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BuildingName
The Description of the Project
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SPECIFICATION DIVISION 23

NUMBER SECTION DESCRIPTION

DIVISION 23 HEATING, VENTILATING AND AIR CONDITIONING (HVAC)
SECTION 238220 - HORIZONTAL FAN COIL UNITS

END OF CONTENTS TABLE

DIVISION 23 HEATING, VENTILATING AND AIR CONDITIONING (HVAC)
SECTION 238220 - HORIZONTAL FAN COIL UNITS

NEW SECTION: JUNE 2011.

FAN COILS IN THIS SPECIFICATION ARE LIMITED TO SINGLE PHASE UNITS OF LESS THAN 1/2 HP WITH DIRECT DRIVE FANS. COMPARED TO BLOWER COILS, FAN COILS TYPICALLY PROVIDE RELATIVELY LOW FAN STATIC PRESSURE AND ARE DESIGNED TO ACCOMMODATE MINIMAL OR NO ATTACHED DUCTWORK.

HORIZONTAL FAN COILS ARE AVAILABLE IN NUMEROUS CONFIGURATIONS AND WITH MULTIPLE OPTIONS; THIS SPECIFICATION IS THEREFORE NECESSARILY OUTLINE IN NATURE. EDIT SECTION CAREFULLY TO MAKE IT PROJECT SPECIFIC. SPECIFICATIONS FOR MFR. PROVIDED CONTROLS INCLUDING 3 SPEED FAN CONTROL (RELAY BOARD), FACTORY PIPING PACKAGES, DX COILS, CABINETS FOR FINISHED SPACE USE, AND INTEGRAL GRILLES/REGISTERS/DIFFUSERS ARE NOT INCLUDED AND MUST BE ADDED IF REQUIRED. U-M SPECIFICATION 238219 "FLOOR MOUNTED FAN COIL UNITS UNDUCTED" IS A GOOD RESOURCE FOR CONTROL SPEC.S AND OTHER SPEC. LANGUAGE THAT MAY BE USEFUL WHEN SPECIFYING HORIZONTAL FAN COILS.

ADDED NAILOR AS APPROVED PER HVAC MTT. D. KARLE APRIL 2018.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

INCLUDE PARAGRAPH 1.1.A AND B IN EVERY SPECIFICATION SECTION. EDIT RELATED SECTIONS 1.1.B TO MAKE IT PROJECT SPECIFIC.

A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 1 Specification Sections, and other applicable Specification Sections including the Related Sections listed below, apply to this Section.

SPEC EDITOR: CAREFULLY VERIFY, EDIT AND COORDINATE RELATED SECTIONS.

B. Related Sections:

1. Section 2220513: Motors.
2. Section 220719: Mechanical Systems Insulation.
3. Division 26: Electrical.

1.2 SUMMARY

A. Section Includes:

1. Horizontal fan-coil units with motors less than 1/2 HP, direct drive fans, and hydronic coils. Controls provided in part or in entirety by the fan coil manufacturer, as specified.

1.3 COORDINATION

A. Coordinate dimensions and arrangement of fan coils with building elements including to maintain all maintenance clearances. Pay special attention to required electrical clearance.

1.4 SUBMITTALS

A. Submit the following product data for approval:

1. Heating and cooling coil total and sensible heat transfer capacity, entering and leaving water temperatures, water flow rate, water pressure drop, and air pressure drop.
2. Piping connections including size, material types, and dimensioned locations for each service.
3. Ductwork connections including sizes, locations, and methods of connections to mating ductwork.
4. Locations of electric power connections.
5. Details of equipment assemblies indicating dimensions, weights, required clearances, component locations, and location and size of each field connection. Include cabinet construction details: panel gauge, removal method for access panel, cabinet mounting method, and filter and fan motor removal method.
6. Details of motor including type, manufacturer and electrical characteristics.
7. Octave band and A-weighted sound power data for each unit type at fan coil rated capacity, tested per AHRI Standard 350.
8. Evidence of UL or ETL listing and labeling.

SPEC EDITOR: UNHIDE THE BELOW HIDDEN TEXT IF DISCONNECT SWITCH, CONTROLS, TRANSFORMER, OR 3 SPEED FAN RELAY BOARD ARE TO BE PROVIDED BY THE FAN COIL MFR.

9. Wiring Diagrams: Power, disconnect switch, controls, transformer and three-speed fan control relays.
10. Control transformer-sizing calculations.
11. Detailed information on fan control relay board.

B. Equipment schedule with the following information for each unit type:

1. Equipment tag.
2. Room number of thermostat location.
3. Model number.
4. Manufacturer’s size designation.
5. Configuration (2-pipe or 4-pipe).
6. Number of coils, number of rows for each coil, fin spacing for each coil.
7. Heating and cooling capacity.
8. Airflow rate and motor watts at each fan speed.

C. Maintenance schedules and repair part numbers and manufacturer of motors, coils, integral controls, relay board, control transformer, and air filters.

1.5 DELIVERY, STORAGE AND HANDLING

A. Mark each fan coil cabinet with the room number where it is scheduled to be installed.

B. Mark each fan coil shipping box with the room number where it is scheduled to be installed.

C. Support piping to prevent damage to pipe and coil headers during shipping.

D. Restrain fans and other components to prevent damage during shipping.

E. Ship each unit wrapped in a heavy plastic bag, packed in a corrugated cardboard shipping box.

1.6 QUALITY ASSURANCE

A. Manufacturers and Products: The products and manufacturers specified in this Section establish the standard of quality for the Work. Subject to compliance with all requirements, provide specified products from the manufacturers named in Part 2.

B. Reference Standards: Products in this section shall be built, tested, and installed in compliance with the specified quality assurance standards; latest editions, unless noted otherwise.

1. ANSI/AHRI 350 Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment.
2. ANSI/AHRI Standard 440: Performance Rating of Room Fan-Coils.
3. NFPA 70- National Electric Code.
4. NFPA 90A Installation of Air-Conditioning and Ventilating Systems.
5. ANSI/ASHRAE 62.1 Section 5 (Systems and Equipment) and Section 7 (Construction and Start-up).
6. ANSI/ASHRAE 90.1-2007 Energy Standards for Low Rise Buildings Except Low Rise Residential Buildings.
7. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation.
8. ASTM C411 Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
9. ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
10. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
11. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
12. Units shall be Underwriters Laboratories (UL) or Intertek (ETL) listed.

1.7 WARRANTY

A. Provide a complete parts and labor warranty for a minimum of one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Airtherm.
2. Enviro-Tec by Johnson Controls.
3. International Environmental Corporation.
4. Daikin Applied.
5. Nailor
6. Trane.

VERIFY THE REQUIRED PROJECT SPECIFIC DIMENSIONS FOR THE FAN COILS AND SCHEDULE OR SPECIFY ACCORDINGLY. MANUFACTURER'S STANDARD SIZE UNITS MAY NOT FIT PROPERLY IN EXISTING FACILITIES.

LIST FAN COIL SOUND POWER LEVELS IN THE FAN COIL SCHEDULE OR IN THE SPECIFICATIONS. BE PARTICULARLY CAUTIOUS FOR FAN COILS USED IN SOUND SENSITIVE AREAS.

THIS SPECIFICATION ASSUMES NONE OF THE FAN COIL CONTROLS ARE PROVIDED BY THE FAN COIL MFR. IF ANY CONTROLS ARE TO BE PROVIDED BY THE MFR.(3-SPEED RELAY BOARD, CONTROL TRANSFORMER, ETC.), EDIT THIS SPECIFICATION TO INCLUDE THOSE REQUIREMENTS. U-M SPECIFICATION 238219 "FLOOR MOUNTED FAN COIL UNITS UNDUCTED" IS A GOOD RESOURCE FOR CONTROL SPEC.S THAT MAY BE USEFUL WHEN SPECIFYING HORIZONTAL FAN COILS.

2.2 FAN COIL UNIT CONSTRUCTION

A. Dimensions: Maximum allowable dimensions as indicated on the Drawings.

B. Casing Construction:

1. Construction: Minimum 18 gauge, G60 galvanized or A40 galvannealed steel or as scheduled. Construct to eliminate racking.
2. Access panels shall be fully insulated and attached with fasteners on at least two opposite sides. No coil or drain piping or electrical connections shall pass through any access panel.
3. One inch duct collars if connected to ductwork.

C. Insulation: Exterior panels and access panels: Foil faced minimum 1-inch-thick, 1-1/2 lb density fiberglass fire resistant insulation complying with the following:

1. ASTM C 411 Standard Test.
2. Attach with adhesive complying with ASTM C 916.
3. Fire-Hazard classification, insulation and adhesive combined: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.3 HYDRONIC COILS

A. Hydronic Coils: Copper tube, minimum 0.025 inch wall thickness, with mechanically bonded aluminum fins, maximum of 12 fins per inch, copper headers and copper connections; rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 degrees F.

1. Factory test all coils as specified in the Source Quality Control article.
2. Include manual air vent and drain connections.
3. Chilled water and dual-temperature water coil casings, tracks, baffles, and supports shall be of stainless steel construction.

2.4 DRAIN PANS

A. Condensate Drain Pan: Fabricate drain pans and drain connections to comply with ASHRAE 62.1.

1. Drain pan: Stainless steel, insulated.
   a. Located under cooling coil allowing the drain pan to be fully inspected and cleaned.
   b. Slope to drain completely dry upon fan coil shutdown.

SPEC EDITOR: SELECT BELOW, ONE OF THE FOUR CODE REQUIRED METHODS OF PROTECTING AGAINST PRIMARY DRAIN PAN FAILURE AND SHOW DRAIN TERMINATION POINTS ON THE DRAWINGS. DELETE THE OTHER THREE OPTIONS.

2. Overflow drain pan connection: shall be on the same side and at a higher elevation than the primary drain pan connection.
3. Water-level detection device conforming to UL 508, factory wired to shut off the equipment prior to drain pan overflow. With auxiliary contact to simultaneously signal owner's Building Automation System.
4. Auxiliary drain pan with drain connection.
5. Auxiliary drain pan with capped or no drain connection, with water-level detection device conforming to UL 508, factory wired to shut off the equipment prior to auxiliary drain pan overflow. With auxiliary contact to simultaneously signal owner's Building Automation System.

2.5 FILTERS

A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2

1. Disposable Type: 2-inch pleated cotton-polyester media: 90 percent arrestance and a MERV A rating of 8 (or as scheduled) when tested per Appendix J of ASHRAE 52.2.

SPEC EDITOR: SELECT BELOW, DIRECTION OF FILTER REMOVAL. WHEN SELECTING, CONSIDER THE OBSTRUCTIONS TO FILTER REMOVAL AT THE FAN COIL MOUNTING LOCATION.

2. Provide filters that are removable horizontally from the casing.
3. Provide filters that are removable vertically from the casing.

SPEC EDITOR: FAN COILS ARE RARELY BELT DRIVEN. IF YOUR PROJECT REQUIRES BELT DRIVE, STRONGLY CONSIDER USING THE BLOWER COIL SPEC. OTHERWISE, EDIT BELOW TO INCLUDE SPEC FOR BELT DRIVE AND REVISE THE MOTOR TYPE.

2.6 FAN AND MOTOR:

A. Fan: Forward curved, double width, centrifugal, direct drive fan(s) mounted on removable fan deck or with easily removable fan and motor. Galvanized steel or aluminum wheels; galvanized-steel fan scrolls.

B. Motor Wiring: Terminate wiring in a junction box, external to the unit casing for a single point connection.

C. Provide a project specific wiring diagram affixed to the inside of each fan coil cabinet.

SPEC EDITOR: SELECT EITHER 3 SPEED PSC OR ECM MOTORS, BELOW.

SPEC EDITOR: ECM MOTORS AUTOMATICALLY ADJUST TO VARYING LOAD/STATIC PRESSURE (E.G. FILTER LOADING). SPEED IS TYPICALLY FACTORY SET BUT CAN BE RESET IN FIELD. ECM MOTORS ARE MORE ENERGY EFFICIENT AND ARE CLAIMED TO LAST LONGER THAN PSC MOTORS. THOUGH ECM MOTORS ARE GENERALLY PREFERRED, CAUTION MUST BE UTILIZED WHEN USING LARGE QUANTITIES OF SINGLE PHASE ECM MOTORS ON 3 PHASE CIRCUITS SINCE ECM GENERATED HARMONICS COULD OVERHEAT NEUTRAL CONDUCTORS, CONNECTORS, AND TRANSFORMERS. FOR HOSPITAL AND OTHER PROJECTS, ECM MOTOR LOCATION MUST BE CONSIDERED RELATIVE TO SENSITIVE ELECTRONIC EQUIPMENT, DUE TO POSSIBLE INTERFERENCE BY ECM GENERATED HARMONICS.

D. Motor: In compliance with Related Section "Motors", permanent split capacitor (PSC) type, 3 speed/3 tap, sleeve bearings.

E. Motor: In compliance with Related Section "Motors", electronically commutated motor (ECM). Designed for use with a single phase electrical input. Motor to be complete with and operated by a single phase integrated speed controller/inverter, speed adjustable manually or via external 0-10 VDC signal, built-in soft start/speed ramps, with permanently lubricated ball bearings.

2.7 SOURCE QUALITY CONTROL

A. Factory test all coils with a minimum of 350 psig air pressure while submerged under water.

B. Assemble and factory test each unit prior to shipping. Pressure test coils and piping packages for leaks. Cycle controls and operate fan at all speeds to check for proper operation. Correct all deficiencies prior to shipping.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Examine areas to receive fan-coil units for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine rough-in construction 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 and to comply with Quality Assurance Standards and manufacturer's installation instructions.

SPEC EDITOR: REGARDING THE BELOW PARAGRAPH: BE SURE TO SHOW OVERFLOW DRAIN ROUTED TO A CONSPICUOUS TERMINATION POINT, IF AN OVERFLOW DRAIN IS BEING USED.

3.3 CONNECTIONS

A. General piping installation requirements are specified in Related Documents Specification Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Connect hydronic, condensate drain, and overflow drain piping to the unit.

3.4 TEMPORARY USE PRIOR TO OCCUPANCY

A. Start units for temporary use only with the express written permission of the Owner and compliance with all requirements of the Contract Documents.

B. Complete all drywall taping, sanding and finishing in an area prior to any early use of units serving that area.

C. Thoroughly clean unit of all grease, dirt, dust, etc.

D. Prior to placement into temporary service:

1. Perform manufacturer's pre-start protocol.
2. Perform commissioning activities.

E. Install a complete set of temporary filters in the unit equal to the quality and efficiency of the specified permanent filters. If the unit was equipped with pre-installed filters, they may be used for temporary service. Provide factory new, clean filters in units at final turn over to the Owner.

F. During temporary service, perform all manufacturer's recommended and required routine maintenance procedures, including filter replacement at regular intervals, as required. Continuously maintain a log of all such procedures completed. Store log at unit during temporary use period and include log as part of the final Operation and Maintenance Manual.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
2. Test unit operation with thermostat in all modes of operation.
3. Verify that drain pans collect all condensate and are properly sloped to drain so that no condensate is retained in the pans.
4. Remove and replace malfunctioning units and retest as specified above.

3.6 COMMISSIONING

A. Perform the commissioning activities as outlined in the Division 01 Section titled Commissioning and other requirements of the Contract Documents.

3.7 CLOSEOUT ACTIVITIES

A. Perform all commissioning activities, even if previously performed to ready for temporary use.

B. After unit has completed final commissioning and just prior to final acceptance by Owner:

1. Thoroughly clean unit of all grease, dirt, dust, etc., lubricate bearings, align and tighten belts.
2. Install a new, complete set of filters.
3. Touch up damaged galvanized surfaces with zinc rich paint, minimum 65 percent metallic zinc by weight. Touch up damaged painted surfaces with manufacturer provided touch-up paint.

3.8 OWNER TRAINING

A. In cooperation with the Commissioning Agent, train Owner's personnel on basic fan-coil unit maintenance by demonstrating the following: location of control devices, removal of access panels, filter replacement, and motor replacement.

END OF SECTION 238220