

Section 1: General
CODES, LISTINGS, STANDARDS

ASTM

Infloor BPEX is manufactured to ASTM F-876 and F-877 standards, and to SDR-9 dimensions.

NSF-pw

Infloor BPEX is tested and listed by the National Sanitation Foundation to Standards 14 and 61

UPC/UMC

Infloor BPEX carries both the UPC and UMC certification mark, as approved by the International Association of Plumbing and Mechanical Officials.

ES

Infloor BPEX is listed by the International Code Council Evaluation Service (ICC-ES) Report #ESR-1155.

NSF

All Infloor BPEX labeled with "cNSF-CAN/B.137.5" is certified to CSA Standard B137.5 by NSF.

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

Refer to Division-15 Basic Mechanical Materials & Methods sections apply to work of this section.

Refer to Division-3 Concrete for structural requirements of concrete slabs.

DESCRIPTION OF WORK

To the Extent of radiant floor heating and snowmelting work is indicated by drawings and schedules, and by requirements of this section.

Types of Infloor radiant floor heating applications for this project may include the following:

Concrete Slab: Three inches (3") or greater in thickness.

Concrete Cap: One and one-half inches (1-1/2") up to three inches (3") in thickness.

Thermafloer or Mudset: One and one-half inches (1-1/2") or greater thickness.

Infloorboard 1 or 2: Installed on top of a wood subfloor or on top of a concrete slab.

RadiantTrak: Installed with the use of heat transfer plates.

Types of snowmelting applications for this project include the following:

Slab Snowmelting: Four inches (4") or greater in thickness.

Brick Paver Snowmelt: Install in two inches (2") or greater sand or gravel below pavers.

Refer to other Division sections for boilers, water heaters, and water source heat pumps; other heat sources, pumps, piping, and other hydronic appurtenances not work of this section.

Refer to Division Section Automatic Temperature Controls for the following work: Interlock wiring between electrically-operated pumps, valves, and their respective field-installed indicating and control devices.

Refer to other Division sections for the following work: Power supply wiring from power source to power connection for heat sources and pumps. Include starters, disconnects, and required electrical devices; except where specified as furnished or factory installed by manufacturer.

QUALITY ASSURANCE

Manufacturer's Qualifications: Firms regularly engaged in the manufacturing and distribution of hydronic radiant floor heating and snowmelting products, of types and size required, whose products have been in satisfactory use in similar service for not less than five (5) years. Tubing shall have a minimum of a twenty-five (25) year, non-prorated warranty including tubing installed at temperatures above freezing and/or is exposed to sunlight for up to thirty (30) days. Tubing shall be Oxygen Barrier of a silane construction, high-grade cross-linked polyethylene tubing.

SUBMITTALS

Product Data: Submit manufacturer's specifications for radiant floor heating and snowmelting products showing dimensions, temperature capacities (both constant and intermittent), pressure ratings (both operating and burst), flow rates, material composition, and bend radius.

Shop Drawings: Submit shop drawings within thirty (30) days of bid date showing representative radiant floor tube spacing's and manifold locations on a per-zone basis, appropriate construction details, and field connection details. Include information on all parts of the system being provided by the manufacturer. Submit three (3) copies of each shop drawing.

Control Sequence: Submit control manufacturer's sequence of operation for the radiant floor heating and snowmelting portions of this project, if not previously described by the architect/engineer in Division Automatic Temperature Controls. Provide a written sequence describing operation and logic, along with a schematic wiring diagram.

Samples: Submit three (3) twelve-inch (12") samples of each type and size of radiant floor tubing being furnished.

Maintenance Data: Submit maintenance instructions, including repair of damaged components and a spare parts list. Include product data and drawings in accordance with requirements in Division.

DELIVERY, STORAGE AND HANDLING

Comply with manufacturer's instructions for unloading radiant floor heating and snowmelting materials and components, and moving them to their final locations.

Handle system components carefully to prevent damage, breaking or scoring. Do not install damaged system components; refer to manufacturer's guidelines. Project architect/engineer to determine whether to repair or replace. Store radiant floor tubing and components to protect from physical damage, weather related damage, and construction debris.

Tubing shall be capable of withstanding exposure to direct sunlight without degradation for a period of at least thirty (30) days prior to installation.

Tubing shall be capable of being installed directly on conventional base rock or sand fill material. The tubing can be pulled through holes drilled in construction framing and can be stapled directly to the top of the subfloor, or attached to the underside of the subfloor with the use of aluminum plates.

Tubing shall be capable of bending at minimum bend radius (see Section 3), at temperatures above 50°F, without detrimental effect. Additionally, the tubing can be kinked without detrimental effect and shall be capable being restored to its original condition after kinking with the use of applied heat gun or a physical repair.

PART 2: PRODUCTS

RADIANT FLOOR TUBING (Infloor BPEX)

Provide radiant tubing in lengths and locations as indicated, with capacities, sizes, spacing's, and depths as indicated by drawings, schedules, and/or Infloor LoopCad® computer printout. Radiant tubing shall be a single layer, cross-linked polyethylene extrusion with an outer layer composed of an EVOH oxygen barrier. Tubing dimensions and capacities shall be as shown on the Infloor BPEX submittal. Tubing shall conform to the Standard Thermoplastic Pipe Dimension Ration (SDR-9). Tubing shall contain a minimum cross-linking value of 65% and no greater than 89%, inclusive. The radiant tubing shall be warrantied to 180°F in hydronic heating applications without detrimental effect. Tubing shall conform to the following operational conditions:

Rated Temperature (F)	Hydrostatic Design (psi)	Operational Pressure (psi)
73.4	630	160
180	400	100
200	315	80

ID. Tubing Size	Burst Pressure Requirements		
	Temperature (F)		
3/8"	73.4	180	200
1/2"	620	275	235
1/2"	480	215	185
5/8" and Larger	475	210	180

Heat transfer fluids shall only be water or water/ propylene glycol mixtures. Use of corrosion-proofing chemicals are permitted and recommended. Use of other heat transfer fluids such as oil, alcohol, or automotive glycol, are not permitted.

MANIFOLDS

Copper Manifolds: Materials shall be of type L copper trunks and copper base branches, with (sweat) branches. Connections shall be soldered with a lead-free, high-strength solder. Standard diameter is one inch (1") with other diameters available or as specified up to two inches (2"). Manifolds shall be fitted with ball valves (mini or standard size) with crimp fitting or without ball valve with crimp fitting as specified by drawings and/or schedules. Manifolds are optionally fitted with vent/purge assemblies for bleeding air, and pressure test kits are available. Infloor BPEX shall be attached to the manifold branches by one of the following methods: Crimp Ring, Oterick Cinch Clamp, or compression. Each to be applied in accordance to manufacturer's specifications.

Brass Manifolds: Standard diameter is one inch (1") or one and one quarter inch (1-1/4"). Manifolds shall be fitted with ball valves on supply and return manifolds with micrometric balancing valves per loop on the supply manifold and isolation valves per loop on the return manifold. Manifolds come completely assembled with air vents and purge valves on the end pieces and are mounted to manifold mounting brackets. Return manifold has ability to accept thermal actuators per loop as well as optional flow meter per loop. Pressure test kits are available for both 1" and 1-1/4" manifolds. Infloor BPEX shall be attached to the manifold branches by the following method: using the self-adjusting fitting for simple and multi-layer plastic pipes is a mechanical device that allows the pipes, the radiant panel system circuit and the manifolds to be connected easily and securely. This versatile fitting has been designed to adapter to the varying pipe diameters of these type systems. Each to be applied in accordance to manufacturer's specifications. Materials shall be of brass Supply Manifold body: made of Brass EN 1982 CB753S with micrometric balancing valves consisting of Body: PA, control device upper part:: brass EN 12164 CW614N, obturator: POM, obturator seal: EDPM, knob: ABS Return Manifold body: made of Brass EN 1982 CB753S with Shut-off valve consisting of, control device upper part:: brass EN 12164 CW614N, obturator stem: stainless steel, obturator: EDPM, springs: stainless steel, seals: EDPM, knob: ABS Ball Valves, Body: made of Brass EN 121165 CW641N, Ball: Brass EN 121165 CW641N chrome plated, Handle (red for supply blue for return): Aluminum EN AB 46100, End fittings: Brass EN 12165 SW641N, Automatic Air Vents obturator stem: Brass EN 12165 SW641N, springs: stainless steel, seals: EDPM, float PP.

ACCESSORIES (Contractor to provide the following):

Repair Kit: One (1) for each size of radiant floor tubing used in the project.
Plastic Tie: One (1) every twelve (12") to eighteen inches (18") of tubing and place 5 ties at each turn, two at the beginning and end and one in the middle.
Wire Tie: One (1) every twelve (12") to eighteen inches (18") of tubing and place 5 ties at each turn, two at the beginning and end and one in the middle.
Plastic Staples: One (1) every twelve (12") to eighteen inches (18") of tubing and place 5 ties at each turn, two at the beginning and end and one in the middle
Screw Clips: One (1) every twelve (12") to eighteen inches (18") of tubing and place 3 clips at each turn, one at the beginning and end and one in the middle.
Plate: One (1) every forty eight inches (48") to sixty inches (60") of tubing for RadiantTrak applications.
Staple: One (1) every twelve (12") to eighteen inches (18") of tubing and place 5 staples at each turn, two at the beginning and end and one in the middle.
Octa Rail: One (1) every ten (10') square feet of tubing for framed floor or on top of concrete applications
Universal Copper Manifold Bracket: One (1) pair per manifold set.
Staple Gun: Minimum of one (1) per project where staples are needed. Contractor to determine if more are needed. Size of staple gun is determined by the diameter of tubing.
Tubing Uncoiler: Minimum of one (1) per project. Contractor to determine if more are needed.
Pressure Test Kit: Minimum of one (1) per manifold location. Contractor to determine if more are necessary.
Primary/Secondary Pumps: Contractor to determine quantities needed based on system design.

Tempering Valve: Sizes, quantities, and temperature ranges shown by drawings and/or specifications.

Variable Speed Injection Pump Control (VIP): Quantity as shown in drawings / specifications.

Micro-bubble Air Remover: Size/quantities shown in drawings or specifications.

RECOMMENDED APPLICATIONS

Concrete Slab: Secure tubing to wire mesh or rebar by mechanical attachments every twelve (12") to eighteen inches (18") of tubing and place 5 ties at each turn, two at the beginning and end and one in the middle with a minimum of two inches (2") of concrete coverage above the top of the tubing. More coverage may be required depending on load requirements

Concrete Cap: Secure tubing to existing concrete or insulation by mechanical attachments every twelve (12") to eighteen inches (18") of tubing and place 5 ties at each turn, two at the beginning and end and one in the middle with a minimum of three-fourths of an inch (3/4") concrete coverage above the top of the tubing for interior light duty applications, and a minimum of two inches (2") of concrete coverage above the top of the tubing for exterior applications. More coverage may be required depending on load requirements.

Thermafloor or Mudset: Staple or secure tubing by mechanical attachments every twelve (12") to eighteen inches (18"), of tubing and place 5 staples at each turn, two at the beginning and end and one in the middle, to a wooden subfloor with a minimum of three-fourths of an inch (3/4") coverage above the top of the tubing.

Infloorboard 1 and 2: Secure Infloorboard 1 application to a wood subfloor following gluing and screwing pattern listed in Infloorboard 1 manual. Tubing will be snapped into the Infloorboard 1. On top of concrete applications Infloorboard 2 product must be used and will be attached to a cured concrete slab application using construction adhesive or be installed as a floating floor refer to Infloorboard 2 manual. Tubing will be snapped into the Infloorboard 2. Tubing size is three eights inch (3/8") and spacing for either product is eight inch (8") on center

RadiantTrak: Secure RadiantTrak to the underside of subfloor using screws in the provided holes in the RadiantTrak Areas must be clean of any nails or staple protruding from subfloor. RadiantTrak plates are 4" wide by 4' long pre-drilled for acceptance of screws. Screw the emission plates to subfloor using screws that will not penetrate the other side of subfloor. Plates should be placed 8" on center the entire length of the joist bay leaving approximately 12" at each end of the bay. Plates can be placed with one half inch (1/2") to one inch (1") gap between emission plates. RadiantTrak is a side groove plate, grooves for tubing should be facing each other for ease of installation.

Slab Snowmelt: Secure tubing to wire mesh or rebar by mechanical attachments every twelve (12") to eighteen inches (18") of tubing and place 5 ties at each turn, two at the beginning and end and one in the middle with a minimum of three inches (3") of concrete coverage above the top of the tubing. More coverage may be required depending on load requirements.

Brick Paver Snowmelt: Secure tubing to wire mesh or rebar by mechanical attachments every twelve (12") to eighteen inches (18") of tubing and place 5 ties at each turn, two at the beginning and end and one in the middle with a minimum of one inch (1") of concrete or sand coverage above the top of the tubing. More coverage may be required depending on load requirements.

PART 3: EXECUTION

INSPECTION

Examine areas and conditions in which the radiant floor tubing is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the installer, the architect/engineer, and/or the owner.

INSTALLATION OF RADIANT FLOOR TUBING

General: Install tubing as indicated by architect/engineer on drawings, schedules, and specifications, in accordance with the manufacturer's installation instructions. Locate tubing in the floors, walls, or ceilings as indicated; cover areas continuously wall to wall at specified tubing spacing unless otherwise indicated. Provide insulation as indicated by architect/engineer drawings, or in

accordance with the manufacturer's instructions or local code. Provide pressure testing of a minimum of 60 psi or to local code for a minimum of twenty-four (24) hours prior to, and during the pour for concrete, paver, Therafloor, and mud bed applications; and for twenty-four (24) hours after all other applications. Install access panels centered in front of each manifold set.

Minimum Bend Radius for Radiant Tubing

3/8" I.D. = Four inch (4") radius	3/4" I.D. = Seven inch (7") radius
1/2" I.D. = Five inch (5") radius	1" I.D. = Ten inch (10") radius
5/8" I.D. = Six inch (6") radius	

ADJUSTING AND CLEANING

General: After construction is completed (including painting), clean exposed surfaces and components inside cabinets and in mechanical rooms, where accessible according to manufacturer's instructions. Repair any damaged materials prior to system start-up.

System Start-Up and Balancing: Provide system start-up, air purging and balancing to ensure proper operation. Check pumps for flows, valves for proper setting and operation, and water temperature and pressure levels in accordance with design specification and manufacturer's recommendations. System will operate properly for two (2) days before the owner and/or the architect/engineer shall be required to certify system compliance.