

**SECTION 23 70 00
AIR HANDLING UNITS**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The other Contract Documents complement the requirements of this section.
- B. The General Requirements apply to the work of this section.

1.2 SCOPE

- A. Provide material, equipment, labor, and supervision necessary to install Air Handling Units.

1.3 STANDARDS

- A. Units shall have certified ratings complying with AHRI Standard 430.

1.4 SUBMITTALS

- A. Submittal data shall consist of drawings showing coil dimensions, construction materials, fan performance curves, coil capacity, horsepower, electrical characteristics, and installation instructions.
- B. Fan manufacturers shall furnish for approval for each fan certified sound power ratings with an octave band analysis and the volume-pressure-horsepower characteristic curves from shutoff to free air delivery.

1.5 COMMISSIONING

- A. Commissioning of a system or systems specified in this section is part of the construction process.
- B. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Authority.
- C. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.
- D. Refer to Section 01 77 00 - Contract Closeout, for substantial completion details.
- E. Refer to Section 01 91 00, Commissioning, for detailed commissioning requirements

1.6 WARRANTIES

- A. Provide 5-year parts and labor warranty to include all motors, fans, bearings, coils, controls, electrical devices and related system components, see section 23 05 13.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Air handling units shall be as manufactured by one of the following.
 - 1. Trane
 - 2. Carrier
 - 3. York
 - 4. Daikin

2.2 GENERAL

- A. Unit shall be factory built and assembled with arrangements as indicated.
- B. Units shall have capacities, ratings, and performance as scheduled.

2.3 CASING

- A. Constructed of a galvanized structural steel framework with 2" insulated double wall roof, wall and floor panels.
 - 1. Casing shall be constructed of a minimum of 16 gauge, G-90 galvanized steel.
 - 2. Separate fan, coil, coil access, drain-pan, and a filter sections.

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3. Casings for coil section and all sections downstream from coil section shall be of the dual wall internally insulated with spray injected foam to achieve minimum thermal resistance of R-13 with a solid internal galvanized liner.
 4. Unit shall comply with ASHRAE 111 class 6 for casing leakage no more than 1% of design airflow at 1.25 times design static pressure up to +8" w.g. in positive pressure sections and -8" w.g. in negative pressure sections..
 5. Casing panel inner liners shall not extend to the exterior of the unit or contact the exterior frame and in all applications must provide a thermal break.
 6. Casing shall have lifting lugs or other attachments to facilitate handling.
 7. Casing shall have removable panels to provide access to internal components.
 8. Coil section shall be removable without disassembly of unit.
- B. Casing panels and access doors shall deflect no more than L/240 when subjected to 1.5 times design static pressure up to +8" w.g. in positive pressure sections and -8" w.g. in negative pressure sections.
- C. Condensate drain pans shall be stainless steel double wall construction and provided under the complete fan and coil section for horizontal units and under the complete coil section for vertical units, with drain connection on lower end.
1. If coil moisture carry-over is, present drain pan shall extend to the section downstream from the coil.
 2. Drain pans shall be insulated with 1" insulation between the two walls and the inner pan shall be coated with an EPA approved antibacterial agent, intercept or equal.
 3. Drain pan shall be internally sloped to provide positive drainage of accumulated condensate.

2.4 FANS

- A. Centrifugal; Belt or Direct Driven. The air handling unit manufacturer shall provide all fans and shafts constructed in accordance with AMCA with the following features and performance.
1. Construct the fan wheels of galvanized steel.
 2. All units shall have externally mounted bearings and motors. Internal bearings, with extended grease lines are permitted.
 3. Fan housing shall be die-formed with streamlined inlets and side sheets.
 4. Bearings shall be grease lubricated ball bearings selected for an L-10 rating life of not less than 130,000 hours for direct connected service and not less than 42,500 for belt-connected service.
 5. Statically and dynamically, balance and factory test the fan unit.
 6. Fans shall be internally isolated for vibrations.
 7. Fan noise levels shall not exceed the specified performance.
- B. Fan Arrays; Direct Driven. The air handling unit manufacturer shall provide multiple, plenum fans constructed per AMCA requirements with the following features and performance.
1. Fans shall be selected to deliver the scheduled airflow quantity, fan/motor speed at a total static pressure that does not exceed 90% of the fan peak performance capability.
 2. Factory installed and wired motor overload panel.
 - a. Nema type 1 enclosure for indoor units, and NEMA type 4 for outdoor units.
 - b. Single or multiple VFD power input for distribution to the fan array motors.
 - c. Manual motor protectors, one per fan.
 - d. Auxiliary contacts shall be wired in series to terminal blocks for generic trip signaling.
 3. Backdraft dampers; for fan isolation tested and rated to AMCA 500.

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- a. Produce less than 0.10" w.c. of static pressure drop and/or system effect when the fan is enabled.
- b. Rated for maximum back pressure that exceeds the fan array total static pressure with minimal leakage.
- c. Extruded aluminum or stainless steel construction.
4. Motors shall incorporate isolated bearings or shaft grounding.
5. Fan/motor assembly shall be dynamically balanced to meet AMCA standard 204-96, category BV-5, to meet or exceed Grade 2.5 residual unbalance.
6. Fan partitions to minimize system effect between fans.

2.5 COILS

- A. Furnish coils for cooling media as scheduled.
- B. Coils shall be aluminum fin copper tube type.
 1. Fins shall have drawn, belled, collars bonded to the tubes by means of mechanical expansion of the tubes.
 2. Coils casings shall be galvanized steel.
- C. Use refrigerant cooling coils as listed in schedule, and shall be split with two individual circuits.
 1. If using independent compressors in lieu of two speed compressors, use a four-circuited coil.
- D. Engineer shall specify face split, row split or intertwined coils.

2.6 MOTORS AND DRIVES

- A. Motors shall be NEMA Standard, normal torque, 40°C rise, splash proof, of horsepower rating and electrical characteristics as scheduled on drawings.
 1. Motors shall be of the high efficiency type.
 2. For draw-thru Air Handling Units provide totally enclosed, weatherproof, factory epoxy-sealed type motors., Fan cooled feature in totally enclosed motors is not required.
 3. For blow-thru Air Handling Units (motors upstream of cooling coils) provide splash proof motors.
- B. Provide drives rated at 1.25 x the motor horsepower rating.
 1. Drives shall be adjustable speed for adjustment within plus or minus 10% of specified RPM.
- C. Mount the motor on an adjustable, spring isolated mount, suitable for adjusting belt tension and drive alignment.
- D. Furnish and install belt guards in accordance with OSHA requirements for all sheaves, exposed shafts, and belts.
- E. Motors used with a variable frequency drive shall be high efficiency and inverter duty rated.

2.7 INSULATION

- A. Double wall unit casings for coil section and all sections downstream from coil section shall have 2" thick insulation between the shells.
- B. Double wall sections shall be factory insulated to prevent sweating at all operating conditions.

2.8 FILTERS

- A. Provide manufacturers medium capacity filter section.
- B. Filter section shall incorporate full size hinged and gasketed access doors with a minimum of two lever type handles.
- C. Filters shall be as specified in Section 23 40 00 and installed prior to use of the unit.

PART 3 EXECUTION

3.1 INSTALLATION

- A. The Contractor shall lay out exact unit location based upon coordinated ductwork shop drawings.

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1. Fabricate unit supports as detailed on the drawings.
 - B. The Contractor shall install units, make piping, and duct connections.
 - C. Install chilled water or refrigerant piping, thermal expansion valves, sight glasses and similar refrigeration specialties on the same side as the motor access.
 - D. Extend condensate drain line from the drain pan, through a trap, to a hub drain with a lip 1" above the finished floor.
 1. The condensate drain shall terminate with a 1" air gap above the rim of the open hub drain.
 2. Route the hub drain to a French drain or a storm water system, if connected to a roof storm water system a backwater valve is required.
 3. Contractor shall provide sufficient height between drain pan and condensate drain trap to allow drainage against negative fan pressure.
 - E. Install fire resistant flexible connectors in ducts at connections to units.
 1. Flexible connectors shall be in accordance with NFPA 90A.
 - F. Provide flexible pipe connectors at inlet and outlet piping to each air-handling unit.
 - G. Provide chilled water thermometers and gauges at inlet and outlet piping for each air handler installed.
 - H. Maintain access to all unit components that require maintenance.
 1. Do not block coil or filter access doors, doors shall open at least 120°.
 2. Provide adequate space for coil and filter pull space.
 - I. Install all air handlers on housekeeping pad extending minimum 6" beyond the footprint of the unit.
 - J. Provide vibration isolator pads between the AHU supports and housekeeping pad.
 1. Air handlers without internal spring mounted blowers shall have external spring mounts.
 - K. When adjustable pulley is set for the required airflow performance, replace it with fixed pulley.
 - L. Install Division 26 wiring for motors contained inside the Air Handler Units with watertight conduit between motor and unit casing and seal both ends of conduit to prevent moisture intrusion.
 1. Motors with multiple wires, make the electrical connections with mechanical fasteners (multi-cable connector blocks) that have external insulation.
 - M. Wire the AHU to immediately shut down upon activation of the fire alarm system.
- 3.2 FUNCTIONAL PERFORMANCE TESTING
- A. System Functional Performance Testing is part of the Commissioning Process.
 1. The Contractor shall perform the Functional Performance Testing and the Commissioning Authority shall witness and document the test.
 2. Refer to Section 01 91 00, Commissioning, for functional performance tests and commissioning requirements.
 - B. Systems Readiness Checklists shall be completed and submitted for each piece of equipment included in this section.
 - C. Include the functional performance testing of HVAC pumps as part of the Chilled Water System Functional Performance testing.
- 3.3 DEMONSTRATION AND TRAINING
- A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative.
 1. Provide competent, factory authorized personnel for instructing of operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.

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2. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.
 3. Refer to Section 01 91 00, Commissioning, for further contractor training requirements.
- B. Provide demonstration and training for all equipment covered by this section and installed in this project.

END OF SECTION