

SECTION 23 83 01
SNOWMELT SYSTEM PIPING AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section includes radiant heating piping, including pipes, fittings, and piping specialties.
- B. Flexible pre-insulated cross-linked polyethylene pipe with cold-expansion compression-sleeve fittings, installation specialties, supervision and field engineering required for the complete and proper function of the system.
- C. Snow and Ice Melt (SIM) system piping, distribution manifold(s) with balancing and flow control valves where required, pipe-to-manifold compression nut fittings, manufacturer-approved cold-expansion and compression-sleeve pipe repair couplings, non-metallic pipe fasteners, controls, installation specialties, supervision and field engineering required for the complete and proper function of the system.

1.2 RELATED DOCUMENTS

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

1.3 QUALITY ASSURANCE

- A. Cross-linked polyethylene (PEXa) pipe shall be manufactured by the high-pressure peroxide (Engel) method with a minimum degree of cross-linking of 80%, and conform to ASTM F 876, F 877 and CSA B 137.5, or DIN 16892 and 16893. Fittings shall meet the requirements of ASTM F 2080 and CSA B 137.5. When required, pipe shall have a co-extruded oxygen diffusion barrier capable of limiting oxygen diffusion through the pipe to less than 0.10 mg/l/day at 104°F (40°C) water temperature, in accordance with DIN 4726.

1.4 DEFINITIONS

- A. PEXa: Cross-linked polyethylene.
- B. SIM: Snow and Ice Melt.

1.5 SUBMITTALS

- A. Product Data: For each type of radiant heating pipe, fitting, manifold, specialty, and control.
 - 1. For radiant heating piping and manifolds, include pressure and temperature rating, oxygen-barrier performance, fire-performance characteristics, and water flow and pressure drop

characteristics.

B. Shop Drawings: Show piping layout and details drawn to scale, including valves, manifolds, controls, and support assemblies, and their attachments to building structure.

1. Shop Drawing Scale: 1 inch = 20 feet.

C. Operation and Maintenance Data: Snowmelt tubing, carrier pipe, distribution manifolds, fittings, temperature sensors, snow and water sensors, snowmelt controller.

PART 2 - PRODUCTS

2.1 PRE-INSULATED, FLEXIBLE CARRIER PIPING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Uponor.
2. Augatherm

B. Piping Material: Cross-linked polyethylene (PEXa) carrier pipe shall conform to the requirements of one or more of the following: ASTM F 876, ASTM F 877, DIN 16892 and/or DIN 16893. PEXa carrier pipe shall have a minimum degree of cross-linking of 80% when tested in accordance with ASTM D 2765, Method B, and shall be capable of continuous operation at 200°F.

C. Oxygen Diffusion Barrier: A co-extruded barrier layer that limits oxygen diffusion through the PEX carrier pipe to less than 0.10 mg/l-day at 104°F temperature, as defined by DIN 4726, shall be applied to the PEX carrier pipe.

D. Insulation Material: Thermal insulation shall be made from closed-cell polyurethane foam. Minimum density to be 3.5 lb/ft³, measured in accordance with ASTM D 1622. Closed cell structure to be minimum 90%, in accordance with ASTM D 2856. Thermal insulation shall be bonded to carrier pipe.

E. Insulation Thermal Conductivity: Closed cell foam insulation shall have a maximum thermal conductivity of 0.02 BTU/hr-ft-°F, measured in accordance with ASTM C 177.

F. Insulation Permeability: Closed cell foam insulation shall have a minimum water diffusion resistance of 90 μ, and a maximum water absorption of 1.5% after 24 hours, in accordance to DIN 53428.

G. Outer Casing Material: Outer casing shall be made from seamless, extruded low density polyethylene (LDPE).

H. Outer Casing Profile: Outer casing shall have corrugated profile.

Outer casing shall be bonded to thermal insulation.

- I. Outer Casing Markings: The outer casing shall be marked with the following information, repeated no less than every 5 feet:
 - 1. Manufacturer name or trade name.
 - 2. Carrier pipe nominal size and Standard Dimensional Ratio (SDR).
 - 3. Minimum bend radius.
 - 4. Temperature and pressure ratings.
 - 5. Footage markings.
- J. Fittings: Mechanical fittings to be of compression nut or compression-sleeve style, manufactured of metal suitable for the fluid application, in a size suitable for the PEX carrier pipe dimensions.
- K. Compression-Sleeve Fittings: Mechanical compression-sleeve cold-expansion fittings to consist of a metal ribbed insert and a metal compression-sleeve. Fittings must meet the temperature and pressure performance requirements of the PEX carrier pipe.
- L. Piping Pressure/Temperature Rating: Minimum 100 psig and 210 deg F.

2.2 SNOWMELT PIPING

- A. Material: All snow and ice melt system pipe shall be high-density cross-linked polyethylene manufactured using the high-pressure peroxide method of cross-linking (PEXa). Pipe shall conform to ASTM F 876, F 877 and CSA B 137.5, and be certified by CSA or equivalent third-party testing organization.
- B. Temperature and Pressure Ratings: Pipe shall be rated for continuous operation of 100 psi gauge pressure at 180°F temperature (690 kPa @ 82°C), and 80 psi gauge pressure at 200°F temperature (550 kPa @ 93°C).
- C. Oxygen Diffusion Barrier: Piping shall have a co-extruded oxygen diffusion barrier capable of limiting oxygen diffusion through the pipe to less than 0.10 mg/l/day at 104°F (40°C) water temperature, in accordance with DIN 4726.
- D. Bend Radius: The minimum bend radius for cold bending of the pipe shall be not less than five (5) times the outside diameter. Bends with a radius less than this shall require the use of a bending template as supplied by the pipe manufacturer, and/or hot air.
- E. Flame and Smoke Spread: Pipe to have a Flame Spread Index of less than 25, and a Smoke Developed Index of less than 50, when tested in accordance with ASTM E 84 (US) or CAN/ULC S102.2 (Canada).
- F. Pipe to be manufactured in an ISO 9001 certified production facility.

2.3 SNOWMELT PIPING FITTINGS

- A. Compression nut manifold fittings shall be manufactured of corrosion-resistant brass with a barbed insert and a reusable split compression ring.
- B. Compression-sleeve fittings shall be manufactured of dezincification-resistant brass and shall be supplied by the piping manufacturer as part of a proven cataloged system.
- C. Fittings shall be third-party certified to applicable standards ASTM F 877, F 2080 and CSA B 137.5 as part of the manufacturer's PEX piping system, with independent listings from IAPMO and ICC, as applicable.
- D. Fittings embedded within the thermal mass shall be cold-expansion compression-sleeve fittings certified to ASTM F 2080. Compression-sleeve fittings to have minimum inside diameter of 82% of pipe inside diameter.

2.4 DISTRIBUTION MANIFOLDS

- A. Material: Distribution manifolds shall be manufactured of brass and be supplied by the piping manufacturer as a proven cataloged part of the manufacturer's system.
- B. Brass manifolds shall be produced from extruded brass round pipe with tapped holes for connections, be pre-assembled and 100% air tested by the manufacturer.
- C. Balancing Manifolds: Brass balancing manifolds shall be equipped with integral visual flow gauges that read to 2 USGPM for each circuit, circuit balancing and flow control valves, isolation valves with integral thermometer housings, and air vent/fill ports. Each circuit valve shall be supplied with a manual actuating handle for filling/purging operation.

2.5 SNOWMELT SYSTEM CONTROL HARDWARE

- A. Automatic SIM Detector and Melting Controls: SIM control shall use low-voltage devices to monitor outdoor ambient, slab, fluid supply and/or return temperatures, as well as an automatic snow and ice detector to detect moisture in the SIM zone. SIM control shall be capable of maintaining a set temperature in a SIM slab or thermal mass, with two adjustable settings for Idle and Melting mode. Connection to output devices shall be as per the recommended installation of the SIM control, as part of a proven cataloged system. Provide Tekmar model 664 snow detector and melting control system or equivalent.

- B. The control system shall be installed as part of a separate project.
All sensors installed for this project shall have open protocols to easily integrate with the system control.
- C. Snow and ice sensor shall be provided with a sensor socket for installation halfway between the snowmelt tubing in the concrete slab. Snow and ice sensor shall be replaceable without damage to the concrete slab. Provide Tekmar model 090 snow and ice sensor with model 091 sensor socket, or equivalent sensor and socket system.
- D. Provide a slab sensor to measure the temperature of the concrete slab. Sensor shall be installed per manufacturer's recommendation. Provide Tekmar or equivalent.

PART 1 - EXECUTION

1.1 EXAMINATION

- A. Examine surfaces and substrates to receive radiant heating piping for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Ensure that surfaces and pipes in contact with radiant heating 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.

1.2 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 snowmelt tubing in concrete slab to provide complete coverage of the slab as shown on the drawings.
- C. Install radiant heating piping continuous from the manifold through the heated panel and back to the manifold without piping joints in concrete slab.
- D. Connect radiant piping to manifold in a reverse-return arrangement.
- E. Do not bend pipes in radii smaller than manufacturer's minimum bend radius dimensions.
- F. Install manifolds in zone valve boxes as shown on the drawings.
- G. Refer to Division 23 Section "Hydronic Piping" for pipes and

connections to hydronic systems and for glycol-solution fill requirements.

H. Piping in Exterior Pavement:

1. Secure piping in concrete floors by attaching pipes to reinforcement using cable ties.
2. Space cable ties a maximum of 18 inches o.c., and at center of turns or bends.
3. Maintain 3-inch minimum cover.
4. Install a sleeve of 3/8-inch- thick, foam-type insulation or PE pipe around tubing and extending for a minimum of 10 inches on each side of slab joints to protect the tubing passing through expansion or control joints. Anchor sleeve to slab form at control joints to provide maximum clearance for saw cut.
5. Maintain minimum 40-psig pressure in piping during concrete placement and continue for 24 hours after placement.

I. Revise locations and elevations from those indicated as required to suit field conditions and ensure integrity of piping and as approved by Architect.

J. After system balancing has been completed, mark balancing valves to permanently indicate final position.

K. 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.

L. Install wiring for SIM sensor and slab temperature sensor in conduit in the concrete slab.

1.3 FIELD QUALITY CONTROL

A. Prepare radiant heating piping for testing as follows:

1. Open all isolation valves and close bypass valves.
2. Open and verify operation of zone control valves.
3. Flush with clean water, and clean strainers.

B. 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. Repair leaks and retest until no leaks exist.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning radiant heating piping components that do not pass tests, and retest as specified above.
- D. Prepare a written report of testing.

- - - E N D - - -