

SECTION 15727 - MODULAR INDOOR AIR HANDLING UNITS

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 WORK INCLUDED

- A. Furnish and install all factory built Packaged air handling units.
- B. All units shall be new and manufactured for the specific purpose of providing conditioned air (heating and cooling) to the systems indicated.
- C. All system components shall be installed in accordance with local codes including seismic isolation.
- D. Secure all permits and local/state approval for the components as specified and included under this Section.

1.3 RELATED SECTIONS

- A. Examine all drawings and criteria sheets and all other Sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.

1.4 REFERENCES

- A. ARI 430 - Standard for Central Station Air Handling Units.
- B. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- C. ANSI/AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- D. SMACNA - HVAC Duct Construction Standards.
- E. ARI 410 - Standard for Forced Circulation Air-Cooling and Air-Heating Coils.
- F. ANSI/UL 900 - Test Performance of Air Filter Units.

- G. AMCA 300 - Reverberant Method for Sound Testing of Fans.
- H. ARI 260 - Standard for Sound Rating of Ducted Air Moving and Conditioning Equipment
- I. AMCA 301 - Method for Publishing Sound Ratings for Air Moving Devices.
- J. ASHRAE 68 - Laboratory Method of Testing In-Duct Sound Power Measurement Procedure for Fans.

1.5 QUALITY ASSURANCE

- A. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on total product offering.
- B. ISO 9001 Certification. The air handling manufacturer shall be registered to ISO 9001, establishing quality assurance requirements from design and development to production to installation and servicing.
- C. Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with ARI 430. If air handling units are not certified in accordance with ARI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
- D. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with ARI 410.

1.6 SUBMITTALS

- A. See Section 15050 and General Condition for additional submittal requirements.
- B. Submit unit performance including: capacity, nominal and operating performance.
- C. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
- D. Submit shop drawings indicating overall dimensions as well as installation, operation and service clearances. Indicate lift points and recommendations. Indicate unit shipping, installation and operating weights including dimensions.
- E. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Each section shall have lifting lugs or shipping skid to allow for field rigging and final placement of section.
- B. Deliver units to site with fan motors, sheaves, and belts completely assembled and mounted in units.
- C. Store and protect products.
- D. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.9 EXTRA STOCK

- A. Provide two sets of each type of filters.

1.10 WARRANTY

- A. A parts warranty for one year from date of owner acceptance.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Approved manufacturers:
 - 1. Trane; Model: Modular Climate Changer
 - 2. York
 - 3. Mcquay
 - 4. Buffalo Air Handling

2.2 GENERAL

- A. Manufacturer must clearly define any exceptions made to Plans and Specifications. Any deviations in layout or arrangement shall be submitted to engineer prior to bid date for approval. Mechanical Contractor is responsible for expenses that occur due to exceptions made.
- B. Unit layout shall be single path (single plenum), providing one path for outside air with all components arranged in series as specified below and indicated on drawings.
- C. Unit arrangement shall be as indicated on the drawings.
- D. Units of sizes, capacities, and configurations as scheduled on drawings.
- E. Provide unit mounting legs to support all sections of unit and raise unit for proper trapping. Contractor will be responsible for providing a housekeeping pad when unit mounting device is not of sufficient height to properly trap unit. Unit mounting devices not constructed of galvanized steel shall be chemically cleaned, coated with rust-inhibiting primer and finished with rust-inhibiting enamel.

2.3 CASING

- A. Unit shall be constructed of a complete structural frame with removable panels. Removal of side panels shall not affect the structural integrity of the unit. Contractor shall be responsible to provide connection flanges and all other framework that is needed on unit to ensure that removal of unit's panels shall not affect structural integrity. On units larger than 12 tons, manufacturer shall be able to ship each segment (filter, coil, fan) separate so that unit can be broken down for ease of installation in tight spaces.
- B. Panels shall be fully removable to allow complete access for inspection and cleaning of all interior surfaces. If panels are not removable, then manufacturer shall provide access sections with doors between all internal components to ensure access and cleanability of the air handler.
- C. Construct casing sections located upstream of supply fan for operation at 4 inches water gauge negative static pressure and casing sections located downstream of supply fan for operation at 6 inches water gauge positive static pressure.
- D. All exterior panels and structural frames shall be constructed of G90-U galvanized steel. Casings not constructed of G90-U galvanized steel, casings with welds on exterior surfaces, or casings with welds on interior surfaces that have burned through to exterior surfaces shall be chemically cleaned, coated with rust-inhibiting primer and finished with rust-inhibiting enamel in order to prevent premature corrosion and microbial growth.
- E. All joints between exterior panels and structural frames shall have seals and gaskets with closed-cell foam gasketing for air seal and acoustical break.

- F. Casing shall have full size removable access doors as scheduled on drawings. Access doors shall have double-wall construction. Provide automotive style neoprene gasketing around full perimeter of access doors to prevent air leakage. Provide "ventlock" style non-corrosive alloy latches operable from the inside or outside of unit. If access doors open against unit operating pressure, provide safety latches that allow access doors to partially open after first handle movement and fully open after second handle movement.
- G. Insulate casing sections with 2" thick 1-1/2 pound per cubic foot density fiberglass insulation or equivalent. Provide double-wall casing construction and encase insulation between solid exterior and solid interior casing panels such that no insulation is exposed to airstream. Foil facing on insulation is not acceptable as alternate to double wall construction. Insulation shall comply with NFPA 90A.

2.4 FANS

- A. Provide supply fan section(s) with AF double-width, double-inlet centrifugal fan designed and suitable for class of service indicated in the unit schedule. Fan shaft to be properly sized and protectively coated with lubricating oil. Fan shafts shall be solid and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. Fans shall be statically and dynamically tested as an assembly at the required RPM to meet design specifications. Key fan wheels to fan shaft to prevent slipping.
 - 1. Provide self-aligning, grease lubricated pillow-block ball bearings selected for L-50 200,000 hour average life per ANSI/AFBMA 9. Extend both grease lubrication fittings to drive side of unit with plastic tubes and zerk fittings rigidly attached to drive side bearing support.
- B. Mount fans on isolation bases. Internally mount motors on same isolation bases and internally isolate fans and motors with 2 inch spring isolators. Install flexible canvas ducts between fan and casings to ensure complete isolation. Flexible canvas ducts shall comply with NFPA 90A. If no isolators or flexible canvas duct is provided, then the entire unit shall be externally isolated from the supply duct work and piping by contractor in order to avoid transmission of noise and vibration through the ductwork.
- C. Fan sections shall have full height, double-wall, hinged, removable access doors on drive side for inspection and maintenance of internal components. Construct doors in accordance with Article 2-3 Paragraph E.
 - 1. To facilitate inspection of internal components, provide sealed-glass and wire-view windows on fan access doors.
 - 2. Provide marine lights inside fan sections. Construct marine lights of sealed glass fixtures with wire guards to keep electrical sockets dry and protect fixtures from damage.
- D. Belts shall be enclosed as required by OSHA standard 29 CFR 1910 to protect worker from accidental contact with the belts and sheaves.

- E. Fan and motor assembly shall be weighed at AHU manufacturer's factory for isolator selection. Fan section assemblies shall be statically and dynamically balanced. Fan section assemblies include fan wheels, shafts, bearings, drives, belts, isolation bases and isolators. Isolators must be allowed to free float when performing fan balance. Vibration shall be measured at each fan shaft bearing in horizontal, vertical and axial directions. Design RPM's to be balanced as scheduled on drawings.
- F. Fan sections controlled by variable frequency drives, shall be balanced at all speeds from 25% and 100% of design RPM.

2.5 MOTORS AND DRIVES

- A. Factory install all motors on slide base to permit adjustment of belt tension.
- B. Fan Motors shall be heavy duty TEFC. Suitable for use with variable speed drives.
- C. SEE SECTION 15170.
- D. Manufacturer shall provide for each fan a nameplate with the listed information to assist air balance contractor in start up:
 - 1. Fan and motor Sheave part number
 - 2. Fan and motor bushing part number
 - 3. # of belts and part numbers
 - 4. Design RPM and Motor HP
 - 5. Belt tension and deflection
 - 6. Center distance between shafts

2.6 COILS

- A. Water Cooling Coils
 - 1. SEE SECTION 15761
 - 2. Clearly label supply and return headers on outside of units such that direction of coil water-flow is counter to direction of unit air- flow.
 - 3. Construct headers of round copper pipe or cast iron.
 - 4. Construct tubes of 5/8 inch O.D. minimum 0.020 inch thick copper and construct fins of aluminum.
- B. Steam Heating Coils
 - 1. SEE SECTION 15761
 - 2. Clearly label supply and return connections on outside of units.
 - 3. Provide non-freeze steam distributing type coils. Pitch steam coils in units for proper drainage of steam condensate from coils.

4. Inner tubes shall have orifices that ensure even steam distribution across coil face. Direct orifices toward return connections to ensure steam condensate is discharged from coils.

2.7 DRAIN PAN CONSTRUCTION

- A. Provide sealed double-wall drain pans constructed of stainless steel exterior panels and stainless steel interior liner. Encase insulation between exterior and interior walls. Drain pans shall be sloped in 2 planes; cross break interior pans and pitch toward drain connections to ensure complete condensate drainage. Units with cooling coils shall have drain pans under complete cooling coil section. Units with heating coils shall have a drain pan under complete heating coil segment to ensure proper drainage during cleaning. All drain pan connections will be to the side of the unit to enable proper trapping.

2.8 FILTERS

- A. See Section 15861
- B. See Drawings for type
- C. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter sections shall have filter guides and full height, double-wall, hinged, removable access doors for filter removal.

2.9 DAMPERS

- A. Provide internally mounted ultra low leak outside air dampers as scheduled on drawings. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent. Construct damper blades and damper frames of galvanized steel. Provide parallel blade action with metal compressible jamb seals and extruded vinyl blade edge seals. Blades shall rotate on stainless steel sleeve bearings. Damper blade lengths shall not exceed 60 inches. Leakage rate shall not exceed 5 CFM/square foot at one inch water gauge and 9 CFM/square foot at 4 inches water gauge. All leakage testing and pressure ratings will be based on AMCA Publication 500.
- B. Provide a factory-mounted ASHRAE Standard 62-89 airflow monitoring and control station in the outdoor air opening of the mixing box. The monitor shall track a variable outside air quantity for ventilation demand flow control and ventilation flow documentation. The airflow monitoring station shall be factory-mounted, factory-calibrated, and the installation certified by the airflow monitor manufacturer.
 1. The air handling unit mixing box shall also include a low lead modulating outside air damper mounted in series with the air flow monitor.

2. The outside air damper blades shall be galvanized steel, housed in a galvanized steel frame with edge and seals and mechanically fastened to a normally closed, spring return, electric actuator through a solid steel shaft which shall rotate in permanently lubricated bearings. All linkages, crank arms, jack shafts and mounting hardware shall be provided.
 3. The airflow measurement station shall be calibrated to measure a variable airflow from 15% of nominal cfm up to 100% of design airflow, maintaining an accuracy of plus or minus five (5%) percent of actual cfm, for air measuring between -40F up to +158F.
 4. Manufacturer shall submit test data to demonstrate compliance.
 5. The airflow monitoring station shall provide a proportional output velocity signal (2-10 vdc). The velocity sensor shall have an automatic zeroing function and it shall be programmed to recalibrate the device's transducer a minimum of once per day. Power requirements shall not exceed 100VA per monitor at 24 VAC with power being provided by the Building Automation System (BAS) contractor. The monitor manufacturer shall provide to the Building Automation System (BAS) contractor a certified conversion table for the signal provided.
- C. Provide ultra low leak Face and Bypass dampers as scheduled on drawings. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent. Construct damper blades and damper frames of galvanized steel. Provide opposed blade action with metal compressible jamb seals and extruded vinyl blade edge seals. Blades shall rotate on stainless steel sleeve bearings. Mechanically link face dampers to bypass dampers and provide end driven control shafts. Damper blade lengths shall not exceed 60 inches. Leakage rate shall not exceed 5 CFM/square foot at one inch water gauge and 9 CFM/square foot at 4 inch water gauge.

2.10 ACCESS SECTIONS

- A. Access for inspection and cleaning of the unit drain pan, coils and fans sections shall be provided. The unit shall be installed for proper access. Procedure for proper access, inspection and cleaning of the unit shall be included in the maintenance manual. Access section shall have double wall, hinged, removable access doors on one sides of sections.
1. To facilitate inspection of internal components, provide sealed glass and wire view windows on access doors.
 2. Provide marine lights inside access sections. Construct marine lights of sealed glass fixtures with wire guards to keep electrical sockets dry and protect fixtures from damage.

2.11 GENERAL UNIT SECTIONS

- A. Air Blender: The blender shall be of the rotary design with radial blades. Blender shall have the proper distances upstream and downstream to provide a minimum mixing effectiveness of 75 percent when mixing 50 percent outside air and 50 percent return air at 50 F initial inlet temperature differential. Construct blender of .080 3003 aluminum.

- B. Moisture Eliminator: Provide moisture eliminator with galvanized sine wave fins and drain pans in the casing.
- C. Diffuser Section: Provide a diffuser section as shown on the drawings to promote equal air distribution across coils and filters.
- D. Acoustical Discharge Attenuator: Provide factory mounted sound attenuation section as scheduled on drawings.
 - 1. See Section 15830.
- E. Economizer Section
 - 1. The economizer segment shall consist of multi-leaf, parallel acting, ultra-low-leak dampers. The return air, outside air and exhaust air dampers shall be sized for 100% of unit airflow. The return air opening shall be located in the rear of the unit.
 - 2. The outside air and exhaust air dampers shall be located on opposite sides of unit to prevent mixing of fresh air and exhaust air. The dampers shall be protected from the elements by a weatherproof louver and bird screen assembly. In addition to the louver/bird screen assembly, a full-length drain pan shall be installed under the outside air damper.
 - 3. A DWDI airfoil fan shall serve as a "true" return air fan. The fan components and installation shall be identical to the supply air fan. The economizer segment shall consist of multi-leaf, parallel acting, low-leakage blades.
 - 4. All economizer sections shall have a double-walled hinged access door as specified. Floors of 16 gauge steel shall be supplied for mixing boxes to protect insulation during installation and servicing of damper actuators. All outside air intakes shall include rain hoods and mist eliminators to reduce the opportunity for rain or snow to enter the unit.

2.12 FACTORY-INSTALLED VARIABLE FREQUENCY DRIVE / DISCONNECTS

- A. Variable Frequency Drive with Bypass/disconnect shall be properly sized, mounted, wired to the fan motor, and commissioned by the AHU manufacturer.
- B. See Section 15175

2.13 CONTROLS

- A. FACTORY END DEVICES WIRED TO TERMINAL STRIPS. All sensors, actuators, valves and end devices shall be selected, mounted, wired and tested by the AHU manufacturer. Control end devices shall be wired to terminal strips for a generic field interface to the field mounted, wired and commissioned DDC controller. Valves and actuators shall require 24VAC and 2-10VDC. Low limits and differential pressure switches shall be dry contacts. The field provided controller shall be calibrated to the air handler manufacturer's RTD and thermister sensors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that the mechanical equipment room is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Manufacturer shall furnish a factory-trained service engineer without additional charge to start the unit(s). Package rooftop unitary manufacturers shall maintain service capabilities no more than 100 miles from the jobsite.
- B. The manufacturer shall furnish complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.

END OF SECTION