

SECTION 238316 - HYDRONIC RADIANT SNOW MELT SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The work covered by this section includes materials required to supply, install and pressure test Engel Method cross-linked polyethylene (PEX-A as shown on drawings or as specified herein. The radiant snow melt system shall include, but not limited to, all piping, manifolds, valves, pumps, pressure relief valves, and controls to provide a complete and operational heating system. The applicable installation method(s) shall comply with published installation instructions from the tubing manufacturer.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. PEX: Crosslinked polyethylene.
- C. PEX/AL/PEX: Crosslinked polyethylene/aluminum/crosslinked polyethylene.

1.4 SUBMITTALS

- A. Product Data: For each type of radiant heating pipe, fitting, manifold, specialty, and control.
 - 1. For radiant snow melt piping and manifolds, include pressure and temperature rating, oxygen-barrier performance, fire-performance characteristics, and water flow and pressure drop characteristics.
- B. Shop Drawings:
 - 1. Provide installation drawings indicating tubing layout, manifold locations, zoning requirements and manifold schedules with details required for installation of the system
 - 2. Provide mechanical schematic indicating heat source, mechanical piping and accessories from heat source to manifolds, circulators, water tempering and

zone controls. Indicate supply water temperatures and flow rates to manifolds.

3. Layout Drawing Scale: 1/4 inch = 1 foot.

C. Operation and Maintenance Data: For radiant snow melt piping valves and equipment to include in operation and maintenance manuals.

D. Quality Assurance and Control Submittals: Submit the following.

1. Test Reports: Upon request, submit test reports from recognized testing laboratories.

2. Documentation: Submit the following.

a. Manufacturer's certificate indicating products comply with specified requirements

b. Manufacturer's detailed heat-loss analysis for the snow melt system.

c. Documentation indicating the installer is trained to install the manufacturer's products

E. Closeout Submittals: Submit the following.

1. Warranty documents specified herein

2. Operation and maintenance data

3. Manufacturer's field reports specified herein

4. Final as-built tubing layout drawing

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Use an installer with demonstrated experience on projects of similar size and complexity and possessing documentation proving successful completion of radiant floor heating or snow melt training by the PEX tubing manufacturer.

B. Certifications: Provide letters of certification as follows.

1. Installer is trained by the PEX tubing manufacturer to install radiant floor heating or snow melt systems.

2. Installer uses skilled workers holding a trade qualification license or equivalent, or apprentices under the supervision of a licensed tradesperson.

C. Pre-installation Meetings

1. Verify project requirements, substrate conditions, floor coverings, manufacturer's installation instructions and warranty requirements.

2. Review project construction timeline to ensure compliance or discuss modifications as required.

3. Interface with other trade representatives to verify areas of responsibility.

4. Establish the frequency and construction phase the project engineer intends for site visits and inspections by the PEX tubing manufacturer's representative.

1.6 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with Division 1 Product Requirements Section.
- B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
 - 1. Store PEX tubing in cartons or under cover to avoid dirt or foreign material from entering the tubing.
 - 2. Do not expose PEX tubing to direct sunlight for more than 30 days. If construction delays are encountered, cover the tubing that is exposed to direct sunlight.

1.7 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.
 - 1. Warranty covers the repair or replacement of any tubing or fittings proven defective.
 - 2. Warranty may transfer to subsequent owners.
 - 3. Warranty Period for PEX Tubing: 30-year, non-prorated warranty against failure due to defect in material or workmanship, beginning with date of substantial completion.
 - 4. Warranty Period for Manifolds and Fittings: 5-year, non-prorated warranty against failure due to defect in material or workmanship, beginning with date of substantial completion.
 - 5. Warranty Period for Controls and Electrical Components: 2-year, non-prorated warranty against failure due to defect in material or workmanship, beginning with date of substantial completion.

1.8 OWNER'S TRAINING

- A. Instruct Owner's personnel about operation and maintenance of installed system. Provide manufacturer's installation, operation and maintenance instructions for installed components within the system.

PART 2 - PRODUCTS

2.1 PEX PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Viega
 - 2. Uponor Wirsbo Co.
 - 3. Watts Radiant, Inc.; a division of Watts Water Technologies, Inc.
- B. Pipe Material: PEX plastic according to ASTM F 876.
- C. Oxygen Barrier: Limit oxygen diffusion through the tube to maximum 0.10 mg per cu. m/day at 104 deg F (40 deg C) according to DIN 4726.
- D. Fittings: ASTM F 1807, metal insert and copper crimp rings.
- E. Pressure/Temperature Rating: Minimum 100 psig (690 kPa) and 180 deg F (82 deg C).

2.2 DISTRIBUTION MANIFOLDS

- A. Manifold: Minimum NPS 2 INCH, copper.
- B. Main Shutoff Valves:
 - 1. Factory installed on supply and return connections.
 - 2. Two-piece body.
 - 3. Body: Brass or bronze.
 - 4. Ball: Chrome-plated bronze.
 - 5. Seals: PTFE.
 - 6. CWP Rating: 150 psig (1035 kPa).
 - 7. Maximum Operating Temperature: 225 deg F (107 deg C).
- C. Manual Air Vents:
 - 1. Body: Bronze.
 - 2. Internal Parts: Nonferrous.
 - 3. Operator: Key furnished with valve, or screwdriver bit.
 - 4. Inlet Connection: NPS 1/2 (DN 15).
 - 5. Discharge Connection: NPS 1/8 (DN 6).
 - 6. CWP Rating: 150 psig (1035 kPa).
 - 7. Maximum Operating Temperature: 225 deg F (107 deg C).
- D. Balancing Valves:
 - 1. Body: Plastic or bronze, ball or plug, or globe cartridge type.
 - 2. Ball or Plug: Brass or stainless steel.
 - 3. Globe Cartridge and Washer: Brass with EPDM composition washer.

4. Seat: PTFE.
5. Differential Pressure Gage Connections: Integral seals for portable meter to measure loss across calibrated orifice.
6. Handle Style: Lever or knob, with memory stop to retain set position if used for shutoff.
7. CWP Rating: Minimum 125 psig (860 kPa).
8. Maximum Operating Temperature: 250 deg F (121 deg C).

E. Zone Control Valves:

1. Body: Plastic or bronze, ball or plug, or globe cartridge type.
2. Ball or Plug: Brass or stainless steel.
3. Globe Cartridge and Washer: Brass with EPDM composition washer.
4. Seat: PTFE.
5. Actuator: Replaceable electric motor.
6. CWP Rating: Minimum 125 psig (860 kPa).
7. Maximum Operating Temperature: 250 deg F (121 deg C).

F. Thermometers:

1. Mount on supply and return connections.
2. Case: Dry type, metal or plastic, 2-inch (50-mm) diameter.
3. Element: Bourdon tube or other type of pressure element.
4. Movement: Mechanical, connecting element and pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Black metal.
7. Window: Plastic.
8. Connector: Rigid, back type.
9. Thermal System: Liquid- or mercury-filled bulb in copper-plated steel, aluminum, or brass stem.
10. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

- G. Mounting Brackets: Copper, or plastic or copper-clad steel, where in contact with manifold.

2.3 PIPING SPECIALTIES

A. Cable Ties:

1. Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
2. Minimum Width: 1/8 inch (3 mm).
3. Tensile Strength: 20 lb (9 kg), minimum.
4. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

2.4 CONTROLS

A. Supply Fluid Temperature Control (automatic control strategy)

1. Temper the supply fluid temperature to the snow and ice melt panel by means of a variable speed injection pump controlled by the Uponor SNOWpro™ 411, or an approved equal.
2. The snow melt controller shall have the ability to reset the supply fluid temperature as it relates to outdoor temperature. Install the outdoor temperature sensor (S4) on the north face of the building out of direct sunlight.
3. Run time shall be programmed by the snow melt controller for between 30 minutes to 17 hours or infinity. The control operates in snow-melt mode as long as there is moisture present on the sensor.
4. Provide one snow and ice detector per well (total of 3) to monitor the presence of moisture on the sensor (snow-melt mode) and slab temperature.
5. The snow melt controller shall have the ability to idle the snow-melt slab at a given temperature and automatically accelerates to a higher slab temperature during snow-melting mode.
 - a. The snow melt controller will automatically switch from snow-melt mode to idle mode once the snow and ice detector indicates the lack of moisture on the sensor.
6. When there is a call for snow melt, the snow melt controller shall:
 - a. Activate the variable speed injection pump (P4)
 - b. Initiate the heat exchanger

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and substrates to receive radiant snow melt piping for compliance with requirements for installation tolerances and other conditions affecting performance.
 1. Ensure that surfaces and pipes in contact with radiant snow melt piping are free of burrs and sharp protrusions.
 2. Ensure that surfaces and substrates are level and plumb.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop or Coordination Drawings.

- B. Install radiant snow melt piping continuous from the manifold through the heated panel and back to the manifold without piping joints in heated panels.
- C. Connect radiant piping to manifold in a reverse-return arrangement.
- D. Do not bend pipes in radii smaller than manufacturer's minimum bend radius dimensions.
- E. Install manifolds in accessible locations, or install access panels to provide maintenance access as required in Division 08 Section "Access Doors and Frames."
- F. Refer to Division 23 Section "Hydronic Piping" for pipes and connections to hydronic systems and for glycol-solution fill requirements.
- G. Fire- and Smoke-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials according to Division 07 Section "Penetration Firestopping."
- H. Piping in Slab Over Existing Slab Construction with Edge and Under-slab Insulation
 - 1. Provide 2 inch thick high-density foam insulation board, install the tubing by stapling the tubing to the insulation foam board with Foam Staples.
 - 2. Install the vertical edge insulation along the perimeter of the slab and down to a depth equal to the bottom of the horizontal under-slab insulation.
 - 3. Refer to the snow melt schedule for the tubing on-center distance(s) and loop lengths.
 - 4. Do not install tubing closer than 6 inches (152mm) from the edge of the heated slab.
 - 5. Install the tubing at a consistent depth below the surface elevation as determined by the project engineer. Tubing installation will ensure sufficient clearance for all control joint cuts.
 - 6. Fibrous expansion joints may be penetrated following the PEX tubing manufacturer's and structural engineer's recommendation.
 - 7. Metal or plastic bend supports will be used to support the tubing when departing from the slab in a 90 degree bend.
- I. Slab Sensor:
 - 1. Install slab sensor and wire in 3/4 inch PEX tubing conduit embedded in the concrete floor slab. Extend conduit out of floor slab to allow for sensor replacement.
 - 2. Install sensor equally spaced between radiant tubing with a 1 inch minimum cover.
- J. Revise locations and elevations from those indicated as required to suit field conditions and ensure integrity of piping and as approved by Architect.
- K. After system balancing has been completed, mark balancing valves to permanently indicate final position.

- L. Perform the following adjustments before operating the system:
 - 1. Open valves to fully open position.
 - 2. Check operation of automatic valves.
 - 3. Set temperature controls so all zones call for full flow.
 - 4. Purge air from piping.

- M. After the concrete floor has cured as recommended by concrete supplier, operate radiant heating system as follows:
 - 1. Start system heating at a maximum of 10 deg F (6 deg C) above the ambient floor temperature, and increase 10 deg F (6 deg C) each following day until design temperature is achieved.

3.3 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Subject piping to hydrostatic test pressure that is not less than 1.5 times the design pressure but not more than 100 psig (690 kPa). Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- B. Remove and replace malfunctioning radiant heating piping components that do not pass tests, and retest as specified above.

- C. Prepare a written report of testing.

END OF SECTION