

RADIANT HEATING PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 01 91 13 - General Commissioning Requirements.

1.02 COMMISSIONING

- A. Where indicated in the equipment or commissioning specifications, engage a factory-authorized service representative, to perform startup service as per functional test sheets and requirements of Section 01 91 13 - General Commissioning Requirements.
- B. Complete installation and startup checks and functional tests according to Section 01 91 13 - General Commissioning Requirements and manufacturers written instructions.
- C. Operational Test: After electrical system has been energized, start units to confirm proper unit operation. Rectify malfunctions, replace defective parts with new one and repeat the start up procedure.
- D. Verify that equipment is installed and commissioned as per requirements of Section 01 91 13 and manufacturers written instructions/requirements.

1.03 SUMMARY

- A. This Section includes radiant heating piping, including pipes, fittings, and piping specialties.

1.04 DEFINITIONS

- A. PEX: Crosslinked polyethylene.

1.05 SUBMITTALS

- A. Product Data: Radiant heating piping specialties, including rated capacities and water flow and pressure drops of selected models.
- B. Shop Drawings: Show piping layout and details drawn to scale, including valves, manifolds, controls, and support assemblies and their attachments to the building structure.
- C. Maintenance Data: For manifolds and control devices to include in maintenance manuals specified in Division 1.

1.06 COORDINATION

- A. Coordinate layout and installation of radiant heating piping and suspension system with building and structural components.
- B. Coordinate size and location of access panels to allow access to manifolds concealed in ceilings, walls, and floors.
- C. Coordinate thickening of slabs where required for adequate encasement of radiant heating piping components.
- D. Revise locations and elevations from those indicated as required to suit field conditions and ensure integrity of piping and as approved by Architect.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Distribution Manifolds:
 - a. Embassy Industries.
 - b. Wirsbo Co.
 - c. Heatlink USA Inc.
 - 2. Mixing Valves:
 - a. Honeywell Sparco.
 - b. Wirsbo Co.
 - c. Heatlink USA Inc.
 - 3. Controls: Radiant Floor
 - a. Heat Timer.
 - b. Tekmar Control Systems, Ltd.
 - c. Honeywell.

2.02 HEAT-TRANSFER PIPES AND FITTINGS

- A. Piping:
 - 1. Tubing shall be cross-linked polyethylene with an oxygen barrier.
 - 2. The PEX tubing shall be manufactured in accordance with ASTM F-876 and have a rated operating temperature of 180 deg F at 100 psi.
 - 3. The tubing shall have an oxygen diffusion barrier, which prevents oxygen from entering the heating system thorough the tubing wall. It is extremely important to note that abrasion of the tubing will strip this thin protective coating off of the underlying PEX material.
 - 4. The minimum bend radius for cold bending of the PEX tube shall not be less than six times the outside diameter. Bends with a radius less than stated shall require the use of bend supports as supplied by the tube manufacturer.

5. The PEX tubing dimensions shall be:
 - a. 3/8" nominal inside diameter in accordance with ASTM F-876.
 - b. 1/2" nominal inside diameter in accordance with ASTM F-876.
 - c. 5/8" nominal inside diameter in accordance with ASTM F-876.
 - d. 3/4" nominal inside diameter in accordance with ASTM F-876.
 6. Tubing shall be covered by a twenty-five year manufacturer's warranty.
- B. Fittings: ASTM F 1807, copper or brass compression type.
1. Compression fittings shall be made of dezincification resistant brass. These fittings must be supplied by the PEX tubing manufacturer.
 2. The compression fitting shall be composed of three parts:
 - a. Barbed insert.
 - b. Compression ring.
 - c. Compression nut.

2.03 RADIANT HEATING SPECIALTIES

- A. Distribution Manifolds: Brass, Copper or Plastic modular design.
1. Manifolds shall include manual air vents, hose bib, supply modules with manual shut off valves also capable of adapting a motorized zone valve, return modules with visible flow indication for balancing, and supply/return thermometers.
 2. Manifold assembled components containing rubber o-rings shall be lubricated with non-toxic silicon grease to ensure proper seating of the modules.
 - a. Motorized 4-Way Mixing Valve: 125 psig, 230 deg F maximum operating pressure and temperature, brass or cast-bronze body, EPDM seals, and threaded connections.

2.04 CONTROLS

- A. Radiant Floor Heating Control Sequence: Flow-through radiant heating piping is modulated to satisfy space thermostat.
- B. Radiant Floor Heating:
1. For hydronic heating systems with a motorized mixing valve, the micro-processor based control will have an outdoor cutoff temperature. The control shall reset the temperature of the circulating heating water based on the outside temperature. The control shall use PID type logic to maintain the circulating heating water temperature.
 2. The control shall include the following features:
 - a. Sensors: Two solid state (thermistor type) sensors which are interchangeable. The sensors measure from -30 deg F to 250 deg F, maintain +/-1 deg F accuracy, and can be located up to 500 feet from the control. The sensors shall fit in a 3/8" ID well, can be strapped to a pipe, or mounted outdoors with a clip.
 - b. Outdoor Cutoff: The control shall provide an integral outdoor cutoff temperature. The temperature selected is the one below which the heating system will be activated. The setting shall be adjustable from 50 deg F to 65 deg F. This shall also select the temperature where the heating the heating circulation pump is started.

- c. Reset Ratios: The control shall provide infinitely adjustable reset ratios from 8:1 (Outdoor Temperature: Water Temperature) to 1:4.
- d. Offset: The control shall provide an integral offset adjustment to parallel shift the selected reset curve. The range of settings shall be -40 deg F to 40 deg F.
- e. Maximum Water Temperature: The control shall provide a maximum water temperature set point to limit the computed water temperature. The range of settings shall be 90 deg F to 150 deg F.
- f. Accept a Plug-in Setback Clock: The control shall be field capable of accepting a plug-in setback time clock requiring no additional wiring or relays. The clock can have either 24 hour or 7 day capability. The degree of water temperature setback shall be adjustable from 0 deg F to 40 deg F.
- g. Boost: The control shall have an optional 60 minute boost period after the night setback.
- h. On-Off-Auto Switch: An ON-OFF-AUTO switch shall be integrated into the control to select the required operating mode. In the ON position, the heating system will be activated (BYPASS). In the OFF position, the heating system pump will be turned off. In the AUTO position, the control automatically will have outdoor cutoff and reset the heating water temperature.
- i. Indication Lights: Three indicator lights shall show the operating status of the control. The green light on will indicate the control is in setback. The yellow light on will indicate the control is in boost. The red light will indicate when the control is outputting to the valve. The control shall have self diagnostic capabilities such that flashing green and yellow lights will indicate problems with the two sensors.
- j. External Shutdown: The control shall be capable of being turned off from an external location. This will allow the control to be turned on and off through a thermostat or zone valve end switches.
- k. Bypass: The control shall be capable of being activated from an external location. When the control is in BYPASS, the heating system will be activated and will hold a constant 180 deg F water temperature (or the Maximum Water Temperature, whichever is less).
- l. Relay Outputs: The control shall have three NO. relay outputs. The relays shall be capable of switching 3A resistive, 1/6 HP.
- m. System Power: The control shall be powered by 24 VAC, 60 hz.

PART 3 - EXECUTION

3.01 HEAT-TRANSFER PIPING INSTALLATION

- A. Install piping downstream from manifolds without joints.
- B. Secure piping in concrete floors by attaching pipes to concrete reinforcement using plastic tie straps.
 - 1. Install a sleeve of foam-type insulation around tubing and extending for a minimum of 3 inches on each side of the slab penetration to protect the tubing passing through expansion joints.
- C. Install manifolds in accessible locations.

3.02 FIELD QUALITY CONTROL

- A. Prepare radiant heating piping for testing as follows:
 - 1. Temporarily restrain expansion joints so they are not damaged due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 2. Flush with clean water, and clean strainers.
 - 3. Install relief valve set at a pressure no more than one-third higher than test pressure.
- B. Perform the following tests:
 - 1. Subject piping to hydrostatic test pressure that is not less than 1.5 times the design pressure but not more than 100 psig.
 - 2. After hydrostatic test pressure has been applied, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 - 3. Prepare a written report of testing.

3.03 ADJUSTING

- A. After system balancing has been done, mark balancing (zone) valves to permanently indicate final position.
- B. Perform the following adjustments before operating the system:
 - 1. Open valves to fully open position. Close bypass valves.
 - 2. Check operation of automatic valves.
 - 3. Set temperature controls so all zones call for full flow.

3.04 CLEANING

- A. After testing has been successfully completed, flush piping and clean strainer screens.

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