

SECTION 23 75 40 – PACKAGED OUTDOOR AIR HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The following Specification Section apply this specification section:
 - 1. Bidding Requirements, Contract Forms and Conditions of the Contract.
 - 2. Division 1 - General Requirements.

1.2 SUMMARY

- A. This Section includes packaged outdoor units and accessories. Refer to contract drawings for accessories that are to be provided with the unit(s).
- B. The units will be utilized in multi-zone variable air volume systems and in single zone variable air flow systems.

1.3 SUBMITTALS

- A. Prior to submission of the specified equipment the Outdoor Air Handling Unit supplier is required to submit shop drawings to the Siemens BMS Installer for coordination purposes. The Outdoor Air Handling Unit Supplier will incorporate and comments from the BMS installer then submit the unit shop drawings for review to the Engineer and note the BMS installer has reviewed the equipment submittal(s). If this requirement is not performed the equipment shop drawings will not be reviewed.
- B. Product Data: Include manufacturer's technical data for each unit including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- D. Operation and Maintenance Data: For all units to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with AHRI Standard 340/360, latest edition.
- B. Unit shall be designed to conform to ANSI/ASHRAE 15, ASHRAE 62, and UL Standard 1995.
- C. Unit shall be listed by ETL as a total package.
- D. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

PACKAGED OUTDOOR AIR HANDLING UNITS

1.5 WARRANTY

- A. All equipment, material and labor provided shall be warranted for a period of one year from date of substantial completion for project or the respective phase.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of units that fail, in materials and/or workmanship, within specified warranty period.
 - 1. Warranty Period for Compressors: Five years from date of shipment including all materials and labor.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Two sets of filters for each unit.
 - 2. Two sets of fan belts for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide Packaged Outdoor Air Handling units manufactured by Carrier. Subject to review, equipment meeting the full requirements of the specifications and project installation limitations (i.e., physical size and weight) and manufactured by one of the following will be considered by alternate bid:
 - 1. Aaon.
 - 2. Trane.
- B. Manufactures other the basis of design manufacturer shall carefully review the contract drawings, prior to bidding to verify the equipment will meet all requirements, including installation clearances, electrical power, and structural support. Any change in cost required for alternate bid manufacturers shall be included in the alternate bid price.

2.2 GENERAL

- A. Provide factory assembled, single-piece hydronic heating units and DX cooling units with accessories indicated on the drawings and within this specification.
- B. Contained within the unit enclosure shall be all factory wiring, piping, refrigerant charge of R-410A, operating oil charge, refrigerant circuits, microprocessor-based control system and associated hardware, and all special features required.

2.3 CABINET

- A. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces. The unit cabinet is to be constructed as a completely watertight assembly.

PACKAGED OUTDOOR AIR HANDLING UNITS

- B. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 340/360 minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum 1/2-in. thick, 1 lb. density, aluminum foil faced fiberglass insulation. Aluminum foil-faced fiberglass insulation shall also be used in the heating compartment.
- C. Unit Base Rail: The unit(s) shall have base rails on a minimum of 4 sides. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering, overhead rigging and for moving the rooftop by fork truck. Base rail shall be a minimum of 16 gage thickness.
- D. Provide an internally sloped condensate drain pan made of a non-corrosive material to comply with ASHRAE Standard 62.
- E. Provide cabinet access panels which are to be easily removable for servicing. Unit(s) shall have one factory installed, tool-less, removable, filter access panel.
- F. All power wiring shall enter the unit cabinet at a single factory provided location.

2.4 EVAPOARTOR FANS

- A. Provide fans with permanently lubricated bearings and automatic-reset thermal overload protection or circuit breaker. The fans shall have a maximum continuous brake horsepower rating for continuous duty operation; no safety factors above that rating shall be required. Provide a Variable Frequency drive to match the three-stage compression logic. The fans to have a motor shaft grounding ring to prevent electrical bearing fluting damage by safely diverting harmful shaft voltages and bearing currents to ground.
- B. The evaporator fan Variable Frequency Drive shall be installed inside the unit cabinet, mounted, wired, and tested. Provide Electromagnetic Interference (EMI) frequency protection and insulated gate bi-polar transistors to produce the output pulse width modulated waveform.
- C. Provide self-diagnostics with fault and power code LED indicator. Field accessory Display Kit available for further diagnostics and special setup applications.
- D. The fan assembly to have RS485 capability standard.
- E. Provide electronic thermal overload protection and harmonic reduction for an improved power factor. All printed circuit boards shall be conformal coated.
- F. Belt drive evaporator fans to be double inlet type with an adjustable pitch motor pulley and permanently lubricated bearings. Construct fans with corrosion resistant steel and fans to be dynamically balanced.

2.5 CONDENSER FANS

- A. Provide direct-driven propeller type fans with galvanized aluminum blades riveted to corrosion-resistant steel spiders and shall be dynamically balanced.
- B. Condenser fan motors to be totally enclosed multi speed ECM motor with permanently lubricated bearings and inherent thermal overload protection with an automatic reset feature.

PACKAGED OUTDOOR AIR HANDLING UNITS

2.6 HYDRONIC COILS:

- A. Supply and return header connections shall be clearly labeled on unit exterior such that direction of coil water-flow is counter to direction of unit air-flow. Coils shall be proof-tested to 300 psig and leak-tested to 200 psig air pressure under water.
- B. Headers shall be constructed of round copper pipe. Tubes shall be minimum 5/8 inch O.D. and minimum 0.024 inch thick copper. Fins shall be aluminum with a maximum of 12 fins per inch.
- C. Hydronic coils shall be supplied with factory installed drain and vent piping to the unit exterior.

2.7 REFRIGERATION COMPONENTS

- A. Refrigerant circuit(s) shall include the following control, safety, and maintenance features:
 - 1. Thermostatic Expansion Valve system shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
 - 2. Refrigerant filter dryer.
 - 3. Service gage connections on suction and discharge lines.
 - 4. Pressure gage access through a specially designed screen on the side of the unit.
 - 5. Single circuit design with tandem compressor and fully activated evaporator coil.

2.8 Compressors:

- 1. Provide fully hermetic tandem scroll compressors optimized for comfort staging and IEER energy savings.
- 2. Provide a single refrigerant circuit and three stages of cooling operation on all models.
- 3. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
- 4. Compressors shall be internally protected from high discharge temperature conditions.
- 5. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.
- 6. Compressor shall be factory mounted on rubber grommets.
- 7. Compressor motors shall have internal line break thermal, current overload and high-pressure differential protection.
- 8. Provide a crankcase heater on each compressor, deactivated whenever a compressor is in operation.

B. Refrigerant Coils:

- 1. Provide evaporator and condenser coils with aluminum plate fins mechanically bonded to seamless internally grooved 5/16-in. diameter copper tubes with all joints brazed. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.

2.9 FILTERS

- 1. Provide MERV 13 filters.

PACKAGED OUTDOOR AIR HANDLING UNITS

2.10 ELECTRICAL

- A. All unit power wiring shall enter unit cabinet at a single location.
- B. Unit shall be provided NEC approved overcurrent protection and disconnecting means in a unit mounted control panel. Equipment manufacturer shall wire all fans and other equipment from the input terminals.
- C. Equipment manufacturer shall provide control power transformer as required to power controls, unit lighting and convenience outlet as required.

2.11 MOTORS

- A. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have either internal line break thermal and current overload protection or external current overload modules with compressor temperature sensors.
- B. All condenser-fan motors shall be totally enclosed 3-phase type with permanently lubricated ball bearings, class F insulation and internal, automatic-reset thermal overload protection or manual reset calibrated circuit breakers.
- C. All indoor fan motors 5 hp and larger shall meet the minimum efficiency requirements as established by the Energy Independence and Security Act (EISA) of 2007.

2.12 ECONOMIZER

- A. Provide an enthalpy-controlled economizer consisting of dampers, actuator, and linkages in conjunction with control system to provide primary cooling using outdoor air, conditions permit-ting, supplemented with mechanical cooling when necessary.
- B. Dampers shall be a gear-driven ultra-low leakage type with blade and edge seals. Dampers shall exhibit a maximum leakage rate of 3 cfm per square foot of area at 1 in. wg pressure differential when tested in accordance with AMCA (Air Movement and Control Association) Standard 500.

2.13 AIR FLOW MONITOR

- A. Provide airflow measurement system for monitoring and controlling minimum outdoor airflow rate. The monitoring equipment shall measure outside air as required and provide input to building management system with a linear measured airflow rate.

2.14 OPTIONS

- A. Hail Guard, Condenser Coil Grille to protect the condenser coil from hail, flying debris, and damage by large objects without increasing unit clearances.

2.15 CONTROLS / SAFETIES

- A. Provide the following:
 - 1. Scrolling marquee display.
 - 2. CCN (Carrier Comfort Network®) capable.

PACKAGED OUTDOOR AIR HANDLING UNITS

3. Unit control with standard suction pressure and condensing pressure transducers.
 4. Provide a 5°F temperature difference between cooling and heating set points to meet ASHRAE 90.1, energy standard.
 5. Provide and display a current alarm list and an alarm history list.
 6. Automatic compressor redundancy.
 7. Service run test capability.
 8. Configurable alarm light shall be provided which activates when certain types of alarms occur.
 9. Compressor minimum run time (3 minutes) and minimum off time (3 minutes).
 10. Service diagnostic mode.
 11. Integrated economizer control.
 12. Minimum of 3 capacity stages of mechanical capacity control (excluding hot gas bypass) controlled with logic to maintain supply air temperature set point with minimum load valve for additional capacity stage.
 13. Unit shall be complete with self-contained low voltage control circuit.
- B. Safeties: Unit shall incorporate a solid-state compressor lockout which provides optional reset capability at the space thermostat should any of the following safety devices trip and shut off compressor:
1. Compressor lockout protection provided for either internal or external overload.
 2. Low-pressure protection.
 3. High-pressure protection (high pressure switch or internal).
 4. Compressor reverse rotation protection.
 5. Loss of charge protection.
 6. Welded contactor protection.

2.16 AIR FLOW MONITORS

- A. Provide airflow measurement system for monitoring and controlling minimum outdoor airflow rate. The monitoring equipment shall measure outside air as required and provide input to building management system with a linear measured airflow rate.
- B. The monitoring equipment shall be tested in accordance with AMCA 610, Figure 4, Methods of Testing Airflow Measurement Stations for Rating, and AMCA 611, Certified Ratings Program - Airflow Measurement Performance, in an AMCA-registered testing facility and bear the AMCA International Certified Ratings Seal for Airflow-Measurement Station Performance.

2.17 ELECTRICAL POWER CONNECTION

- A. Unit shall be provided with standard power block for connecting power to the unit.
- B. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.
- C. Unit shall be provided with factory installed and factory wired 115V, 13-amp GFI outlet with outlet disconnect switch in the unit control panel.

2.18 ROOF CURBS

- A. Roof curbs: provide roof curbs for all roof mounted units. Provide curbs with spring isolation rails with 2" static deflection. Roof curb shall support the full perimeter of the air handling unit, including pipe chases. Furnish with wood nailing. Roof curb shall include frame work necessary to support supply and return duct installation. Refer to drawing details and/or notes and provide roof curbs height as required.

PART 3 - EXECUTION

3.1 SHIPPING

- A. Protect equipment during shipment and delivery, all units shall be completely stretch or shrink wrapped. Wrap shall be a minimum of 7 mil plastic. Pipe ends and pipe connection holes in the casing shall be capped or plugged prior to shipment.

3.2 ON-SITE STORAGE

- A. If equipment is to be stored for a period of time prior to installation, the installing contractor shall remove all stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in an area not subject to rain and/or snow.

3.3 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.
- B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.
- C. Examine roofs for suitable conditions where RTUs will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 INSTALLATION

- A. At the direction of the Owner's Representative the contractor shall remove and dispose of filters from the respective units and install a new filter obtained from the Extra Materials required in Part 1 of this specification. If additional filter installation is not required, forward filters to the owner as extra stock, at the completion of the project.
- B. Roof curb: provide a roof curb for all roof mounted units. Install the roof mounted unit(s) on the roof curb immediately after the curb is installed. If immediate installation is not performed provide temporary watertight covering, for all curb openings, consisting of minimum 3/4" exterior grade plywood and watertight rubber or plastic cover.

3.5 CONNECTIONS

- A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts.

PACKAGED OUTDOOR AIR HANDLING UNITS

3.6 CLEANING

- A. After completing system installation, testing, adjusting, and balancing and after completing startup service, clean rooftop units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.7 FIELD QUALITY CONTROL

- A. Engage a factory service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections and to provide start-up service. Unit or components will be considered defective if unit or components do not pass tests and inspections. Prepare test and inspection reports.

3.8 DEMONSTRATION AND STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service and to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION 23 75 40