SECTION 237313 - MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Components for Air handling units.

1.02 RELATED SECTIONS

A. Electrical contractor will need to wire Fan Wall Array to VFD(s)

1.03 REFERENCES


1.04 SUBMITTALS

A. See Administrative Requirements, for submittal procedures.
B. Product Data:
   1. Dimensioned plan and elevation view drawings, including motor starter and control cabinets, required clearances, and location of all field connections.
   2. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.
   3. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
   4. Sound Power Level Data: Fan inlet, outlet and casing radiation at rated capacity.
   5. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
C. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.
D. Manufacturer's Instructions: Include installation instructions.
E. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.05 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
1.06 DELIVERY, STORAGE, AND PROTECTION

A. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids, individual “bagged” sections and lifting lugs. Inspect for damage.

B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

C. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.07 EXTRA MATERIALS

A. See related section - Product Requirements, for additional provisions.

B. Supply one extra set of filters for each filter type.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Temtrol Inc: (www.temtrol.com)

B. Governair (div of NAS)

C. Haakon

D. Climate Craft

All other manufacturers must submit a prior approval request form with performance data 3 weeks prior to the job bidding and must be approved by engineer before proceeding.

2.02 GENERAL DESCRIPTION

A. Air handling unit manufacturer shall be responsible for providing a complete air handling unit package including their own components and components manufactured by others. Air handling unit manufacturer shall be responsible for proper component selection such that specified and scheduled unit performance parameters are met.

B. Provide units with sections in the layout configuration shown on the airflow schematics, drawings and as scheduled.

C. Air handling unit components shall be sized to fit inside the existing air handler structure. The AHU manufacturer shall survey the job site and inspect each unit so that all loose components not only fit properly but also operate properly.

D. Manufacturer shall design and submit detailed shop drawings of each component and how it will ship loose and be properly re-assembled into existing AHU location. Contractor shall verify that air handler can be installed as submitted.

2.02 UNIT DESCRIPTION

A. Provide factory-fabricated air handling units with capacity as indicated on the schedule and specifically designed for INDOOR application with construction features as specified below. Units shall have overall dimensions as indicated and fit into the space available with adequate clearance for service. All units shall come completely assembled. Multiple sectioned units shall be shipped as a single factory assembled piece (except where shipping limitations prevent) de-mounted into modular sections in the field by the contractor.
B. Units shall be furnished with sufficient gasket and bolts for reassembly in the field by the contractor. Unit manufacturer shall provide certified ratings conforming to the latest edition of AMCA 211, 300, 301, 500 and ARI 410. All electrical components and assemblies shall comply with NEMA standards. Unit internal insulation must have a flame spread rating not over 25 and smoke developed rating no higher than 50 complying with NFPA 90A, “Standard for the Installation of Air Conditioning and Ventilating Systems.” Units shall comply with NFPA 70, “National Electrical Code,” as applicable for installation and electrical connections of ancillary electrical components of air handling units. Units shall be UL or ETL listed.

C. Unit Base / Floor

1. Provide a full perimeter welded base frame manufactured with structural steel tubing and C-Channel cross support members on close centers. Formed metal base rails with bolted or screwed support members are not acceptable. Base and unit frame shall be painted with a lacquer resisting gray phenolic, corrosion inhibitive primer. Base rails shall be fitted with lifting lugs at the corner of the unit or section (if de-mounted). The base shall include a 4-inch thick polyurethane foam insulated “double bottom” floor with minimum 20 gauge G-90 galvanized outer and 16 gauge G-90 galvanized inner walk-on surface. All floor seams shall be caulked and sealed for an air-tight unit. Where access is provided to the unit interior, floor openings shall be covered with walk on steel safety grating. Single wall floors with glued and pined fiberglass insulation are not acceptable. Base frame shall be attached to the unit at the factory.

D. DOUBLE WALL CONSTRUCTION

1. Each unit shall have double wall construction with 20 gauge solid galvanized steel liner.
2. 16Ga Galv Exterior Material
3. 20Ga Galv Interior Material

E. INSULATION

1. Entire unit to be insulated with a full 3” thick non-compressed fiberglass insulation. The insulation shall have an effective thermal conductivity (C) of .24 (BTU in./sq.ft.°F) and a noise reduction coefficient (NRC) of 0.70 / per inch thick (based on a type “A” mounting). The coefficients shall meet or exceed a 3.0 P.C.F. density material rating. Insulation shall meet the erosion requirements of UL 181 facing the air stream and fire hazard classification of 25/50 (per ASTM-84 and UL 723 and CAN/ULC S102-M88). All insulation edges shall be encapsulated within the exterior panel. Insulation facing the airstream shall be Tuf-Skin with black acrylic coating.

F. ACCESS DOORS

1. The unit shall be equipped with solid double wall insulated, hinged access doors as shown on the plans, same construction as unit cabinet. The doorframe shall be extruded aluminum with a built-in thermal break barrier and full perimeter gasket. The door hinge assembly shall be die-cast zinc with stainless steel pivot mechanism, completely adjustable. There shall be a minimum of two heavy duty cast; UV rated; nylon handles per door. Provide ETL, UL 1995, and CAL-OSHA approved tool operated safety latch on all fan section access doors. Windows, rated for UV protection, required in all sections.
2.03 FAN ARRAYS

A. Unit shall have multiple direct-drive fans that create a fan wall. It shall consist of multiple, direct driven, arrangement plenum fans constructed per AMCA requirements for the duty specified, minimum Class III. All fans shall be selected to deliver the specified airflow quantity at the specified operating Total Static Pressure and specified fan/motor speed. The Fan Wall Array shall be selected to operate at a system Total Static Pressure that does not exceed 90% of the specified fan’s peak static pressure producing capability at the specified fan/motor speed. Each fan/motor “cube” shall include an 11 gauge, A60 Galvanized steel intake wall, 14 gauge spun steel inlet funnel, and an 11 gauge G90 Galvanized steel motor support plate and structure. The fan intake wall, inlet funnel, and motor support structure shall be powder coated for superior corrosion resistance. All motors shall be standard pedestal mounted type, TEAO, T-frame motors selected at the specified operating voltage, RPM, and efficiency as specified or as scheduled elsewhere. All motors shall include shaft grounding, like AEGIS or BALDOR. Each fan/motor cartridge shall be dynamically balanced to meet AMCA standard 204-96, category BV-5, to meet or exceed Grade 2.5 residual unbalance.

B. Each fan cube shall be able to fit through a 30” door. The maximum wheel size is 20” in diameter.

1.1.1. The FWT array shall be provided with acoustical silencers that reduce the bare fan discharge sound power levels by a minimum of 15 db re 10^-12 watts throughout the eight octave bands with center frequencies of 125, 250, 500, 1000, 2000, 4000, and 8000 HZ when compared to the same unit without the silencers. The silencers shall not increase the fan total static pressure, nor shall it increase the airway tunnel length of the Air Handling Unit when compared to the same FWT unit without the silencer array.

1.1.2. Alternate manufacturers must submit acoustical data for review and approval prior to the bid indicating that the proposed alternate equipment can meet all specified performance requirements without impacting the equipment performance or design features including duct connection location, unit weights, acoustical performance, or specified total fan HP for each FWT array. Proposals submitted which indicate a higher connected fan HP than specified or scheduled will not be accepted.

1.2. The fan array shall consist of multiple fan and motor “cubes”, spaced in the air way tunnel cross section to provide a uniform air flow and velocity profile across the entire air way tunnel cross section and components contained therein. Each fan cube shall be individually wired to a motor overload panel, for the total connected HP for all fan motors contained in the FWT array. Wire sizing shall be determined, and installed, in accordance with applicable NEC standards. VFDs will ship loose.

1.3. The Fan Wall array shall produce a uniform air flow profile and velocity profile within the airway tunnel of the air handling unit not to exceed the specified cooling coil and/or filter bank face velocity when measured at a point 12” from the intake side of the Fan Wall array intake plenum wall, and at a distance of 48” from the discharge side of the Fan Wall intake plenum wall.

1.4. Each fan/motor assembly shall be removable through a 24” wide, free area, access door located as shown on the drawings. Each fan array shall be designed for redundancy. If one fan is off, the remaining fans shall be sized to produce 100% of the airflow without exceeding the max amp draw. For smaller 2 fan systems, a reduction of the redundancy capacity to 70% airflow will be allowed.

1.5. Each fan/motor “cube” will be provided with an individual back-draft damper with a net zero effect on air pressure drop to the fan system. Damper bearings shall be corrosion resistant long life synthetic. Shut-off plates are not acceptable. Horizontal backdraft dampers with or without actuators are not acceptable.
2.04 COILS
A. Drain pans: Construct from 16 gauge 304 stainless steel. All pans are to be insulated “Double Bottom” construction with welded corners. Drain pans are to be sloped for complete drainage with no standing water in the unit. If coils are stacked, an intermediate drain pan is required. Drain connections shall be standard 1¼” MPT connection extended to the exterior of the air handler. Drain pans shall be provided under all cooling coils as shown on the drawings.
B. Coils shall match the scheduled dimensions and capacity. Coils shall be small enough to fit into building without demolition of walls or other structure. Proper coordination required by coil manufacturer to ensure fit.
C. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with ARI 410. Coil air face velocities shall not exceed the specified velocities of the mechanical schedule.
D. Hot and Chilled Water Coils:
1. Tubes: 5/8 inch OD seamless copper arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.
2. 0.025 Tube Wall Thickness
3. Fins: Aluminum continuous plate type with full fin collars.
4. Casing: Die formed channel frame of 16 gage 304 stainless steel with 3/8 inch mounting holes on 6 inch centers (Heating coils shall have 16 ga galv casing). Provide tube supports for coils longer than 42 inches.
6. Testing: Air test under water to 350 psi for working pressure of 250 psi and 300 degrees F.
7. Configuration: Drainable, with threaded plugs in headers for drain and vent; threaded plugs in return bends and in headers opposite each tube.
E. Integral Face & Bypass Coils (IFB):
1. 2 Rows / 9 FPI
2. 0.035 Tube Wall Thickness
3. Copper Tube / Aluminum Fin
4. 304SS IAQ Drain Pan

2.05 FILTERS
A. Filter Box: Only Provide 24” x 24” and 12” x 24” frames to house the pre-filters for a front load arrangement. Other sizes will not be acceptable.
B. Filter Media: UL 900 listed, Class II, approved by local authorities.
C. Pre: 21” MERV 13 Bag Filter
D. Filter Gauges:
1. 2 inch diameter diaphragm actuated dial in metal case with static pressure tips.

2.06 DAMPERS
A. All dampers, (Min/Max) Outside, Return, and Exhaust shall be constructed of galvanized steel with vinyl bulb edging and edge seals in galvanized frame shall be provided, with galvanized steel axles in self-lubricating nylon bearings, in parallel blade arrangement with damper blades positioned across short air opening dimension. Provide removable, full width rack for supporting freeze protection thermostat, with removable end panel to permit rack removal. Two separate outside air dampers will be required (min and max). Floor openings shall have grating.
B. Damper Leakage: Maximum 2 percent at 4 inch wg differential pressure when sized for 2000 fpm face velocity.
2.07 AIR FLOW MEASUREMENT
A. Each fan assembly shall be supplied with a complete flow measuring system, which indicates airflow in cubic feet per minute.
B. The flow measuring system shall consist of a flow measuring station with four static pressure taps and four total pressure tubes located at the throat of the fan inlet cone.
   1. The flow measuring station shall not obstruct the inlet of the fan and shall have no effect on fan performance (flow or static) or sound power levels.
C. A surface mounted indicator, located on the unit exterior, shall provide a digital CFM readout, and/or a (4-20 ma) or (0-10) output control signal for use in the BMS as specified elsewhere.

2.08 SHAFT GROUNDING
A. Shaft grounding system for each three-phase AC motor to prevent electrical damage to motor bearings and to extend motor life by safely channeling harmful shaft currents to ground.
B. Provide shaft grounding on all motors controlled by variable frequency controllers and as indicated.
C. Electrographite construction. Integral shunt with quick disconnect terminal and mount.
D. Continuous spring loaded brush holder, conductive carbon brush or carbon fiber ring technology.
E. Replaceable without motor removal or uncoupling.

2.09 ELECTRICAL POWER AND CONTROLS
A. The unit shall be equipped with 15W LED light fixtures with guards in every access section. Lights shall be controlled by one light switch mounted adjacent to the supply air fan access door.
B. Provide field installed 120 volt service

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Bolt sections together with gaskets.
C. Isolate fan section with flexible duct connections.
D. Install flexible duct connections between discharge ductwork and air handling unit sections. Ensure that metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.
E. Make connections to coils with unions or flanges.
G. Hydronic Coils:
   1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
   2. Provide shut-off valve on supply line and lockshield balancing valve with memory stop on return line.
   3. Locate water supply at bottom of supply header and return water connection at top.
   4. Provide manual air vents at high points complete with stop valve.
   5. Ensure water coils are drainable and provide drain connection at low points.
H. Insulate coil headers located outside air flow as specified for piping. Refer to section on insulation.

3.02 START-UP

A. Factory Start-Up Services: Start-up is to be supervised by the unit manufacturer or a manufacturer-certified service organization. Physical connections and start-up are provided by the installing contractor. Provide for as long a period of time as is necessary to ensure proper operation of the unit but in no case for less than 1 full day. The start-up engineer shall conduct such operating test as required to ensure that the unit is operating in accordance with design. Complete testing of all safety and emergency control devices shall be made. The start-up engineer shall submit a written report to the owner and manufacturer containing all test data recorded as required above and a letter certifying that the unit is operating properly.