

SECTION 237313 - AIR HANDLING UNITS, CENTRAL STATION, MODULAR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

1.2 SCOPE

- A. Furnish and install modular central station air handling units of the types, sizes, and capacities indicated.

1.3 RELATION TO OTHER WORK

- A. Refer to the section "General Mechanical Provisions" for related requirements. Refer to other sections of Division 23 and to all other applicable portions of the drawings and specifications.

1.4 SHOP DRAWINGS

- A. Refer to Section entitled "General Mechanical Provisions". Include complete performance data at the scheduled operating conditions; dimensions; weights; fan performance curves, airside pressure losses; waterside pressure losses; water quantities; coil descriptions; and unit inlet, discharge and radiated sound power levels, by octave bands, at the stated conditions; and a complete schedule worked up by unit number.

1.5 CERTIFICATION

- A. Equipment performance ratings shall be certified as follows:
 - 1. Fans: AMCA Bulletin 210 or ARI Standard 430.
 - 2. Coils: ARI Standard 410.

1.6 MANUFACTURER

- A. Products listed in this Section or on the plans are based on a specific manufacturer to establish the desired style, quality and type. Equivalent products, complying with the requirements of this Section and the installation requirements of the plans, by the following manufacturers are acceptable:
 - 1. Trane
 - 2. Carrier
 - 3. Temtrol

PART 2 - PRODUCT

2.1 GENERAL

- A. Units shall be configured of standard modules arranged in sequence in direction of air flow as required to meet project requirements. Modules shall generally include, but not be limited to, the following as applicable to each air handling unit's individual requirements:
1. Intake module.
 2. Mixing/Filter-Mixing Box module.
 3. Filter module(s).
 4. Inspection and/or access module(s).
 5. Coil module(s).
 6. Fan module.
 7. Discharge plenum module(s).
 8. Diffuser module.
 9. Internal or external face and bypass module.
 10. Multizone or double-duct coil section.

Modules shall comply with the requirements of the following component descriptions as appropriate to the configuration of the individual module.

- B. Unit layout and configuration shall be as defined in project plans and schedule.
- C. 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 and coated with both a rust-inhibiting primer and finished coat of rust-inhibiting enamel.

2.2 MODULE CASINGS

- A. Unit shall be constructed of a complete structural frame with removable panels. Unit manufacturer shall ship separate segments so unit can be broken down for ease of installation in tight spaces. The entire air handler shall be constructed of galvanized steel. Casing finished to meet ASTM B 117 250-hour salt-spray test. The removal of side panels shall not affect the structural integrity of the unit. All removable panels shall be gasketed to minimize air leakage. All doors shall have gasketing around full perimeter to prevent air leakage. Contractor shall be responsible to provide connection flanges and all other framework that is needed to properly support the unit.
- B. Construct casing sections capable of operating from -4"wg to +6"wg.
- C. Hinged access doors shall be available in all sections to allow easy access to drain pan, coil(s), motor, drive components and bearings for cleaning, inspection, and maintenance. At a minimum, doors shall be provided in filter, upstream of cooling coil, downstream of cooling coil and fan sections. Removable access panels in lieu of doors are not acceptable.
- D. Access doors shall be double wall construction to prevent damage to insulation during routine maintenance.
- E. Access panels and doors shall be fully removable without the use of specialized tools to allow complete access of all interior surfaces.

- F. Door hardware shall be surface mounted to minimize penetrations in the door casing that could lead to air leakage paths.
- G. All joints between exterior panels and structural frames, as well as joints between module frames, shall be properly sealed and gasketed to provide an air seal.
- H. Panels shall be double-wall construction to facilitate cleaning of the unit interior. The interior wall shall be constructed of solid, galvanized steel. Thermal resistance (R-value) shall be 8.33 ft²-hr-F/BTU or better.

2.3 FANS

- A. Provide fans of type and class as specified on the schedule. Fan shafts shall be solid, coated with a rust-inhibiting coating, and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. All fans shall be statically and dynamically tested by the manufacturer for vibration and alignment as an assembly at the operating RPM to meet design specifications. Fans controlled by variable frequency drives shall be statically and dynamically tested for vibration and alignment at speeds between 25% and 100% of design RPM. If fans are not factory-tested for vibration and alignment, the contractor shall be responsible for cost and labor associated with field balancing and certified vibration performance. Fan wheels shall be keyed to fan shafts to prevent slipping.
- B. Provide grease lubricated ball bearings selected for L-50 200,000-hour average life per ANSI/AFBMA 9. Greasable bearings shall have lubrication lines extended to the drive side of the unit. Lubrication lines shall be a clear, high-pressure, polymer to aid in visual inspection. Extend both grease lubrication lines to drive side of unit and rigidly attach to drive side bearing support with zerk fittings. If extended lubrication lines are not provided, manufacturer shall provide permanently lubricated bearing with engineering calculations for proof of bearing life.
- C. Fans shall be mounted on isolation bases. Internally-mounted motor shall be on the same isolation base. Fan and motor shall be internally isolated with spring isolators. Flexible canvas ducts shall be installed between fan and unit casing to ensure complete isolation. Flexible canvas ducts shall comply with NFPA 90A and UL 181 requirements.
- D. Fan modules shall have a access door located on the drive side of the unit to allow inspection and maintenance of the fan, motor, and drive components. Construct door(s) per Section 2.03 paragraphs D, E, and F.
- E. Fans for VAV applications shall be factory inverter duty balanced prior to shipment.

2.4 MOTORS AND DRIVES

- A. All motors and drives shall be factory-installed and run tested. All motors shall be installed on a slide base to permit adjustment of belt tension. Slide base shall be designed to accept all motor sizes offered by the air-handler manufacturer for that fan size to allow a motor change in the future, should airflow requirements change. Fan sections without factory-installed motors shall have motors field installed by the contractor. The contractor shall be responsible for all costs associated with installation of motor and drive, alignment of sheaves and belts, run testing of the motor, and balancing of the assembly.
- B. Fan Motors shall be heavy duty, open drip-proof, E+.

- C. Motors shall be selected to operate continuously at 104 F (40 C) ambient without tripping of overloads. Motors shall have a +/- 10 percent voltage utilization range to protect against voltage variation. Motors shall be in compliance with EPACT when applicable.
- D. V-Belt Drive shall be fixed pitch rated at 1.5 times the motor nameplate.
- E. Manufacturer shall provide for each fan a nameplate with the following information to assist air balance contractor in start up and service personnel in maintenance:
 - 1. Fan and motor sheave part number
 - 2. Fan and motor bushing part number
 - 3. Number of belts and belt part numbers
 - 4. Fan design RPM and motor HP
 - 5. Belt tension and deflection
 - 6. Center distance between shafts

2.5 COILS

- A. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drainpan under the coil.
- B. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.
- C. Construct coil casings of stainless steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.
- D. All coils shall be completely cleaned prior to installation into the air handling unit. Complete fin bundle in direction of airflow shall be degreased and steam cleaned to remove any lubricants used in the manufacturing of the fins, or dirt that may have accumulated, in order to minimize the chance for water carryover.
- E. On stacked cooling coils, intermediate stainless steel drain pans shall be installed between the coils. Intermediate drain pans shall have drop tubes to guide condensate to the main drain pan, thus preventing flooding of lower coils that would result in moisture carryover.
- F. Where indicated on the schedule coils shall be provided with a factory applied heresite corrosion protection coating. Manufacture shall guarantee no moisture carryover when coating is applied. Field applied coating is unacceptable.
- G. Hydronic Coils:
 - 1. Supply and return header connections shall be clearly labeled on outside of units such that direction of coil water-flow is counter to direction of unit air-flow.
 - 2. Coils shall be proof tested to 300 psig and leak tested to 200 psig air pressure under water.
 - 3. Headers shall be constructed of round copper pipe or cast iron.
 - 4. Tubes shall be 1/2 inch O.D. or 5/8" O.D minimum .016 inch thick copper. Fins shall be aluminum.

2.6 BASE-LEVEL DRAIN PANS

- A. Insulation shall be encased between exterior and interior walls. Units with cooling coils shall have stainless steel drain pans under complete cooling coil section that extend beyond the air-leaving side of the coil to ensure capture of all condensate in section. Cooling coil drain pans shall be sloped in 2 planes, pitched toward drain connections to ensure complete condensate drainage when unit is installed level and trapped per manufacturer's requirements. See section 2.05, paragraph E for specifications on intermediate drain pans between cooling coils.
- B. Units with heating coils shall have a galvanized steel drain pan under complete heating coil section sloped in 2 planes and pitched toward drain connections to ensure proper drainage during cleaning and to capture water in the event of a coil failure.
- C. All drain pan connections supplied by unit manufacturer including, piping, and piping connections extending from stainless steel drain pans shall be constructed of stainless steel. The contractor is responsible to ensure the unit is installed level, trapped in accordance with the manufacturer's requirements, and visually inspected to ensure proper drainage of condensate.

2.7 FILTERS

- A. Provide factory-fabricated filter section(s) of the same construction and finish as unit casings. Filter section(s) shall have filter guides and access door extending the full height of the casing to facilitate filter removal. Construct doors in accordance with Section 2.03, paragraphs D, E, and F. Provide filter blockoffs as required to prevent air bypass around filters.
- B. Final Filters:
 - Thickness: 2-inches
 - Efficiency: MERV 12
 - Media Type: Pleated media
 - Access: Removable from one side of unit
 - Arrangement: Provided as defined by the drawings.

2.8 DAMPERS

- A. All dampers, with the exception of external bypass and multizones (if scheduled), shall be internally mounted. Dampers shall be premium ultra low leak and located as scheduled. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent for minimal air leakage and pressure drop. 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 shall be based on AMCA Publication 500. Manufacturer shall submit brand and model of damper(s) being furnished.
- B. Where required, provide a factory-mounted ASHRAE Standard 62 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 installed per the airflow monitor manufacturer's recommendations.
 - 1. The air handling unit mixing box shall also include a modulating outside air damper mounted in series with the air flow monitor.

2. All linkages, crank arms, jack shafts and mounting hardware shall be provided.
3. The airflow monitoring station shall be calibrated to measure a variable airflow from 15% of nominal airhandler 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. Monitoring station shall compensate for outside air temperature fluctuations that affect mass flow rate of air.
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 shall be programmed to recalibrate the device's transducer a minimum of once per day to ensure continuous accuracy of airflow measurements. The monitor manufacturer shall provide to the Building Automation System (BAS) contractor a certified conversion table for the signal provided.

2.9 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 side of sections. Construct doors per Section 2.03 paragraphs D, E, and F.

2.10 OVERALL CONSTRUCTION

- A. Shall be low, medium or high pressure as recommended by the manufacturer for operation at the indicated conditions.

2.11 UNIT COMPONENTS AND CONFIGURATIONS

- A. General: Refer to drawings and schedules for components and configurations of units. In general and unless exceptions are indicated, unit assemblies shall consist of the following items in series in direction of air flow:
- B. Draw-through Type Units:
 1. Mixing box / filter module.
 2. Coil module(s).
 3. Access module.
 4. Plenum fan module.

2.12 CONSTRUCTION PRESSURE REQUIREMENTS

- A. Each unit shall be specifically cataloged, rated and constructed for operation at the total static pressure conditions of the system in which the unit is utilized and shall be recommended by the manufacturer for the specific pressure and operating conditions encountered on this project.

2.13 OTHER REQUIREMENTS

- A. Units shall be horizontal or vertical configuration (as applicable).

- B. Cooling coils shall not have face velocities in excess of 550 fpm unless otherwise indicated on drawing schedule (in such case, velocity obtained from drawing schedule shall be upper limit).
- C. Units shall be provided which will perform as indicated with proper consideration of any correction factors which are applicable to unit casing configuration.
- D. Heating coils shall be located in either or both the reheat and preheat positions as scheduled.
- E. Pipe all coils for counterflow heat transfer.

PART 3 - INSTALLATION

3.1 EQUIPMENT PLACEMENT

- A. Air handling equipment shall be located essentially as shown on drawings; however, actual placement of the unit shall be verified using field measurements and data relating to the units approved for actual installation on this project.

3.2 WIRING

- A. Where units utilize internal drives, conduit penetrations shall be provided by the manufacturer. The conduit openings shall be located on the drive side and positioned so as not to compromise access to any portion of the unit. The opening shall be provided with effective seals and the edges of the internal insulation shall be properly sealed.

3.3 SOUND AND VIBRATION CONTROL

- A. Refer to other sections for airside sound control and vibration control. Mount isolators using height saving brackets where required to reduce operating height of unit to suit space available.

3.4 DUCT CONNECTIONS

- A. Supply and return ducts shall be connected to their respective air handler using flexible connectors. Connectors shall be properly installed so that they are not in tension and are aligned with their respective ducts.

3.5 PIPING

- A. Refer to sections describing connected piping. Plug unused drain connections.

END OF SECTION 237313