SECTION 23 82 19 – FAN COIL UNITS

PART 1- GENERAL

1.1 SUMMARY

A. This Section includes fan coil units and accessories.

1.2 DEFINITIONS

A. BAS: Building Automation System.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories, a schedule documenting radiated, inlet, and discharge sound pressure levels per octave band center frequency at the operating conditions scheduled.

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 and associated values.

1. Wiring Diagrams: Power, signal, and controls 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. Manufacturer Seismic Qualification Certification: Submit certification that fan coil units, accessories, and components will withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

G. Field quality-control test reports.

H. 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.

I. Warranty: Special warranty specified in this Section.

1.4 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.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. ARI Compliance: Rated and tested in accordance with ARI Standard 440 “Room Fan Coil Units.”

E. UL listed and labeled in accordance with ANSI/UL Standard 880 - “Safety Standard for Fan Coil Units.”

F. All units must be tested in accordance with ARI 350 “Sound rating of Non-Ducted indoor Air-Conditioning Equipment”

1.5 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.

C. Specific configuration of the supply and return ductwork and piping at each unit has been indicated on the drawings. If the configuration of the units furnished on the project differs from that indicated on the drawings (whether or not the units furnished are the specific units or an acceptable substitute), it shall be the contractor's responsibility to modify ductwork, piping, etc., as required to accommodate the actual configuration of units furnished on the project.

1.6 WARRANTY

A. Furnish minimum 1 year from date of final acceptance.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan coil unit Filters: Furnish two spare filters for each filter installed.

2. Fan Belts: Furnish two spare fan belts for each unit installed.

PART 2 - PRODUCTS

2.1 GENERAL

A. Manufacturer shall be responsible for examining applications of each type of unit to assure that each will operate properly in the intended application.

B. Unit sizes are shown as selected in accordance with the principles set forth in the ASHRAE Guide and Manufacturer's literature.

C. All items of a given type shall be the products of the same manufacturer.

2.2 FAN COIL UNITS

Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

A. Manufacturers

1. **Carrier Corporation.**

2. **Trane.**

3. **Johnson Controls**.

B. Description: Factory-packaged, completely assembled and -tested units rated according to ARI 440, ASHRAE 33, and UL 1995.

C. Coil Section Insulation: 1-inch (25-mm) thick, foil-covered, closed-cell foam complying with ASTM C1071 and attached with adhesive complying with ASTM C916.

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 E84.

2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1

D. Main and Auxiliary Drain Pans: Stainless steel. Fabricate pans and drain connections to comply with ASHRAE 62.1

E. Chassis: 18 gauge galvanized steel casing withstanding 125 hour salt spray test per ASTM B117. Floor-mounted units shall have leveling screws.

F. Cabinet: 18 gauge galvanized steel casing withstanding 125 hour salt spray test per ASTM B117 with baked-enamel finish in manufacturer's custom paint color as selected by Architect.

1. Vertical Unit Front Panels: Removable, steel, with steel 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 custom 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- thick, aluminum, rain-resistant louver and box with integral eliminators and bird screen.

1. Louver Configuration: Horizontal, rain-resistant louver.

2. Louver Material: Aluminum.

3. Bird Screen: 0.5-inch mesh screen on interior side of louver.

4. Decorative Grille: On outside of intake.

5. Finish: Anodized aluminum, color as selected by Architect from manufacturer's custom 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. Recirculating fan coil units require pre-filter and MERV 13 final filter,

2. Fan coil units with outside air connections refer to Division 23 Section 23 40 00 “HVAC Air Cleaning Devices” for requirements that include activated carbon filters.

J. Hydronic Coils: 0.375 in. diameter, copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.

K. Fan and Motor:

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Galvanized steel or aluminum wheels, and aluminum, or galvanized-steel fan scrolls.

2. Motor: Permanently lubricated, variable speed resiliently mounted on removable motor board. Comply with electrical equipment requirements of Division 23 Section 23 05 13 "Common Motor Requirements for HVAC Equipment."

3. Wiring Termination: Connect motor to chassis wiring with twist lock plug connection.

L. Unit Control Box: Integral unit cabinet to include:

1. Fan starter and electric heating coil circuit breakers.

2. Disconnect switches

3. Control circuit transformer for 24 volt control circuit, fused on primary and secondary sides.

4. All controls factory installed and prewired.

5. Single point power entry

6. Numbered Terminal strips.

M. Factory, Hydronic Piping Package: ASTM B88, Type L (ASTM B88M, 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 dual-temperature coil.

2. Hose Kits: Minimum 400-psig working pressure, and operating temperatures from 33 to 211 deg F Tag hose kits to equipment designations.
   a. Length: 36 inches.
   b. Minimum Diameter: Equal to fan coil unit connection size.

3. Two-Piece Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600 psig minimum CWP rating and blowout-proof stem.

4. Calibrated-Orifice Balancing Valves: Bronze body, ball type; 125 psig working pressure, 250 deg F 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.

5. Automatic Flow-Control Valve: Brass or ferrous-metal body; 300 psig working pressure at 250 deg F 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

6. Y-Pattern Hydronic Strainers: Cast-iron body (ASTM A126, Class B); 125 psig working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 0.5inch hose-end, full-port, ball-type blowdown valve in drain connection.

7. Wrought-Copper Unions: ASME B16.22.

8. Risers: ASTM B88, Type L (ASTM B88M, Type B) copper pipe with hose and ball valve for system flushing.

N. Control devices and operational sequences are specified in Division 25 Sections "Terminal Building Automation System”.

O. 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 dead band.
   f. Exposed set point.
   g. Exposed indication.

h. Degree F indication.

3. Wall-mounting temperature sensor.

4. Unoccupied-period-override push button.

5. 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.

P. 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. Dual-Temperature Hydronic-Coil Operation:
   a. Occupied Periods: When chilled water is available, modulate control valve if room temperature exceeds thermostat set point. When hot water is available, open control valve if temperature falls below thermostat set point.
   b. Unoccupied Periods: When chilled water is available, close control valve. When hot water is available, modulate control valve if room temperature falls below thermostat setback temperature.

5. Reheat-Coil Operation:
   a. Occupied Periods:
      (1) Heating Operations: 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. Humidity control is not available.

6. 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.

7. Controller shall have volatile-memory backup.

Q. 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.
   d. Occupied and unoccupied schedules.

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

S. Capacities and Characteristics: As scheduled on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

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 STORAGE AND HANDLING

A. Comply with manufacturer’s installation instructions for rigging, unloading and transporting units.

B. All fan coil units shall be received and stored on the job site with the wooden shipping skids in place. Under no condition shall the units be stored on such a way that metal components are in direct contact with the ground.

C. Unit delivery shall be coordinated with building construction and units shall be delivered to the job site just prior to their installation. Cover air handling units stored on the job site with 6 mil polyethylene sheet, taped in place, to protect the units from damage and the weather. Units that receive water damage due to improper handling or storage shall be removed from the site and new ones furnished at no additional charge to LAWA.

3.3 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 and at least four 3/8 inch) galvanized threaded support rods. 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 above finished floor.

E. Install new filters in each fan coil unit within two weeks after Substantial Completion.

3.4 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 full size but not less than 3/4 inch indirect waste.
   a. Install condensate trap of adequate depth to seal against the pressure of fan.
   b. 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 UL1995 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."

3.5 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. Operate electric heating elements through each stage to verify proper operation and electrical connections.

3. 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.

3.6 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Occupancy Adjustments: When requested within 12 months of date of LAWA final acceptance, 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.

C. Engage a factory-authorized service representative to train LAWA Facilities and Maintenance personnel to adjust, operate, and maintain fan coil units.

3.7 TRAINING

A. Provide minimum of 8 hours each (3 shifts) of classroom and hands on training to LAWA Facilities and Maintenance personnel.

END OF SECTION 23 82 19