

**SECTION 23 82 19
FAN COIL UNITS**

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. The work of this Section shall include the furnishing and installation of fan coil units and associated controls.
 - 1. Provide fan coil units in accordance with the Contract Documents.
 - 2. In addition to the work covered under this Section, comply with description of individual systems under other Sections of the Specifications.
 - 3. Valve and control package for each fan coil unit.
 - 4. Belt drive blower coil units as scheduled.
 - 5. Factory mounting of DDC controller provided by Section 23 09 23 BMS Contractor.

1.02 RELATED DOCUMENTS

- A. Section 23 05 01 – HVAC General Provisions
- B. Section 23 05 13 – Common Motor Requirements for HVAC Equipment
- C. Section 23 05 23 – General-Duty Valves for HVAC Piping
- D. Section 23 05 29 – Hangers and Supports for HVAC
- E. Section 23 09 23 – Building Management System (BMS)
- F. Section 23 09 93 – Sequence of Operations for HVAC Controls
- G. Section 23 21 13 – Hydronic Piping
- H. Section 23 33 19 – Acoustics
- I. Section 23 40 00 – HVAC Air-Cleaning Devices
- J. Section 23 82 16 – Air Coils
- K. Division 26 – Electrical Specifications

1.03 REFERENCE STANDARDS

Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this Section where cited below.

- A. AHRI – Air Conditioning and Refrigeration Institute
 - 1. AHRI 260 Sound Rating of Ducted Air Moving and Conditioning Equipment
 - 2. AHRI 350 Sound Performance Rating of Non-Ducted Indoor Air-Conditioning and Heat Pump Equipment

- 3. ANSI/AHRI 440 Performance Rating of Room Fan-Coils
 - B. ASHRAE – American Society of Heating, Refrigeration, and Air Conditioning Engineers
 - 1. ASHRAE Std. 52.2-2017 Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
 - C. ETL – ETL SEMKO (formerly Edison Testing Laboratory)
 - D. NFPA – National Fire Protection Association
 - 1. NFPA 70 National Electrical Code
 - E. UL – Underwriters Laboratories Inc.
- 1.04 QUALITY ASSURANCE
- A. UL Listed.
 - B. Non-ducted fan coil units shall be tested and rated for sound in accordance with AHRI 260.
- 1.05 SUBMITTALS
- A. Provide dimensioned, detailed installation drawings showing piping details; manufacturer's latest published data including certified sound power ratings with octave band analysis, certified fan performance curve and coil data and performance data, electrical wiring diagram.
 - B. Provide a detailed installation sketch (plan and section) for a typical **condo** room, at ½-inch to 1-foot-0-inch scale, indicating fan coil unit, condensate drain, chilled water (and heating water) risers where applicable, outside air duct where applicable and volume damper where applicable.
 - C. Fan coil units product data certified dimensioned shop drawings, sizes, configuration, materials of construction, features, accessories, weights, points of connection and other pertinent information
 - D. Fan curves or tables with selection point clearly indicated
 - E. Coil performance
 - F. Acoustic data
 - G. Motor details and efficiencies
 - H. Wiring Diagrams: Power, signal and control wiring including detailed wiring diagram that clearly differentiates between manufacturer-installed and field-installed wiring
 - I. Provide a coordinated wiring diagram incorporating the DDC controller

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Fan Coils: International, Trane, McQuay, Williams

2.02 GENERAL

- A. Provide fan coil and blower coil units of the type, size and capacity shown on the Drawings.
- B. All fan coil units shall be complete with cabinet, fan motor, drive, chilled water coils, hot water coils, as specified or indicated on the Drawings, primary drain pan, auxiliary drain pan, control valves as specified, filters and motor speed controllers.
- C. Units and application rating data to bear the AHRI seal, certifying conformance with AHRI 440-08. All fan coil units shall be UL Listed.
- D. Construct the units of 18-gauge zinc-coated sheet steel. The removable fan board and drain pan assembly shall be formed from a single piece of metal without joints. Drain pans shall be insulated with a closed cell polyurethane or polyisocyanurate that is sprayed on and into every crevice of the drain pans. Drain pan shall have an integral auxiliary drain pan connection located above primary drain connection to provide an auxiliary drain. Insulation shall be UL-listed and -labeled. Drain pans shall be pitched for positive drainage with the fan coil unit installed level. The enclosure shall be lined with ½-inch matte faced glass fiber insulation, securely fastened with a weather-proof adhesive. Exposed edges of insulation are not acceptable.
- E. The fans shall be forward curved double width wheels. The wheel and scroll shall be of galvanized steel or aluminum construction.
- F. Water coils shall be constructed of ½-inch O.D. copper tube with 0.025-inch wall thickness and mechanically expanded into aluminum fins. Coils shall be suitable for a working pressure of 250 pounds per square inch gauge. Furnish manual air vent and drain cocks.
- G. Motors:
1. Direct drive fan motors shall be 3-speed, permanent split capacitor type with inherent overload protection and factory-mounted disconnect switch and mounted on a resilient base. The fan and motor shall be readily removable and provided with a quick disconnect of the motor cord.
 2. Belt drive fan motors shall comply with Section 23 05 13 – Common Motor Requirements for HVAC Equipment.
- H. Filters:
1. Disposable, glass-fiber, flat type **2-inch** thick, treated with adhesive, and having a Minimum Efficiency Reporting Value (MERV) of 7 according to ASHRAE 52.2.
- I. The manufacturer of the fan coil equipment shall mount, as a pre-assembled package, the hand valves, vent, cock, drain cock, automatic control valves and strainers and other valving as indicated for each unit. All valving, etc., shall be located over an insulated auxiliary drain pan furnished with the unit. Provide control valves with flared connections. Automatic control valves shall be silent electric motor driven modulating type. Pressure

ratings of valves and fittings shall be appropriate for the system working pressure where the units are to be installed. Evaluate actual working pressure at each installation location, verify pressure and provide valves accordingly.

- J. The remote fan coil control unit comprising the motor speed switch and “Warmer-Cooler” reset dial shall be provided and mounted as specified under other Sections or Divisions of the Specifications. Provide fan coil unit controls such that the room thermostat, provided by others, shall control the automatic cooling and heating valve, where applicable, in sequence.
- K. All electric wiring between fan motor and unit mounted junction box shall be completed at the factory by the fan coil manufacturer. Provide quick disconnects for easy removal of fan section and provide suitable terminals for field connections of power and control wiring. Unit junction box shall be factory-mounted at the rear of the coil connections side of the unit with cover plate screws readily accessible for service from the intake side of the unit.
- L. Recirculating type fan coil units shall generally be of the horizontal or vertical type, cabinet or concealed type. Units with ducted return air or ventilation air shall be of the horizontal cabinet type housing the motor and fan assembly in an insulated sheet metal enclosure with a bottom access door sufficiently sized for removal of fan and motor assembly as a single unit.
- M. Electric heating shall be factory-mounted and -wired. The entire assembly shall comply with Section 23 82 17 – Electric Heating Coils and shall be UL-labeled.

2.03 MODULAR VERTICAL HI-RISE FAN COIL UNITS AND HORIZONTAL FAN COIL DIRECT DRIVE UNITS

- A. General:
 - 1. Each vertical fan coil unit shall be complete with the following:
 - a. 18-gauge cabinet
 - b. Return air grille (only required if custom grille is not specified on the Drawings)
 - c. Supply air grille (only required if custom grille is not specified on the Drawings)
 - d. Premium efficiency 3-speed fan motor
 - e. 300 psig working pressure chilled water **[and heating water]** cooling coil with manual air vent
 - f. Main and auxiliary drain pan
 - g. Filters
 - h. Motor speed controller
 - i. Valving package
 - j. Leveling legs
 - k. Drain valve
 - l. 24-volt controls including transformer, BMS Contractor-supplied DDC controller and relay board factory-installed
 - m. Electrical internal wiring to junction box and electrical disconnect
 - 2. Each horizontal fan coil unit shall be complete with the following:

- a. 18-gauge cabinet
 - b. Insulated sheet metal plenum enclosure housing motor and fan assembly
 - c. Rear return air with filter rack
 - d. Bottom access door for fan and motor assembly removal
 - e. Premium efficiency 3-speed fan motor
 - f. 250 psig chilled water **[and heating water]** coil
 - g. **[Electric resistance, if scheduled]**
 - h. Main and auxiliary extended drain pan
 - i. Filters
 - j. Pre-assembled valving package
 - k. 24-volt controls including transformer, BMS Contractor-supplied DDC controller and relay board factory-installed
 - l. Motor speed controller
 - m. Electrical internal wiring to junction box and electrical disconnect
3. Construct the units of 18-gauge zinc-coated sheet steel. Fabricate the removable fan board and drain pan assembly formed from a single piece of metal without joints. Insulate exterior surfaces of drain pans with fire retardant closed cell foam insulation. Line the enclosure with matt-faced glass fiber insulation having a one pound per cubic foot density securely fastened with a weather-proof adhesive.
 4. Supply openings shall be sized for individual air delivery requirements to provide optimum velocity for **[quiet]** operation and proper air throw. Return air openings shall be sized to give **[quiet]** operation while allowing full access to internal components.
 5. Provide units with 1-inch MERV 7 filters. Provide one (1) spare set of filters for each unit.
 6. Sound pressure level at rated airflow not to exceed NC-35 (plus or minus 2).
 7. Each chilled water cooling **[and heating water]** coil shall include a manual air vent.
 8. The condensate drain pan shall be fabricated of G90 galvanized steel, and be insulated with closed cell, fire retardant foam insulation. The condensate drain shall be equipped with a removable P-trap to allow easy cleaning and maintenance.
 9. Fan coil units shall bear the ARI seal certifying performance per ARI 440-98. Fan coil units shall be UL Listed.

B. Fan and Drive:

1. Provide centrifugal type, forward curved, double width, double inlet fan wheels. Construct the wheel and scroll of galvanized steel or aluminum. Plastic is not acceptable.
2. Blower housings shall be constructed of galvanized steel with spot-welded construction to provide maximum rigidity and performance.
3. Motors to be 3-speed, split capacitor type designed for positive speed reduction with inherent overload protection and mounted on a resilient base.
4. The motor/blower assembly shall be direct-drive type with the motor mounted directly to the blower housing, allowing the entire assembly to be easily removed from the unit without disturbing the blower wheel and motor alignment.
5. All motors shall be thermally protected and have sleeve type bearings. Motor bearings shall have oversized oil reservoirs to ensure adequate lubrication with minimum servicing.

6. Each motor shall include a UL Listed thermal overload device to protect the motor against excessive current draw and overheating.
- C. Coils:
 1. Construct water coils of ½-inch O.D. copper tubes mechanically expanded to aluminum fins. Furnish manual air vent.
- D. Controls:
 1. All valving including control valve, etc., to be located over an insulated auxiliary drain pan within the fan coil unit casing for the vertical units and external for horizontal units. Control valve shall be modulating, 2-way motorized ball valves, electric type, and N.C. for cooling (and N.O. for heating).
 2. Room DDC control shall be provided by the Building Management System Contractor Sections 23 09 23 and 23 09 93.
 3. Provide motor speed switch mounted at the factory.
- E. Wiring:
 1. All internal electric wiring between fan motor, valve actuators, controls, (electric heater) and unit-mounted junction box shall be provided by the fan coil manufacturer. Provide a 6-foot umbilical cord with molar plug six (6) inches from thermostat connections. Provide quick disconnects for easy removal of fan section and provide suitable terminals for field-connection of power. Unit junction box shall be factory-mounted with cover plate screws readily accessible for service. Provide an unfused disconnect switch mounted on the unit next to the junction box in an accessible location.
- F. Valve Package: Provide the following valves with each fan coil unit:
 1. Chilled **[and heating]** water supply:
 - a. Griswold Isolator S (Combination ball valve and strainer with drain valve and P/T test valve)
 2. Chilled **[and heating]** water return:
 - a. Union with manual air vent
 - b. Griswold Unimizer (actuated ¼-turn characterized ball valve)
 - c. Griswold Isolator R (combination stainless steel flow cartridge, isolation ball valve, and two P/T test valves)

2.04 BELT DRIVE BLOWER COIL UNITS

- A. Provide ETL-listed units per UL 1995 standard.
- B. Unit Construction:
 1. Blower coil cabinet shall be constructed of heavy-gauge galvanized-steel panels, which are assembled to form a rigid structure designed for durability. Removable panels with camlock latches shall be provided on both sides of the cabinet for maintenance and commissioning, and blower housing removal. Acoustical and

- thermal 1-inch thick insulation shall be adhered to the interior of the cabinet.
2. Provide stainless steel, double-sloped drain pan, externally lined with urethane closed-cell insulation. The drain pan shall be provided with a 7/8-inch stainless steel threaded drain connection and 1/2-inch stainless steel secondary drain connection.
 3. Provision for hanging the unit is provided by knockouts, which allow the insertion of a threaded rod through the top and bottom of the four corners of the unit.
- C. Coils:
1. Cooling **[and heating]** coils shall be constructed with 1/2-inch copper tubes with aluminum fins mechanically bonded to the tubes. All coils are pneumatically leak-tested to ensure suitability for design working pressures of 250 psig at 200 degs F.
- D. Blowers:
1. The blowers shall be centrifugal, forward-curved, double-width wheels. Blower housings shall be galvanized steel and independently isolated from cabinet and motor.
- E. Motors:
1. Blower motors (single phase or three phase) shall be UL Listed, factory-wired, single-speed with thermal overload protection, Class B insulation, and are continuous duty-rated open drip-proof. Motor bearings are permanently lubricated ball bearings. The motor mount has an adjustable platform for belt drive adjustment. The motor and its mounting are independently isolated from the cabinet and blower. Provide adjustable pitch pulley. Motor drive packages are provided with keyed pulleys.
 2. All motors on belt-driven units contain internal thermal-overload protection with automatic resets when the temperature returns to a safe limit.
- F. Filters:
1. Provide a 1-inch, glass fiber pleated MERV 7 filter on frame across rear return air opening.
- G. Control:
1. Provide junction box mounted on the exterior of the unit. Provide factory-installed wiring from the motor to the junction box.
 2. 24-volt controls including transformer and relay board factory-installed.
 3. Provide factory-mounted integral disconnect switch mounted on unit exterior.
 4. Mount junction box on same side as coil connections.
 5. Mount Section 23 09 23 BMS-supplied DDC controller.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install fan coil units, including components and controls required for operation, in accordance with manufacturer's instructions.

- B. Locate each unit accurately in the position indicated in relation to other work. Position unit with sufficient clearance for normal service and maintenance, including clearance for cabinet removal.
- C. Level fan coil units to the tolerance recommended by the manufacturer.
- D. Comb out any damaged fins or replace coil if fins cannot be combed to a like-new condition.
- E. Provide two (2) sets of filters for each fan coil unit. One set shall be installed at initial unit start-up after all ductwork has been cleaned as specified and shall be used during balancing and testing, the second set shall be installed at the time of final acceptance.
- F. Test unit to verify proper operation and correct any defects found.

END OF SECTION 23 82 19