

A. Electroplated steel nipple, complying with ASTM F 1545 and IAPMO PS 66.

1. Rated for 300 psig at 225 deg F.
2. Male threaded or grooved end connections.
3. Inert and noncorrosive propylene lining.

2.4 VALVES

A. CALIBRATED BALANCE VALVES

1. Pre-Set Balance Feature. Valves to be designed to allow Installing Contractor to pre-set balance points for proportional system balance prior to system start-up in accordance with scheduled flow rates.
2. Valve Design and Construction. All valves shall have a calibrated orifice or venturi section, two 1/4" threaded pressure tap ports with integral seals, and memory stop to retain the set position. Valves should be rated for 125 psig working pressure and 250 Deg. F maximum operating temperature.
3. Valves shall be selected based on flowrate, not on pipe size dimensions.
4. Prefomed Insulation. All valves to be provided with molded insulation to permit access for balance and read-out.

B. GATE VALVES

1. Up To and Including 2 Inches:
 - a. Bronze body, bronze trim, union bonnet, rising stem, lockshield stem handwheel, inside screw with backseating stem, solid wedge disc, alloy seat rings, solder or threaded ends, Class 125, MSS SP-80. Add valve stem extensions to all valves that will be installed in insulated piping systems.
2. Over 2 Inches:
 - a. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged or grooved ends, Class 125, MSS SP-70. Add valve stem extensions to all valves that will be installed in insulated piping systems.
 - b. Chainwheel: On valves 6" and larger and installed higher than 8-feet above finished floor, provide sprocket rim, brackets, and chain compatible with valve.

C. BALL VALVES

1. Up To and Including 2 Inches:
 - a. Bronze two piece body, stainless steel full-port ball on all systems, "glass filled" Teflon seats and stuffing box ring, lever handle with balancing stops, solder or threaded ends. Include stem extensions on valves used in insulated piping systems.
 - b. Energy isolation ball valves shall be provided with lockable handle.

D. BUTTERFLY VALVES

1. 2-1/2 Inches and Larger:
 - a. Body: Cast or ductile iron with resilient replaceable EPDM seat, lug ends, extended neck.
 - b. Disc: Aluminum bronze on closed systems and stainless steel on open systems.
 - c. Stem: Stainless steel, extended on insulated systems as required to allow valve operation without damage to the insulation.
 - d. Operator (4" and smaller): 10 position lever handle with memory stop, gear drive.

- e. Operator (6" and larger): Handwheel, gear drive.
- f. Chainwheel: On valves 6" and larger and installed higher than 8-feet above finished floor, provide sprocket rim, brackets, and chain compatible with valve.

E. SWING CHECK VALVES

- 1. Up To and Including 2 Inches:
 - a. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder or threaded ends.
- 2. Over 2 Inches:
 - a. Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

F. SPRING LOADED CHECK VALVES

- 1. Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.

G. ALTERNATE MATERIALS

- 1. Process cooling water systems are to be constructed entirely of materials that do not contain ferrous compounds, except that stainless steel pipe and fittings may be used.

3. EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends to full inside diameter using tools designed for this purpose. Remove burrs. Bevel or groove plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Unions and flanges for servicing and disconnect are not required in installations with grooved mechanical joint couplings. (The couplings shall serve as disconnect points.)
- E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION

- A. Where connecting ferrous and non-ferrous piping materials, use full-port ball valves with bronze construction or a galvanized steel dielectric nipples with plastic liner to separate piping materials.
- B. Heating water connections to terminal units shall be copper (no steel).
- C. Install all piping in accordance with ASME B31.9.
- D. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- E. Install piping to conserve building space, and not interfere with use of space.
- F. Group piping whenever practical at common elevations.

- G. Sleeve pipe passing through partitions, walls and floors as follows:
 1. Install schedule 40 pipe sleeves at fire rated walls and floors. Seal with UL approved fire stopping material.
 2. Install minimum 18 gage pipe sleeves at non rated walls.
 3. Sleeves through floors should extend a minimum of 2" above finished floor.
 4. Sleeves through walls should be flush with the wall surface.
 5. All sleeves should be large enough to has insulated piping with crushing the insulation.
- H. Slope piping and arrange to drain at low points.
- I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- J. Provide insulation clearance and access to valves and fittings in hangers and from structure and other equipment. Insulation shall be continuous through all hangers and supports. Provide access where valves and fittings are not exposed. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- K. Install unions on both sides of each control valve and on one side of all other valves. Install unions on the equipment side of final connections to each piece of equipment. Unions are not required at flanged valves or equipment or equipment or in grooved joint piping systems.
- L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- M. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Provide insulated valve stem extensions on all valves installed in insulated piping systems.
- P. Pipe connections shall be installed with the branch piping connected to the top of the main/header. If this is not possible due to space constraints, a connection with the same vertical centerline is acceptable. Connections to the bottom of the main/header is not allowed.
- Q. Hydronic systems shall be designed and constructed with isolation valves at branch taps for all floors.
- R. Provide solid chrome plated steel escutcheons cover the sleeves and openings at walls and ceilings in exposed areas.
- S. Process cooling water systems are to be constructed entirely of non-ferrous materials, including but not limited to, piping, pumps, filters, heat exchangers, valves, and air separators. The exception to this is that stainless steel pipe and fittings may be used.

3.3 SYSTEM FLUSHING, FILLING, PRESSURE TESTING AND CLEANING

- A. Flush, fill, pressure test and clean all new hydronic systems and parts of existing systems which have been altered, extended or repaired.
- B. Flush and fill systems with all valves open to coils. Bleed air from coils and piping. Clean strainers.

C. Pressure Test Procedure:

1. Submit copy of pipe pressure test log for each section of piping tested. Refer to 23 05 00 for general pipe pressure testing requirements (i.e., test pressure gages, inspections, etc.).
2. Leave joints including welds uninsulated and exposed for examination during the test.
3. Provide temporary restraints for expansion joints which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.
4. Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.
5. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.
6. Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test.
7. After the hydrostatic test pressure has been applied for at least 12 hours, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks.

END OF SECTION 23 21 13

SECTION 23 82 19 FAN COIL UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. Fan coil units.

1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. NFPA 70 – National Electrical Code.
 - 2. ASHRAE Standard 90.1 – “Energy Standard for Buildings Except Low-Rise Residential Buildings”.
 - 3. ARI 440 – “Room Fan-Coils”.
 - 4. ANSI/UL-883 – “Safety Standards for Fan Coil Units and Room Fan Heater Units”.
 - 5. NFPA 90A – “Standard for the Installation of Air Conditioning and Ventilation Systems”.

1.04 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three (3) years documented experience.

1.05 SUBMITTALS

- A. Product Data:
 - 1. Submit product data indicating typical catalog of information including dimensions, weights, capacities, ratings, fan performance, gages and finishes of materials, electrical characteristics and connection requirements.
 - 2. Submit fan curves with specified operating point clearly plotted. Fan curves shall clearly demonstrate that the fan coil unit will operate stably within the range of performance scheduled.
 - 3. Submit coil performance data as tested and certified per ARI standards.
 - 4. Submit electrical requirements for power supply wiring, clearly indicating factory-installed and field-installed wiring.

5. The submittal shall indicate that all materials meet NFPA 90 flame/smoke spread levels of 25/50 or better.

B. Record Documents:

1. Shop Drawings: Indicate materials and methods of assembly, unit dimensions, weight loading, required clearances, field connection details, electrical characteristics and dimensional views as required to adequately describe the unit.
2. Submit manufacturer's installation instructions.
3. Submit Record Drawings in accordance with Division 01.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and protect products to the Project Site.
- B. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

1.07 WARRANTY

- A. Provide one (1) year manufacturer's warranty.
- B. Include coverage of fan-coil unit and motors.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. Units shall bear an ARI stamp.
- C. Fan coil units shall be of the size and configuration as described on the Drawings.
- D. Performance as scheduled on the Drawings shall be a minimum requirement. Base coil unit performance on sea level conditions.
- E. Fan coil unit height shall be equal to the existing units.
- F. Fan coil unit sizes shall be such that the units can be transported to the area of work and installed within the physical space available.

2.02 MANUFACTURERS

- A. Envirotec.
- B. International Environmental Corp.
- C. McQuay.
- D. Temtrol
- E. Trane.
- F. York.

2.03 CASING AND FRAME

- A. 18 gage enclosure, galvanized steel. Frame shall be galvanized steel members.

- B. Units exposed below deck shall have a baked enamel finish.
- C. Internally insulate units throughout the entire enclosure with 1-inch thick insulation. Insulation shall have a foil facing on the interior.
- D. Units shall be completely enclosed with all components including the motor, interior to the casing.
- E. Primary Drain Pan:
 - 1. Units shall have a rust-inhibiting IAQ style drain pan across the full width of the unit, extending from the cooling coil to the end of the unit.
 - 2. Insulate drain pan.
 - 3. Drain connection shall be minimum 7/8-inch outside diameter, copper construction.
 - 4. Arrange coil and drain pan connections on the side of the unit as shown on the Drawings.
- F. Units shall be provided with integral mounting brackets adequate to support the unit's weight.
- G. Units shall be provided with a discharge and inlet duct collar.
- H. Furnish access doors as required to service all elements of the unit from the sides. It shall not be necessary to access the bottom of the unit to service any component.

2.04 FANS AND RELATED COMPONENTS

- A. Provide single or dual fans with integral direct drive multiple-speed motor or demountable belt drive motor. Direct drive motor speed shall be set via easily accessible wall-mounted switches.
- B. Motors shall be high efficiency type with built-in thermal overload protection.
- C. All units scheduled for capacities of 1200 cfm or greater shall be externally isolated with spring isolators.

2.05 COILS

- A. Cooling Coils:
 - 1. Copper tube with aluminum fins.
 - 2. Tubes shall be ½-inch outside diameter with a minimum wall thickness of 0.02 inches.
 - 3. For units scheduled with capacities of 600 cfm or less, fins shall be spaced no closer than 14 fins per inch and shall have a minimum fin thickness of 0.0075 inches.
 - 4. Larger capacity units shall have fins spaced no closer than 9 fins per inch and shall have a minimum fin thickness of 0.0088 inches.
- B. Where required, heating coils shall be copper tube with aluminum fins. Tubes shall be ½-inch outside diameter with a minimum wall thickness of 0.020 inches. Fins shall be spaced no closer than 14 fins per inch with a minimum fin thickness of 0.0075 inches.
- C. Air velocities across cooling coils shall not exceed 500 fpm. Air velocities across heating coils shall not exceed 700 fpm.
- D. Coil headers shall be the full size of the coil connection with manual air vents located at the top.

E. Coil frames shall be heavy duty galvanized steel construction.

2.06 FILTERS AND RELATED COMPONENTS

A. All fan coil units shall have provisions for mounting a filter at the unit inlet. Filter shall be a standard ½-inch throwaway filter, 30 percent efficiency.

2.07 UNIT SPECIALTIES

A. For each unit, provide a 22 gage sheet metal auxiliary drain pan mounted below the entire unit and primary drain pan.

B. Auxiliary drain pans shall either be drained to an approved condensate receiving location or shall be provided with a float switch that shall de-energize the fan coil unit and send an alarm to the building automation system (BAS).

2.08 ELECTRICAL PROVISIONS

A. Each unit shall have a single point of power connection pre-wired at the factory.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that areas are ready to receive Work and opening dimensions are as indicated on Shop Drawings.

B. Verify that required utilities are available, in proper location, and ready for use.

3.02 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Protect units with protective covers during balance of construction.

D. Leave adequate room to access and service all components.

E. Arrange fan coil units and ductwork such that poor fan performance does not result.

F. Do not operate units without specified filters being installed.

G. Mount disconnect switches and starters within sight of the fan motor and independent of the unit to allow for maintenance access.

3.03 CLEANING

A. After construction and painting is completed, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

C. Install new filters after Substantial Completion.

END OF SECTION 23 82 19