

## **SECTION 23 82 19 – FAN COIL UNITS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. This Section includes fan-coil units and accessories.

#### **1.3 DEFINITIONS**

- A. BAS: Building automation system.

#### **1.4 SUBMITTALS**

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Ceiling suspension components.
  - 2. Structural members to which fan-coil units will be attached.
  - 3. Method of attaching hangers to building structure.
  - 4. Size and location of initial access modules for acoustical tile.
  - 5. Items penetrating finished ceiling, including the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Access panels.
  - 6. Perimeter moldings for exposed or partially exposed cabinets.

- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of fan-coil unit indicated.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For fan-coil units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  - 1. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.
- H. Warranty: Special warranty specified in this Section.

## 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## 1.6 COORDINATION

- A. Coordinate layout and installation of fan-coil units and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- B. Coordinate size and location of wall sleeves for outdoor-air intake.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Compressor failure.
    - b. Condenser coil leak.
  - 2. Warranty Period: **Five** years from date of Substantial Completion.
  - 3. Warranty Period (Compressor Only): **Five** years from date of Substantial Completion.
  - 4. Warranty Period (Condenser Coil Only): **Five** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
- B. In the Fan-Coil-Unit Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

### 2.2 FAN-COIL UNITS

- A. **Available Manufacturers:**
  - 1. Airtherm; a Mestek Company.
  - 2. Carrier Corporation.
  - 3. Engineered Air Ltd.
  - 4. Environmental Technologies, Inc.
  - 5. First Co.
  - 6. International Environmental Corporation.
  - 7. Marlo Coil; Subsidiary of Engineered Support Systems, Inc.
  - 8. Marshall Engineered Products Co., LLC (MEPCO); Dunham-Bush, Inc.
  - 9. McQuay International.
  - 10. Rosemex.
  - 11. Trane.
  - 12. USA Coil & Air.
- B. Description: Factory-packaged and -tested units rated according to ARI 440, ASHRAE 33, and UL 1995.
- C. Coil Section Insulation: **1-inch (25-mm) thick, matte-finish, closed-cell foam** complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.
  - 1. Fire-Hazard Classification: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
- D. Main and Auxiliary Drain Pans: **Stainless steel pan per DFW DCM** formed to slope from all directions to the drain connection as required by ASHRAE 62.
- E. Chassis: Galvanized steel where exposed to moisture. Floor-mounting units shall have leveling screws.
- F. Cabinet: Steel **baked-enamel finish in manufacturer's standard paint color as selected by Architect.**

1. Vertical Unit Front Panels: Removable, steel, with **integral stamped** discharge grille and channel-formed edges, cam fasteners, and insulation on back of panel.
  2. Horizontal Unit Bottom Panels: Fastened to unit with cam fasteners and hinge and attached with safety chain; with **integral stamped** discharge grilles.
  3. Stack Unit Discharge and Return Grille: Aluminum double-deflection discharge grille, and louvered- or panel-type return grille; color as selected by Architect from manufacturer's **standard** colors. Return grille shall provide maintenance access to fan-coil unit.
  4. Steel recessing flanges for recessing fan-coil units into ceiling or wall.
- G. Outdoor-Air Wall Box: Minimum 0.1265-inch- (3.2-mm-) thick, aluminum, rain-resistant louver and box with integral eliminators and bird screen.
1. Louver Configuration: **Vertical**, rain-resistant louver.
  2. Louver Material: **Steel**.
  3. Bird Screen: 1/2-inch (13-mm) mesh screen on interior side of louver.
  4. Decorative Grille: On outside of intake.
  5. Finish: **Baked enamel**, color as selected by Architect from manufacturer's **standard** colors.
- H. Outdoor-Air Damper: Galvanized-steel blades with edge and end seals and nylon bearings; with **electronic modulating** actuators.
- I. Filters: Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
1. Pleated Cotton-Polyester Media: 90 percent arrestance and 7 MERV.
- J. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm), rated for a minimum working pressure of 200 psig (1378 kPa) and a maximum entering-water temperature of 220 deg F (104 deg C). Include manual air vent and drain valve.
- K. Fan and Motor Board: Removable.
1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
  2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
  3. Wiring Termination: Connect motor to chassis wiring with plug connection.
- L. Factory, Hydronic Piping Package: **ASTM B 88, Type L (ASTM B 88M, Type B)** copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet, and outlet.
1. **Two-way, modulating** control valve for chilled-water coil.
  2. **Two-way, modulating** control valve for heating coil.
  3. Hose Kits: Minimum 400-psig (2758-kPa) working pressure, and operating temperatures from 33 to 211 deg F (0.5 to 99 deg C). Tag hose kits to equipment designations.
    - a. Length: **24 inches (600 mm)**.
    - b. Minimum Diameter: Equal to fan-coil-unit connection size.

4. Two-Piece Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.
  5. Calibrated-Orifice Balancing Valves: Bronze body, ball type; 125-psig (860-kPa) working pressure, 250-deg F (121-deg C) maximum operating temperature; with calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, threaded ends, and equipped with a memory stop to retain set position.
  6. Automatic Flow-Control Valve: Brass or ferrous-metal body; 300-psig (2070-kPa) working pressure at 250 deg F (121 deg C), with removable, corrosion-resistant, tamperproof, self-cleaning piston spring; factory set to maintain constant indicated flow with plus or minus 10 percent over differential pressure range of 2 to 80 psig (13.8 to 552 kPa).
  7. Y-Pattern Hydronic Strainers: Cast-iron body (ASTM A 126, Class B); 125-psig (860-kPa) working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 1/2 (DN 15) hose-end, full-port, ball-type blowdown valve in drain connection.
  8. Wrought-Copper Unions: ASME B16.22.
  9. Risers: **ASTM B 88, Type L (ASTM B 88M, Type B)** copper pipe with hose and ball valve for system flushing.
- M. Control devices and operational sequences are specified in 230901\_Control System Integration section of the specifications.
- N. Basic Unit Controls:
1. Control voltage transformer.
  2. **Wall-mounting** thermostat with the following features:
    - a. Heat-cool-off switch.
    - b. Fan on-auto switch.
    - c. Fan-speed switch.
    - d. **Automatic** changeover.
    - e. Adjustable deadband.
    - f. **Concealed** set point.
    - g. **Exposed** indication.
    - h. **Degree F** indication.
  3. **Wall-mounting** humidistat.
    - a. **Concealed** set point.
    - b. **Concealed** indication.
  4. **Wall-mounting** temperature sensor.
  5. Unoccupied-period-override push button.
  6. Data entry and access port.
    - a. Input data includes room temperature, and humidity set points and occupied and unoccupied periods.
    - b. Output data includes room temperature and humidity, supply-air temperature, entering-water temperature, operating mode, and status.
- O. **DDC** Terminal Controller:

1. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.
2. Unoccupied Period Override Operation: **Two** hours.
3. Unit Supply-Air Fan Operation:
  - a. Occupied Periods: Fan runs continuously.
  - b. Unoccupied Periods: Fan cycles to maintain room setback temperature.
4. Hydronic-Cooling-Coil Operation:
  - a. Occupied Periods: **Modulate** control valve to maintain room temperature.
  - b. Unoccupied Periods: Close control valve.
5. Heating-Coil Operation:
  - a. Occupied Periods: **Modulate control valve** to provide heating if room temperature falls below thermostat set point.
  - b. Unoccupied Periods: Start fan and **modulate control valve** if room temperature falls below setback temperature.
6. Reheat-Coil Operation:
  - a. Occupied Periods:
    - 1) Heating Operations: **Modulate control valve** to provide heating if room temperature falls below thermostat set point.
    - 2) Humidity-Control Operations: Humidistat **modulates control valve** to provide heating. As space temperature rises above the set point, cooling coil valve **modulates** to maintain room temperature.
  - b. Unoccupied Periods: Start fan and **modulate control valve** if room temperature falls below setback temperature. Humidity control is not available.
7. Outdoor-Air Damper Operation:
  - a. Modulate outside air damper to maintain appropriate CO2 levels in the space. Measure the outside air coming into the building with an air flow station.
8. Outdoor-Air Damper Operation:
  - a. Occupied Periods:
    - 1) Outdoor-Air Temperature below Room Temperature: If room temperature is above thermostat set point, modulate outdoor-air damper to maintain room temperature (outdoor-air economizer). If room temperature is below thermostat set point, position damper to fixed minimum position.
    - 2) Outdoor-Air Temperature above Room Temperature: Position damper to fixed minimum position for **25** percent outdoor air.
  - b. Unoccupied Periods: Close damper.
9. Controller shall have volatile-memory backup.

P. BAS Interface Requirements:

1. Interface relay for scheduled operation.
2. Interface relay to provide indication of fault at the central workstation.
3. Provide **BACnet** interface for central BAS workstation for the following functions:
  - a. Adjust set points.
  - b. Fan-coil-unit start, stop, and operating status.
  - c. Data inquiry, including **outdoor-air damper position**, supply- and room-air temperature **and humidity**.
  - d. Occupied and unoccupied schedules.

Q. Electrical Connection: Factory wire motors and controls for a single electrical connection.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas to receive fan-coil units for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before fan-coil-unit installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install fan-coil units level and plumb.
- B. Install fan-coil units to comply with NFPA 90A.
- C. Suspend fan-coil units from structure with elastomeric hangers. Vibration isolators are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- D. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices **48 inches (1220 mm)** above finished floor.
- E. Install new filters in each fan-coil unit within two weeks after Substantial Completion.

#### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:
  1. Install piping adjacent to machine to allow service and maintenance.
  2. Connect piping to fan-coil-unit factory hydronic piping package. Install piping package if shipped loose.
  3. Connect condensate drain to indirect waste.

- a. Install condensate trap of adequate depth to seal against the pressure of fan. Install cleanouts in piping at changes of direction.
- B. Connect supply and return ducts to fan-coil units with flexible duct connectors specified in Division 23 Section "Air Duct Accessories." Comply with safety requirements in UL 1995 for duct connections.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, **test, and adjust** field-assembled components and equipment installation, including connections, **and to assist in field testing**. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

### 3.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to **two** visits to Project during other than normal occupancy hours for this purpose.

### 3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fan-coil units. Refer to Division 01 Section "Demonstration and Training."

### END OF SECTION