted AHU. Furnish weather sealing hubs of the size and type required for network cabling connection to the AHU controller.

D. Exhaust Fan, Valve and Bridge Wiring Connection Cabling
Furnish flexible control cabling from the AHU controller to the exhaust fan starter and EG/W valve actuator. Each cable shall be a single jacketed type with the number and size of conductors required and suitable for outdoor service and sunlight resistant. Connections to each device or terminal box shall be made with weather sealing hubs of the size and type required, bottom entry only.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of air handling units.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. PCA air handling units shall be mounted under the loading bridge to the rotunda.

B. Arrange installation of units to provide access space around air handling units for service and maintenance.

C. Furnish all necessary supports, brackets, guard posts, safety rails, etc., for properly installing all air-handling units.

D. All air-handling units shall be properly aligned, adjusted and lubricated before final acceptance.

E. Perform water and air system testing and balancing as specified by the Director.
3.03 CONNECTIONS

A. Duct installations and connections are specified in other sections. Make final air duct connections with flexible connections.

B. Electrical Connections: The following requirements apply:

1. Electrical power wiring is specified in DIVISION 16.
2. Temperature control wiring as specified in DIVISION 15.
3. Grounding: Connect unit components to ground in accordance with the National Electrical Code.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Inspection: Arrange and provide at no cost to the City for a factory authorized service representative to perform the following:

1. Inspect the field assembly of components and installation of air handling units including ductwork and electrical connections.
2. Prepare a written report on findings and recommended corrective actions. The Proposer shall repair all recommended corrective actions at his own expense.

3.05 ADJUSTING, CLEANING, AND PROTECTING

A. Check variable inlet damper (or inlet butterfly damper) for proper damper operation.

B. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel and cabinet.

3.06 COMMISSIONING

A. Final Checks Before Start-Up: Perform the following operations and checks before start-up:

1. Remove shipping, blocking, and bracing.
2. Verify unit is secure on mountings and supporting devices and those connections for piping, ductwork, and electrical wiring are complete. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
3. Perform cleaning and adjusting as specified.
4. Lubricate bearings and other moving parts with factory-recommended lubricants.
5. Verify manual and automatic volume control.
6. Disable automatic temperature control operators.
B. Starting Procedures for Blowers:

1. Energize motor; verify proper operation of motor, drive system, and blower wheel. Replace blower and motor as required to achieve design conditions.
2. Measure and record motor electrical values for voltage and amperage.

C. Refer to Division 15, Section 15950 - TESTING, BALANCING AND COMMISSIONING MECHANICAL SYSTEMS for procedures for air handling system testing, adjusting, and balancing.

3.07 PCA Air Handling Required Spares

A. SPARES

The following spares must be provided:

1. Two AHU controller boards properly configured.
2. Two complete sets of AHU fuses.
3. One of each type of control Transformer.
4. Two of each type of starter and heater contactor.
5. One of each type of pushbutton lighted pushbutton assembly.
6. Two of each type of pushbutton contact blocks.
7. Two inlet air damper/valve actuators.
8. One of each type of temperature sensor.
9. Two aircraft connectors.
10. Two complete sets of the air delivery hoses with all separate hose sections and reducers. These may be stored in OEM boxes in the storage area.
11. Provide and install at the time of Owner’s acceptance of the system, new air filters in all air handling units, and clean strainers in EG/W piping at each air handling unit.