

OKLAHOMA STATE UNIVERSITY - BUILDING DESIGN STANDARDS

PART 1 GENERAL

1.1 SUMMARY

- A. Work of this section includes providing basic mechanical materials including, but not limited to, the following:
 - 1. Valves.
 - 2. Pipe expansion joints.
 - 3. Supports and anchors.
 - 4. Motors.
 - 5. Mechanical identification.
 - 6. Vibration control.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
- C. Operation and Maintenance Data: Submit manufacturer's operation and maintenance data, including operating instructions, list of spare parts and maintenance schedule.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 PRODUCTS

- A. Pipe, Fittings, and Specialties: Refer to individual piping systems specifications for materials and installation requirements.
- B. Valves: General duty valves cast iron, bronze, and brass, fabricated to comply with Manufacturers Standardization Society (MSS) classification listed. Gate, ball, and butterfly, valves for shut-off duty.
- C. Valves: General: To be installed at each branch, riser and to isolate each floor, also each piece of equipment. To be accessible from the floor or install a chain operator for valve handles more than seven foot above finished floor. Valves above a hard ceiling to have an access door (2'-0" x 2'-0" min.) with a complete description of the valves

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function written on the backside in one inch high bold lettering. Gate valves to be used on steam and condensate only. Soldered valves globe valves and plug valves are not allowable.

1. Gate Valves: To be Class 150. Steel body, rising stem, O.S.&Y, solid wedge, flexible disc and bolted bonnet. Gate valves to be used on steam and condensate only.
 2. Ball Valves:
 - a. Service Steam: 600 WOG. 316 stainless steel ball and stem with extended stem on insulated piping.
 - b. Service Domestic Water: All bronze with extended stem on insulated piping.
 - c. Approved Manufacturer's: Apollo , Jamesbury or Stockman.
 3. Butterfly Valves: CI. Body, lug type, EPDM seat and body liner, 316 stainless steel extended shaft, aluminum bronze disc with gear operator (chain operator if 84 inches above finished floor.) 150 pounds permanent open end shut off. Centerline Series 200. Keystone 222 Mueller 52. No substitutions.
 4. Swing Check Valves:
 - a. Service Steam: 2-Inch and Smaller: MSS SP-80, Class 125 or 150 based on system pressure, cast-iron body and cap, threaded or solder ends based on service
 - b. Service Domestic Water: All bronze.
 5. Wafer Check Valves: 2.5 inches and larger to be full body wafer check DI, body, EPDM full body liner, 316 stainless steel shaft and aluminum bronze plates. Centerline series 800 or an OSU Architectural & Engineering Services approved equal.
 6. Lift Check Valves, 2-Inch and Smaller: Class 125, cast-bronze body and cap, threaded ends.
- D. Expansion Joints for Piping Systems: Joints shall provide 200 percent absorption capacity of piping expansion between anchors.
1. Packless expansion joints.
 2. Slip joints.
 3. Flexible ball pipe joints.
 4. Mechanical grooved fittings.
 5. Fabricated expansion loops.
- E. Supports and Anchors: Hangers and Support Components: MSS SP-58, pipe and equipment hangers and supports including clamps, hanger-rod attachments, saddles and shields, spring hangers, pipe alignment guides, and anchors.
- F. Motors: NEMA MG 1 motors with phase, frequency rating, voltage rating, and capacity suitable for use.
- G. Mechanical Identification: ASME A13.1 as applicable, color coded, of the following types: Standard stencils, snap-on plastic pipe markers, pressure-sensitive pipe markers, plastic duct markers, plastic tape, valve tags, valve tag fasteners, access panel markers, valve schedule frames, engraved plastic laminate signs, plastic equipment markers, plasticized tags suitable for use.

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- H. Vibration Control: Fiberglass pads and shapes, neoprene pads, vibration isolation springs, pad-type isolators, plate-type isolators, double-plate-type isolators, threaded double-plate-type isolators, all-directional anchors, neoprene mountings, free standing spring isolators, housed spring isolators, vertically-restrained spring isolators, earthquake-resistant spring isolators, seismic snubbers, thrust restraints, equipment rails, fabricated equipment bases, inertia base frames, roof-curb isolators, isolation hangers, riser isolators, flexible pipe connectors suitable for use, or as noted on plans.
- I. Dielectric Isolation: Joints between dissimilar metals shall be made with a non electrical conducting union.
- J. Air Vents:
 - 1. Automatic air vents: Installed at all high points and air traps with a ball valve the same size as the pipe .
 - 2. Manual air vents: Installed at all high points and air traps with a ball valve the same size as the pipe, are approved in lieu of automatic air vents.
 - 3. Approved Manufacturer's: Spirovent, Amtrol or Hoffman.
- K. Pressure Gauges: To be installed as listed below for pipe sizes 2" or larger. Liquid filled 4" Ashroft 4-1008SL or Palmer 40CBLQ installed with a stainless steel needle valve or ball valve on each side of coils, heat exchangers, pumps and strainers. Gauges to be manifolded when differential pressure is desired.
- L. Temperature Gauges: Digital solar powered. Weiss DV-U6 or Wika type TI. DOI. To be installed in a separate well. Solar panel to be pointed at nearest light source.
- M. Temperature Wells: To be installed as listed below for pipe sizes 2" or larger. Brass 2.5 insertion with 2.5 neck Trerice 138-0017.1. Installed at a 45 deg. Angle on vertical piping and on the top of horizontal piping so wells will hold water. Install on each side of coils and heat exchangers.
- N. Air Separator: To be of micro bubble technology such as (Spirovent) dirt and air separator with a flanged bottom for cartridge removal sized for 99% air removal with an auto air vent and bottom blow down valve piped to a floor drain.
- O. Chemical Feeder: A 5-gallon pot with a 3" lid and bottom connection S.M.C. Model SK1000 piped to have continuous flow.
- P. Slip Stream Filter: One micron, 10" housing U.S. Filter PPI.
- Q. Make-up Water Regulator: Watts U5-LP. Installed with a pressure gauge downstream.
- R. Strainers: To be Flow Design with dual ports and bottom blow down valve including a hose connection.
- S. Instrument Test Holes: Ventlok 699-2 with screw on cap to be installed on each section of an air handler and on all mixing boxes, outside air ducts, return air ducts and at points

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in the air system that changes occur in temperature. Caps to be attached to the air handler unit (AHU), so they can be removed without being lost.

- T. **Equipment Access.** Install all piping, conduit, duct and accessories to permit full access to all equipment, equipment access door, panels and covers. Oklahoma State University (OSU) Architectural & Engineering (A&E) Services shall settle conflicts in the field at no cost to the owner.
- U. **Training:** The General Contractor shall demonstrate the complete and correct operation of each piece of equipment and the total heating and air condition system. Also demonstrate the preventive maintenance and care of all equipment. Training shall be videotaped and saved on a DVD. 3 (three) copies of the DVD shall be provided to the operation and maintenance personnel before substantial completion. The Owner requires completed and accepted maintenance manual and notice seven days in advance of training.
- V. **Commissioning:** To be performed in accordance with ASHRAE, LEED, Building Commissioning Association, or other approved organization.
- W. **Maintenance Manuals:** Prepare three copies with a complete description of functions, normal operating characteristics and limitations, performance curves, engineering data and test with complete nomenclature, commercial numbers of replacement parts. Manufacturers printed operation procedures to include start-up, break-in, routine and normal operating instructions, maintenance procedures for preventive maintenance, trouble shooting, disassembly repair and lubrication charts and schedules.
- X. **Owner Layout Coordination:** The owner shall be notified prior to the installation of any equipment or group of equipment which requires maintenance. OSU A&E Services shall have 3 (three) days prior notice before installation of equipment which requires maintenance is installed, to review equipment layout and give owner input on maintenance concerns. If notification is not given or maintenance concerns are not addressed during installation then the contractor will bear the cost of correcting the maintenance issues.
- Y. **BTU Meter:** OSU will supply the BTU flow meter and panel. The Mechanical Subcontractor will install the BTU meter and four temperature wells. Two temperature wells are test wells. The Electrical Subcontractor will wire up the BTU meter control panel to a dedicated breaker and OSU Physical Plant will program the meter.
- Z. **Domestic Water Meter:** The Owner will supply the domestic water meter for the General Contractor to install with isolation valves before and after the meter.
- AA. **Pumps:** To be sized for 100 percent flow with diversity by Paco, Taco, Grundfos or B&G 1510. Hydronic pumps to mounted per manufacturer's recommendation's and with approved vibration isolation systems. Pumps shall be mounted as shown on drawings. The engineer of record shall determine the layout and if a suction diffuser is necessary due to space restrictions. Pump speed shall be set at 1750 rpm, unless approved by OSU A&E Services.

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- BB. Flexible Connectors: Stainless steel bellows with woven flexible bronze wire reinforcing protective jacket and a minimum of 150 psig working pressure.
- CC. Piping and Fittings: Type M copper, grooved piping and fittings are not allowed on Hydronic systems.
- DD. Steam Pressure Reducing Valves: Spence type E full port with D-210 pilot, solenoid valve for automation. For manual operation use a D-5 pilot.
- EE. Steam to Water Heat Exchanger:
 - 1. Domestic water: single pass instantaneous steam to water heat exchanger is acceptable. Steam side size for a maximum of 12 psi and a minimum of 5 psi steam pressure.
 - a. Leaving water temperature shall be 120 degrees F, for systems with no storage.
 - b. Leaving water temperature shall be 140 degrees F, for systems with storage.
 - 2. Heating water: 0.001 fouling factor. Water side to be sized for 20 degree delta T at full flow . Steam side size for a maximum of 12 psi and a minimum of 5 psi steam pressure.
- FF. Water Treating Procedure For Closed Loop Systems: Chemicals shall be PK-7 and CST-90 to be compatible with existing chemicals. Chemical cleaning shall be performed by a qualified applicator similar to SMC Technologies of Midwest City, Oklahoma or approved equal. Equals must be approved by OSU A&E Services.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials in proper relation with adjacent construction and with uniform appearance for exposed work. Coordinate with work of other sections. Comply with applicable regulations and code requirements. Provide proper clearances for servicing.
- B. Maintain indicated fire ratings of walls, partitions, ceilings and floors at penetrations. Seal with firestopping to maintain fire rating.
- C. Clearly label and tag all components.
- D. Test and balance all systems for proper operation.
- E. Restore damaged finishes. Clean and protect work from damage.
- F. Instruct Owner's personnel in proper operation of systems.

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3.2 CLEANING OF HYDRONIC SYSTEM

- A. The Mechanical Contractor shall provide and install a temporary pump when necessary for the chemical treatment. All water introduced into the system shall be through a 1-micron filter.
- B. Start the pump and verify flow to all coils to within five percent of design. This is done with a differential pressure meter and spot checked by the OSU Physical Plant Hydronic Specialist. All components must be cleaned at the same time.
- C. Add PK-7 at a rate of 1 gallon per 250 gallons of system capacity to insure a PH of 12. The system shall circulate for twenty-four hours alternating three-way valves every eight hours if applicable.
- D. Start a rapid bleed and feed continuously until the PH is the same as the domestic water and free of visible particulates with less than 25 NTU of turbidity.
- E. Clean all strainers and dirt legs.
- F. Add CST-90 at a rate of 1 gallon per 100 gallons of system capacity to insure a residue of 150 to 180 ppm MoM4 NTU is less than 25. Test to be verified by OSU A&E Inspection Services.
- G. Clean all strainers and dirt legs two weeks after system is in normal operation, verified by Physical Plant Hydronic Specialist.
- H. Prepare written reports with test results.

END OF SECTION 15050