MrPEX® SYSTEMS

Installation Guide

HEATING

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Heating Installation Guide
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MrPEX® Systems has used reasonable efforts in collecting, preparing, and providing quality information and material in this guide. However, system enhancements may result in modification of features of specifications without notice.

MrPEX® Systems is not liable for installation practices that deviate from this guide or are not acceptable practices within the mechanical trades.

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INTRODUCTION TO MrPEX®

ABOUT MrPEX® SYSTEMS

MrPEX® Systems is one of the leading North American system suppliers of residential and commercial radiant heating/cooling, snowmelt systems, and PEX-a domestic hot and cold water systems. With a very knowledgable and experienced team, our company is on the fast track for growth in the USA and Canadian market. We are the exclusive providers of a unique PEX-a pipe from LK PEX AB in Sweden. As our core product, the MrPEX® PEXa Tubing, is considerably more flexible, kink-resistant and able to hold more pressure than any other Pex Tubing on the market today, plus comes with an extensive 30 year warranty!

Combined with our highly technical knowledge and dedication to customer service, it's no wonder MrPEX® Systems is one of the fastest growing radiant system suppliers in North America.

WHY MrPEX®?

MrPEX® Systems provides all components you need for a superior system, whether radiant heating/cooling, using our potable water system or snowmelt system. This includes tubing, fittings, manifolds, controls and accessories that are matched for high performance and reliability over many years of service. When used together, these components provide trouble free installation and long-term reliability. The MrPEX® tubing and fittings meet current national standards of performance and dimensional tolerances. The system package and product offering is growing continually with an emphasis on taking advantage of sustainable energy sources whenever possible. Additionally, we also offer IDC, the state-of-the-art PC based intelligent control systems that delivers optimized comfort and maximized efficiency by coordinating HVAC, Indoor Air Quality, and Hydronic Systems in one control. IDC is also capable of energy monitoring and remote access from anywhere in the world.

WHO IS MrPEX®?

MrPEX®—Tomas Lenman—started at Wirsbo Bruks AB in Sweden as a development engineer in 1971, developing the very first PEX process ever invented. He developed many Standard Specifications for PEX Tubing in Europe and Australia. MrPEX® wrote the ASTM F 876/877 for PEX Tubing during 1982–84. In 1982 he co-authored the book "Water and Pipes". He founded and managed Wirsbo Company (USA) 1984 -1992 and continued consulting for this group until 1996. He authored the CSA B137.5 standard for PEX Tubing in 1989. MrPEX® managed the successful start-up of Roth Industries PEX Tubing Division 1997–2001 after which he started his own radiant floor heating company: MrPEX® Systems using PEX Tubing with exclusive distribution in North America for LK PEX AB in Sweden. The unique production process is invented by Mr. Lennart Aagren of Sweden, previously manager of Uponor Innovation AB for many years, and his second innovation of a PEX Tubing manufacturing process.

No one has more knowledge and experience with PEX Tubing and Radiant Floor Heating Systems than MrPEX®.

ABOUT THIS GUIDE

The purpose of this guide is to assist the radiant panel heating professional by providing specific information regarding the MrPEX® Radiant Panel System. This installation guide is written with the understanding that an accurate heat-loss, design and creating material list has already been performed. Use MrPEX® LoopCAD Design Software to perform an accurate heat-loss, design and required materials. This guide will help you plan and perform a successful installation of the MrPEX® Systems components. This guide is derived from MrPEX® Systems information and a combination of sections from an industry consensus document** compiled and distributed by the Radiant Panel Association.

This guide constitutes the Manufacturer's Recommendations for the design and installation of a MrPEX® Systems radiant floor, ceiling or wall heating, or snowmelt system. For the purpose of clarity in communicating concepts, this guide is conceptual in nature, and may, therefore, omit certain components that are not necessary in communicating the concept at issue, but may be necessary or essential in the actual installation. The designer must rely on his knowledge of radiant panel systems, regional climate conditions, and the local administrative requirements to determine the suitability of any particular material or method described herein.

It is expected the installer has an adequate knowledge of accepted industry practices for the equipment and applications involved.

***(Standard Guidelines for Design and Installation of Radiant Panel Heating and Snow/Ice Melt Systems, 2007 edition)*

AN INTRODUCTION TO RADIANT PANEL HEATING, AND SNOWMELTING:

Radiant Panel is a form of space heating using warm floors, ceilings, or walls to distribute the heat energy throughout a structure. Hydronic radiant panels use warm water circulated through tubing systems that are embedded in the floors, ceilings or walls. These types of systems provide superior comfort and efficiency when compared to other forms of heat distribution because they rely on radiation as the primary heat transfer process. The mild temperature surfaces emit invisible rays of energy that are absorbed by cooler objects in the rooms. As all of the surfaces reach room temperature, they begin to re-radiate any additional energy they receive. The combination of radiation, re-radiation and mild convection provide comfort to every reach of the entire structure. In the case of snowmelting, instead of tubing being embedded indoors, the tubing is embedded in a driveway, sidewalk, emergency entrance etc. The tubing then will keep the surface above freezing eliminating potential ice or snow from accumulating, keeping the surface dry and safe.

ADVANTAGES OF RADIANT PANEL HEATING:

The primary advantages of radiant panel heating are comfort, safety and efficiency. With radiant panel heating, the heat energy follows the path of the tubing embedded in the structure.

The designer is able to route the tubing precisely to the regions of the structure that require heat and, through various layout patterns, able to distribute the heat in a manner that directly addresses the particular heat loss features of the rooms. Each room behaves differently with regard to heat loss. Rooms with large windows may enjoy some solar gain during a sunny day, but present abnormally high heat losses when the sun goes down. Kitchens and baths enjoy significant internal gains during cooking and bathing but not when those activities are suspended. Rooms with high occupancy levels enjoy large internal heat gains from warm bodies. A major advantage of radiant panel heating systems is the ability to control each loop individually, thus placing the energy where it is needed and when it is needed. This is the essence of comfort and efficiency that must be designed into the radiant panel heating system in order to enjoy the fullest measure of its capability. Use MrPEX® LoopCAD Design Software to perform an accurate heat-loss, design and required materials.

Oxygen Diffusion

MrPEX® tubing with barrier is available with an external Oxygen Diffusion Barrier which meets the stringent requirements of the European DIN 4726 standard. This standard restricts the amount of oxygen that is allowed to permeate the pipe and affect corrodible cast iron or steel components within the system. The standard allows permeation of less than or equal to 0.10 g/ (m3 d) equivalent to 0.32 mg/ (m2 d). This is an amount that is consistent with approximately half a system refill with fresh water on an annual basis. The Oxygen Diffusion of MrPEX® Tubing with Barrier is exceeding the minimum requirement of DIN 4726/29 by more than 25 times according to our test report from a German Governmental Testing Institute.

MrPEX® PEX-al-PEX tubing has an aluminum core that is 100% gas/oxygen tight. This gives it the advantages of both metal and plastic pipe, but not the disadvantages.

MrPEX® BARRIER PEX TUBING INFO

- Expansion: The tubing has an expansion coefficient of 1.1" per 10°F per 100 feet.
- Bending: The tubing can be exposed to a bending radius approximately 4 times the actual outside diameter without kinking.
- Uncoiling: The tubing coil has an inside diameter exceeding 15 inches, so that memory-effect of its coiling is minimal. Un-roll the tubing from its coil without twisting the tubing, this will make the installation easier. Use a MrPEX® tube uncoiler to aid the installation.

- Markings and Ratings: The tubing is marked with MrPEX®, size, SDR, pressure rating 100 psi at 180°F, ASTM standard reference, independent third party certifiers mark, production date, and running ft. length—every three feet. The running ft. markings start from 0 at the inside of each coil so that the installer will always know how much tubing is left in each coil.

- Cutting: The tubing needs to be cut using an appropriate tubing cutter, leaving a square clean cut, free from burrs.

MrPEX® PEX-AL-PEX TUBING INFO

- Expansion: The tubing has an expansion coefficient almost 9 times less than regular PEX. Noise and movement after installation is virtually eliminated.

- Bending: The tubing will stay in place after bending due to its aluminum core. This allows for a clean and professional looking installation. The tubing can be exposed to a bending radius approximately 5 times the actual outside diameter without kinking.

- Uncoiling: Un-roll the tubing from its coil without twisting the tubing, this will make the installation easier. Use a MrPEX® tube uncoiler to aid the installation.

- Markings and Ratings: The tubing is marked with MrPEX®, size, pressure rating 160 psi at 200°F, ASTM standard reference, independent third party certifiers mark, production date, and running ft. length—every five feet. The running ft. markings start from 0 at the inside of each coil so that the installer will always know how much tubing is left in each coil.

- Cutting: The tubing needs to be cut using an appropriate tubing cutter, leaving a square clean cut, free from burrs. Use a reamer tool to chamfer and round the tubing prior to completing a fitting.

BEFORE YOU BEGIN

READ THIS PRIOR TO STARTING THE INSTALLATION

For the purpose of clarity in communicating concepts, this guide is conceptual in nature, and may, therefore, omit certain components that are not necessary in communicating the concept at issue, but may be necessary or essential in the actual installation. The designer must rely on his or her knowledge of radiant panel heating, regional climate conditions, and the local administrative requirements to determine the suitability of any particular material or method described herein.

STORAGE AND HANDLING

MrPEX® tubing is delivered in cardboard boxes. Check boxes at delivery for any possible freight damage and report immediately. Store tubing indoors in original boxes, safe from, moisture, tampering and UV exposure.

ULTRA VIOLET LIGHT

All hydrocarbon based plastic and rubber materials will eventually degrade if exposed to the harmful rays of Ultra Violet (UV) light. UV rays are present in direct sunlight or from fluorescent light at close proximity. It is important to protect the tubing from UV damage. Do not install tubing which has been exposed to direct sunlight for more than 30 days.

THE DESIGN PROCESS

Radiant panel heating systems are integrated within the structure. They are embedded in floors, ceilings and walls in a manner that cannot effectively be changed at a later date. Therefore, it is extremely important, during the design process, to perform a thorough assessment of the building. Particular attention must be paid to the structural heat loss, potential use patterns, and thermodynamics of radiant panel performance in order to determine the suitability of the design. Radiant panel heating systems have very definite limits in terms of their maximum output capability, and their ability to meet a specific heating load. The designer must never allow the heating load to exceed these capabilities.

REVIEW YOUR DESIGN

Radiant floor heating systems rely on the tubing embedded in the structure to deliver adequate heat and to meet expected comfort needs of the customer. Therefore, it is essential that all design aspects, use patterns and customer expectations are taken in account and matched with the design prior to any tubing being installed. Once the tubing is installed, it can be costly if not impossible to change the layout or remove it.

Please review this installation guide and compare with the design of your project. Once review is finalized and approved, you can proceed to "Starting the Installation" in this guide.

VERIFY ORDER QUANTITIES

Once on the job site, make sure that you have all required and correct parts to complete the current installation phase.

TOOLS FOR THE JOB

The success and ease of your installation can be greatly contributed to having the correct tools available for your install. Below is a list of some of the most common tools needed.

- ☑ **Tube uncoiler** MrPEX® Part #8110720
- ☑ **Tube cutter** *(for plastic tubing)* MrPEX® Part #8120878 or 8120879
- ☑ **Tube reamer** *(for PEX-AL-PEX)* MrPEX® Part #8210872, 8210873, and 8220875
- ☑ **Tube fastening tools and clips/staples**
- ☑ **Wrenches or Press tools** *(with correct inserts to meet your fitting selection)*
- ☑ **Air compressor for pressure testing and Air Pressure Test Kit**
- ☑ **General tools such as cordless drill, screwdrivers, wire cutters etc..**

SITE SURVEY

Before unloading all your parts and equipment, complete a full "site survey." Walk-through all of the areas where you are to install the system.

CONSIDERATIONS BEFORE STARTING THE INSTALLATION

Mechanical Room

Locate the area where the mechanical equipment is to be located. Make sure that it is large enough and that all required utilities are present such as a drain, gas, electricity etc.. If not, discuss with general contractor/builder to have a licensed contractor complete the installation. Verify distance and path for routing the supply and return mains to remote manifolds and compare to design. Any discrepancies need to be addressed prior to installation.

Slab On Or Below Grade

Make sure the grade is evenly prepared to the correct depth, that vapor barrier is installed (if applicable), and take spot check measurements. This is to make sure that all the walls are still in the correct location. If insulation is to be installed by you, make sure the grade depth accommodates the thickness of the insulation. Review "Special Insulation Consideration" quick reference chart on page 10, to make sure adequate R-value is used. Also, follow local building codes or check with structural engineer for correct compressive strength (PSI) for your application.

Suspended Floors

Poured Underlayment

Make sure the subfloor is prepared as per underlayment contractor and to correct elevation and take spot check measurements. This is to make sure that all the walls are still in the correct location.

Duo-Track, Omega heat emission plates and Joist Heating

Make sure joist cavities are clear and free from obstruction and take spot check measurements. This is to verify the correct number of joist cavities and locations. If there are sharp objects such as nails coming through from above, remove prior to starting the installation. It is also a good idea to mark subfloor above with a caution such as "CAUTION! Radiant tubing Beneath this floor." Every MrPEX® PEXa tubing box includes a template for this.

RetroPanel

Make sure concrete floor is level and clean. Knock down or grind off any bumps or high spots that may interfere with the panels. If the floor is very uneven, skim-coat the floor with an approved self leveling product such as concrete or gypsum based underlayment. Consult with flooring specialist prior to application. Follow manufacturers recommendation.

INSTALLING INSULATION

Insulation is a very important part of a well performing and efficient system. It is essential that you choose the correct type for your application. Heat transferred from the tubing will go the path of least resistance. Insulation is used to block heat transfer to areas where we don't want it to go, and to direct it to the areas where it is needed. The R-value and type of insulation depends on the application.

Heat transfer is a balancing act between warm and cool objects and their ability to transfer their stored heat/energy. Higher density objects such as concrete has a higher conductivity or ability to transfer heat than wood, which, due to its lower density does not transfer heat well and even works as an insulator. Nature seeks equilibrium, meaning, that if you have two masses next to each other, one at 50°F and the other at 80°F, if no other influences are present, given time, the cooler object would absorb heat from the warmer object and the warmer object would give up some of its heat until both objects reach the same temperature. What that temperature will be is dependent on which mass is greater. The speed at which the heat transfer will take place is subject to the objects ability to transfer its heat and what the temperature difference between the two objects actually is. The greater the differential temperature, the greater the heat transfer. But as the temperature differential gets smaller, so does the heat transfer.

Knowing this dynamic is essential when designing a radiant floor heating or snowmelt systems. Heat transfer will take the path of least resistance if given the opportunity. To make sure that the heat is not lost or directed in the wrong direction, we install insulation to eliminate the effects of colder masses that may interfere with our system. Floor covering will then also play an important role in that, the R-value of the floor covering will work against the insulation below, and it is important to make sure that the path of least resistance is up by having a greater R-value below. As you can imagine, a slab poured right on grade will have the mass of the earth beneath it to contend with. If there is no insulation underneath the slab and there is a floor covering on top of the slab, the path of least resistance is actually down! Of course there are different types of soils, some lower in conductivity than others. Dry soil such as sand is less of a detriment than let's say clay that has a tendency to retain water that increases its conductivity.

▶ Install suitable insulation as per chart below.

SPECIAL INSULATION CONSIDERATIONS:

QUICK REFERENCE			
APPLICATION		**MIN. R-VALUE**	**COVERAGE**
SLAB ON GRADE	Alternate #1	*(Ti-To) 0.125	Perimeter To Below Frost Line
	Alternate #2	R-10	4' Horizontal Or Vertical At Perimeter
	Alternate #3	R-10	Under Entire Slab Edge
SLAB BELOW GRADE		**R-10	
SUSPENDED FLOOR			
Over Heated Space	Hard Surface	R-5	Under Entire Floor
	Carpeted Surface	R-11	Under Entire Floor
Over Unheated Space	Hard Surface	R-13	Under Entire Floor
	Carpeted Surface	R-19	Under Entire Floor
WALLS WITH PANELS	Outside Wall	R-13	Entire Wall
	Inside Wall	Optional	
CEILINGS PANELS	Inside Ceiling	R-11	Entire Ceiling Above Panel
	Outside Ceiling	R-30	Entire Ceiling Above Panel

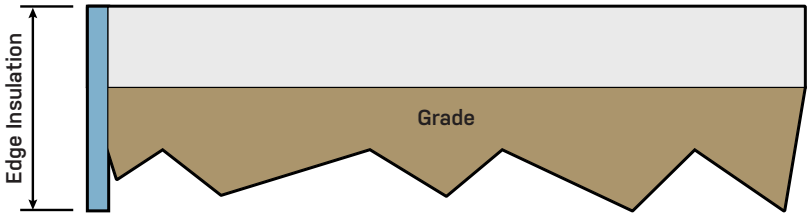
*R-value = Inside Temperature - Outdoor Temperature x 0.125 (temperatures in °F)
*(72°inside temp.- 10°outside temp.) 62 x 0.125= 7.75 of R-value needed
** For slab above frost line, slab edge

Disclaimer: It is the responsibility of the installer to verify the required structural integrity, compressive strength, and r value with project engineers and local building authorities prior to installation.

There are three areas to consider for insulation; Edge, Perimeter, and Under Slab. Depending on the specifics of the project such as use and construction method used, it may be important to use all three. Here's a brief description of these areas:

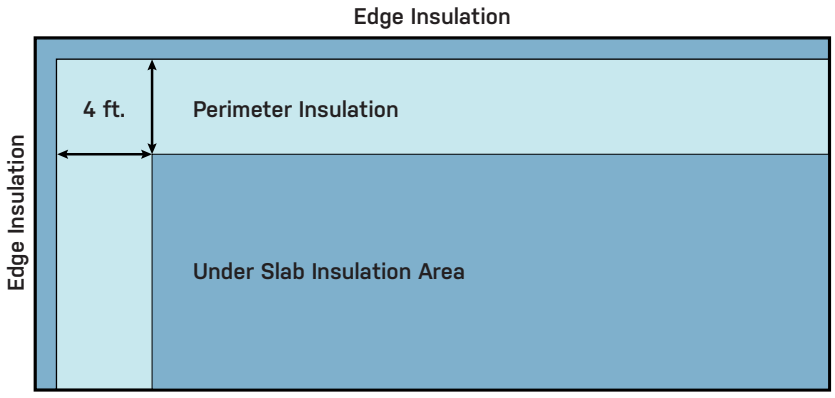
EDGE INSULATION

Edge insulation refers to the vertical area of the slab and is there to eliminate side losses or to break conductivity between a block wall, foundation wall or footing. If only edge insulation is used, it is recommended to go vertically down past the frost-line as determined by local building code. Make sure the soil beneath the slab is dry and water table is not present. For thickness, refer to chart on previous page.



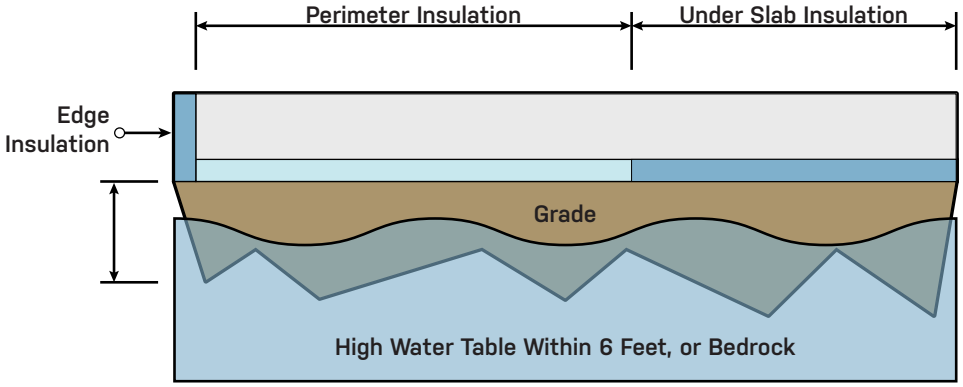
PERIMETER INSULATION

Perimeter insulation is placed 4 feet in from the edge horizontally around the perimeter of the heated area to eliminate downward migration of heat to cooler soil directly adjacent to the heated slab. If only edge and perimeter insulation is used, make sure the soil beneath the un-insulated portion of the slab is dry and water table is not present. For thickness, refer to chart on previous page.



UNDER SLAB

Under slab insulation is placed horizontally underneath the whole heated area. Installations that should consider Under Slab Insulation includes but not limited to; the need for fast response, high water table or highly conductive soil, bedrock, or thick floor covering. In areas where the soil underneath is dry and sandy, the under slab area can be left un-insulated to help build a heat sink that will maintain even temperatures. Do keep in mind that creating a heat sink requires a lot of energy in the start up phase to saturate the slab. For thickness, refer to chart on previous page.



CHOOSING YOUR MANIFOLD & LOCATION

THOUGHTS ON ZONING

The function of a manifold is to distribute the correct flow to each loop to meet its specific heating load. This is achieved by balancing each loop to meet the design flow requirement. Customized zoning can be achieved by adding actuators for the different loops controlled by thermostats. Each room would then be a zone, allowing the thermostat to open and close the valve to the room as required. For simpler one zone systems, it is possible to just control a zone valve or the pump. Zoning rooms with different loads or that are seldom occupied, allow you to keep those areas at a lower setting, saving energy without sacrificing comfort elsewhere. Heavily used spaces, such as bathrooms and kitchens, can be kept warmer than the rest of the house for the "barefoot comfort" homeowners often expect from a radiant system.

MANIFOLD LOCATIONS

The number of manifolds and their location will depend on the size of the structure. Most manifolds are installed in the mechanical room. Sometimes, the distance from the mechanical room to the farthest room served will exceed the allowed maximum loop length. In those cases, a manifold will have to be located closer to the served room/zone. It is good practice when designing a system to identify potential trouble spots early and to find manifold locations that meet the system needs. Look for clusters of rooms with similar, exposure, use-patterns, floor construction etc. that may have a common location to feed the loops from, such as a closet or similar. Find planned locations for the manifold(s). Take spot check measurements to verify that the location and distance to all rooms served by the manifold are as planned.

MANIFOLD CONSIDERATION

MrPEX® offers 1 ¼" and 1 ½" stainless steel manifolds, as well as composite and 1 ½" brass manifolds. The selection between stainless steel, composite and brass is strictly matter of preference. The selection of the size is has more to do with the design requirements, but as a rule of thumb the 1 ¼" manifolds are used for residential applications, and the 1 ½" manifolds are mostly used for commercial or larger projects due to the typically higher flow requirements.

Following pages will give you more detailed information about each of the manifolds we offer.

MANIFOLDS

MrPEX® 1 ¼" Stainless Steel Manifold is made from high quality stainless steel, and is offered in 2 through 12 loop configurations. The manifold comes mounted on brackets and it is equipped with full port ball valves provided with thermometers, manual air vents and fill/drain valves. The branch Cv value is 1.39.

The SUPPLY (upper) manifold is fitted with balancing flowmeters with readable range of 0 to 2 GPM that allow flow adjustment of each individual loop. The flow meters have a brass body and the sight glass is made from temperature and impact resistant plastic material, all components are antifreeze resistant up to a 50% mix.

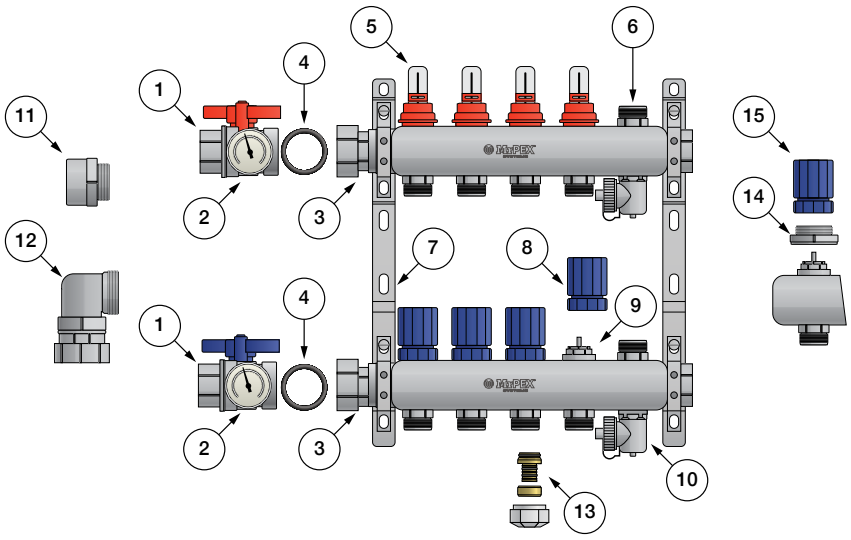
The RETURN (lower) manifold, has manual on/off valves that controls the flow for each individual circuit. The manual knob can be removed to accommodate the MrPEX® actuators VA 10 Adpater (part# 5120700 & 5120701).

Supply and return mains can be connected from either left or right sides. The manifold comes ready for a left-hand connection. Connection from the right can be done by removing the manifold body from the brackets and flipping them over.

* Shipped as shown

MrPEX® 1 1/4" Stainless Steel Manifold Assembly w/Flowmeter and Ball Valve

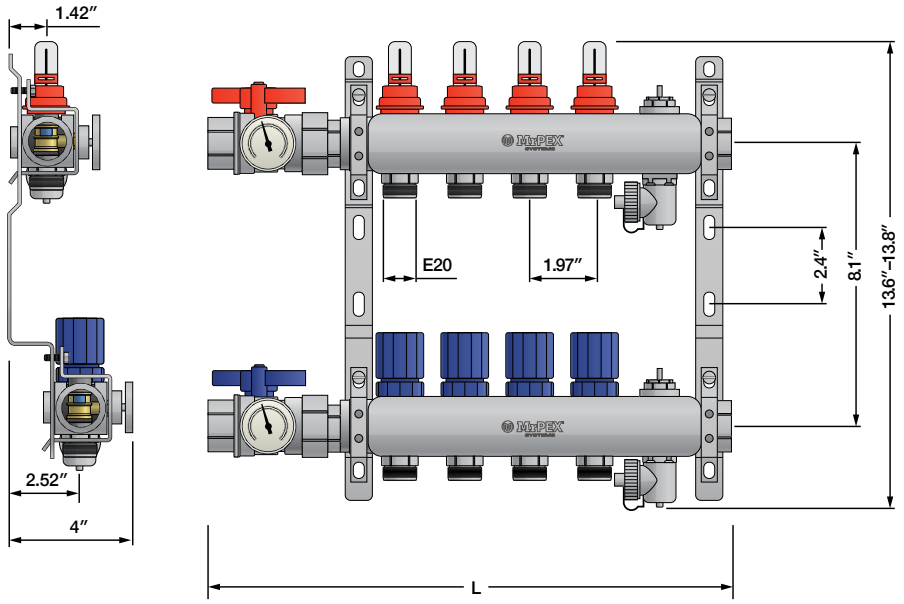
PART#	TYPE	UNIT
3250200	2 Branches	Each
3250300	3 Branches	Each
3250400	4 Branches	Each
3250500	5 Branches	Each
3250600	6 Branches	Each
3250700	7 Branches	Each
3250800	8 Branches	Each
3250900	9 Branches	Each
3251000	10 Branches	Each
3251100	11 Branches	Each
3251200	12 Branches	Each



Manifold Options

#	PART#	DESCRIPTION	TYPE
1	3250018	Manifold Ball Valves, supply & return, straight, w/ thermometer, spare part	1" NPT X G 1-1/4" Flat Gasket
2	3250001	Thermometer, spare part	32 °F to 175 °F
3	3250002	1" BSP Manifold Connection X G 1-1/4" Union Flat Gasket, spare part	
4	3761175	Flat Gasket 1-1/4", spare part	Rubber EPDM 60 SH
5	3741172	Flowmeter for manifold series 325XXX and 332XXX, spare part	0 to 2 GPM
6	3740011	Manual Air Vent, spare part	
7	3741171	1-1/4" Manifold Bracket for manifold series 325XXXX, spare part	
8	3741173	Plastic Valve Cap, spare part	Threaded M30x1.5 - Blue
9	3741174	On/Off Valve for manifold series, 325XXX and 332XXX, spare part	Threaded M30x1.5
10	3740002	Fill/Drain Valve for manifold series 325XXXX and 332XXXX, spare part	3/4" GHT
11	3230010	G 1-1/4" Flat Gasket X 1" Female NPT Straight Fitting Kit	
12	3250007	G 1 1/4 Flat Gasket X G 1 1/4 Flat Gasket Union Elbow Kit	
13	4310***	Compression pre-assembled fitting for "MrPEX PE-Xa Tubing"	For sizes 3/8" - 1/2" - 5/8"
13	435****	PEX Expansion fitting Assembly, F1960	For sizes 1/2" - 5/8" - 3/4"
14	5700010	Plastic Adapter for electrothermal actuator 5120701	Threaded M30x1.5 - Type VA10
15	5120700	MrPEX electrothermal actuator 24V AC 4-wire w/ End Switch	Quick connection
15	5120701	MrPEX electrothermal actuator 24V AC 2-wire	Quick connection

** = Requires EK Compression fitting, see compression fitting section in MrPEX® Price List*
*** = see compression fitting section in MrPEX® Price List*



Manifold Options

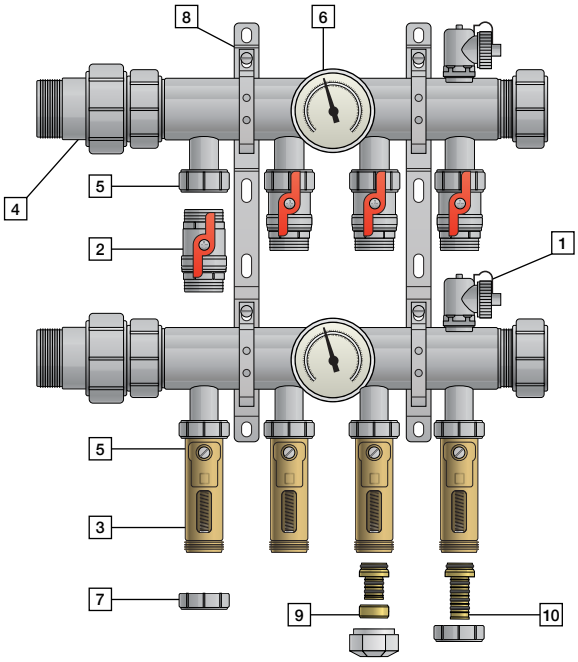
PART#	TYPE	LENGTH L (INCH)
3250200	2 Branches	10.6"
3250300	3 Branches	12.6"
3250400	4 Branches	14.6"
3250500	5 Branches	16.5"
3250600	6 Branches	18.5"
3250700	7 Branches	20.4"
3250800	8 Branches	22.4"
3250900	9 Branches	24.4"
3251000	10 Branches	26.3"
3251100	11 Branches	28.3"
3251200	12 Branches	30.3"

1 1/2" LARGE STAINLESS STEEL MANIFOLDS FOR 5/8" AND 3/4" PEX AND PEX-AL-PEX TUBING

MrPEX® 1 1/2" Stainless Steel Manifolds are made from high-quality Type 304 stainless steel and comes fully assembled in 3–13 loop configurations. The manifold body supply and return inlet comes with 1 1/2" NPT flat gasket union to aid in installation. End cap, vent, drain/purge valve come factory mounted on the body. The branches come with G 1" x EK 25 flat gasket on/off valves on the supply, and G 1" x EK 25 flat gasket inline visual flowmeter with built-in balancing valves on the return. Use any of the MrPEX® EK 25 fitting assemblies (PEX to EK 25 or PEX-AL-PEX to EK 25) to connect tubing to the manifold.

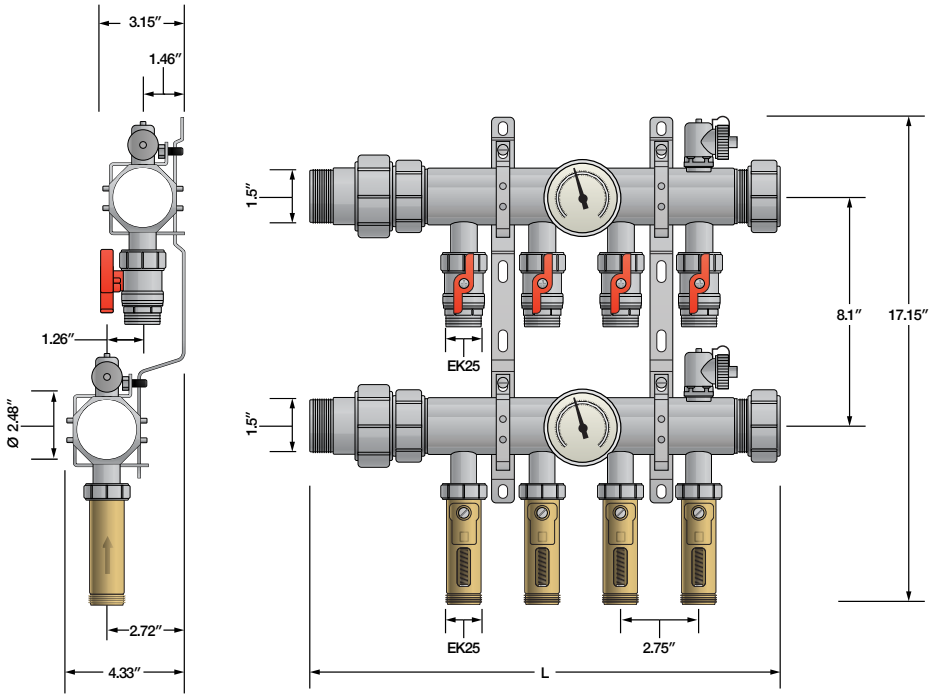
1 1/2" Stainless Steel Manifold, Supply & Return Body, G 1" Branch Union, 3" O.C.

PART#	TYPE	UNIT
3260300	3 Branches	Each
3260400	4 Branches	Each
3260500	5 Branches	Each
3260600	6 Branches	Each
3260700	7 Branches	Each
3260800	8 Branches	Each
3260900	9 Branches	Each
3261000	10 Branches	Each
3261100	11 Branches	Each
3261200	12 Branches	Each
3261300	13 Branches	Each



Manifold Options

#	PART#	DESCRIPTION	TYPE
1	3740002	Fill/Drain Valve, Spare Part for Manifold Series 326xxxx	G 1/2" x 3/4" GHT
2	3761174	Branch On/Off Valve, Spare Part	G 1" Flat Gasket x EK 25
3	3761172	Inline Flowmeter, Spare Part	G 1" Flat Gasket x EK 25
4	3760001	Union Connection for Manifold Series 326xxxx, Spare Part	G 1-1/2" Female 1-1/2" NPT
5	3761176	Flat Gasket 1", Spare Part	Rubber EPDM 60SH
6	5240748	Strap On Thermometer with Spring, Spare Part	32" to 176"
7	3610004	Loop Cap for Manifolds, G1"	G 1" for EK25
8	3761171	Manifold Bracket for Manifold Series 326xxxx, Spare Part	5/8" PEX x EK 25
9	4320525	PEX Fitting Assembly (Nut, Ring, & Insert) for EK 25	5/8" PEX x EK 25
9	4320750	PEX Fitting Assembly (Nut, Ring, & Insert) for EK 25	3/4" PAP x EK 25
10	4360625	PEX Expansion Fitting Assemblhy F1960 for EK 25	5/8" PEX x EK 25
10	4360750	PEX Expansion Fitting Assemblhy F1960 for EK 25	3/4" PAP x EK 25



Manifold Options

PART#	TYPE	LENGTH
3260300	3 Branches	11.8"
3260400	4 Branches	14.55"
3260500	5 Branches	17.30"
3260600	6 Branches	20.05"
3260700	7 Branches	22.80"
3260800	8 Branches	25.55"
3260900	9 Branches	28.30"
3261000	10 Branches	31.05"
3261100	11 Branches	33.80"
3261200	12 Branches	36.55"
3261300	13 Branches	39.30"

COMPOSITE MANIFOLD FOR UP TO 5/8" TUBING, 2–12 BRANCHES

MrPEX Composite Radiant Manifold is made from a durable high performance glass filled plastic designed to withstand high temperature and pressure. The manifold exceeds the oxygen diffusion standard DIN 4726 and is completely corrosion resistant. The manifold has flow capacity of 15.4 GPM with a branch Cv of 1.35 GPM and comes partially assembled as a complete kit.

Kit includes;

- A complete supply body with positive shut-off balancing flowmeters, thermometer, a Fill/Drain valve with Vent, and a blank end cap.
- A complete return body with on/off valves for manual shut-off, thermometer, a Fill/Drain valve with Vent, and a blank end cap.
- A set of mounting brackets
- A set of 1" NPT isolation union ball-valves.

* Shipped as a kit

Plastic cap on the return valve can be removed to accommodate valve actuator #5120700 or #5120701 (Adapter VA 90 part #5700090 is needed and purchased separately). The branches have Eurokonus (EK20) connections, and all MrPEX® EK20 compression fitting assemblies (PEX to EK20 or PEX-AL-PEX to EK20) can be used to connect tubing up to 5/8" to the manifold. Single, 2 loop, 3 loop, and 4 loop add-on supply and return manifold sections and other accessories are sold separately to allow for easy add-on.

Composite Manifold, Valve & Flowmeter, Complete Kit

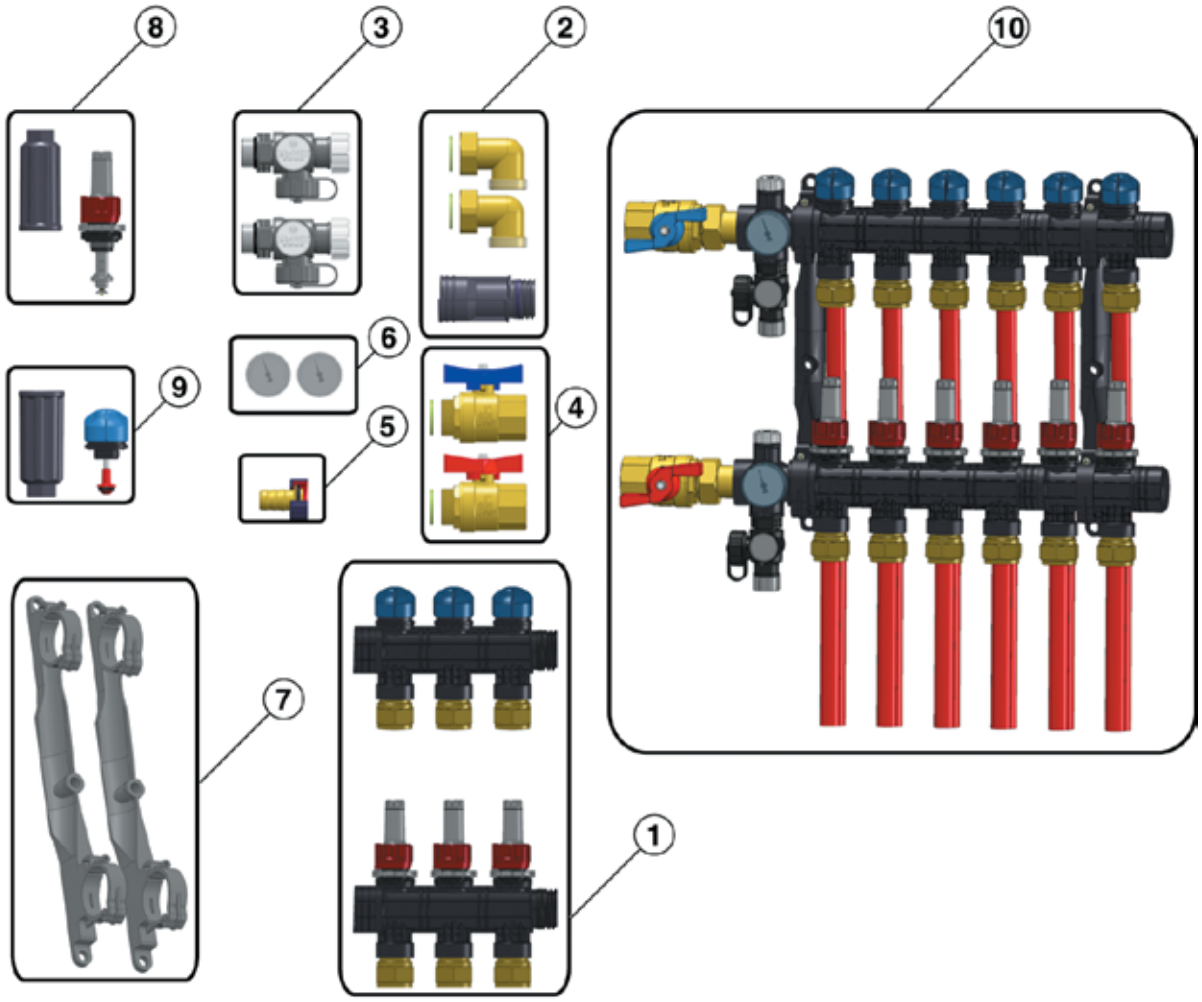
PART#	TYPE	UNIT
3810200	2 Branches	Each
3810300	3 Branches	Each
3810400	4 Branches	Each
3810500	5 Branches	Each
3810600	6 Branches	Each
3810700	7 Branches	Each
3810800	8 Branches	Each
3810900	9 Branches	Each
3811000	10 Branches	Each
3811100	11 Branches	Each
3811200	12 Branches	Each

Composite Manifold Sections, Valve & Flowmeter

PART#	TYPE	UNIT
3810001	1 Branche	Each
3810002	2 Branches	Each
3810003	3 Branches	Each

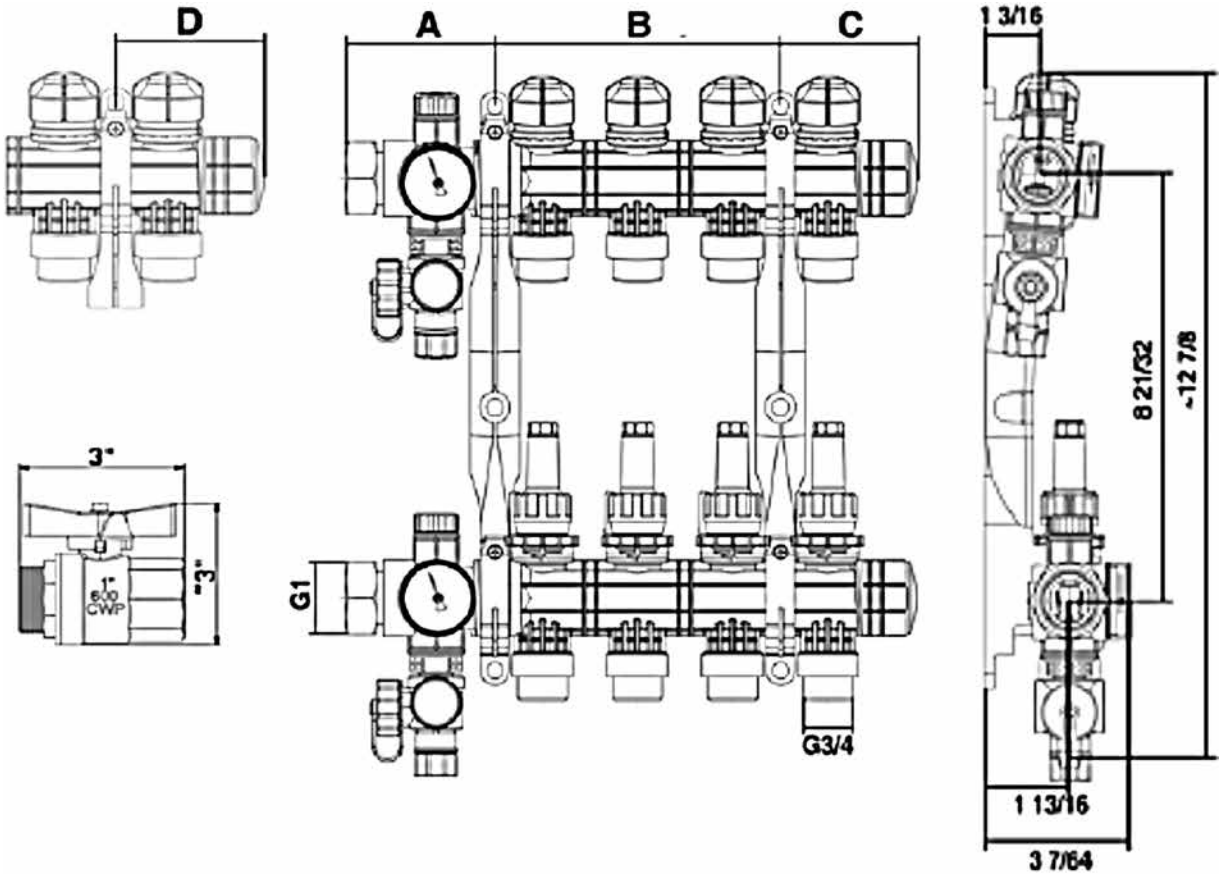
Composite Manifold Elbow Set

PART#	TYPE	UNIT
3810007	90° Supply and Return Elbow set	Set of 2



Manifold Options

#	PART#	DESCRIPTION	TYPE	UNIT
1	3810001	Composite Manifold Sections, Valve & Flow-meter	1 Branch	Each
	3810002	Composite Manifold Sections, Valve & Flow-meter	2 Branch	Each
	3810003	Composite Manifold Sections, Valve & Flow-meter	3 Branch	Each
2	3810007	Composite Manifold Body Extension Set		Set of 2
3	3810010	Drain Valve for #3810009, spare part		Set of 2
4	3810014	Composite Manifold Isolation ball-valves, spare part		Set of 2
5	3810015	Hose connector for drain valve, spare part		Each
6	3810016	Composite Manifold Thermometer, spare part		Set of 2
7	3810171	Composite Manifold Bracket, spare part		Set of 2
8	3810172	Composite Manifold Supply flowmeter valve, spare part		Each
9	3810174	Composite Manifold On/Off valve, spare part		Each
10	3810200	Composite Manifold, Valve & Flowmeter, Complete Kit	2 Branch	Each
	3810300	Composite Manifold, Valve & Flowmeter, Complete Kit	3 Branch	Each
	3810400	Composite Manifold, Valve & Flowmeter, Complete Kit	4 Branch	Each
	3810500	Composite Manifold, Valve & Flowmeter, Complete Kit	5 Branch	Each
	3810600	Composite Manifold, Valve & Flowmeter, Complete Kit	6 Branch	Each
	3810700	Composite Manifold, Valve & Flowmeter, Complete Kit	7 Branch	Each
	3810800	Composite Manifold, Valve & Flowmeter, Complete Kit	8 Branch	Each
	3810900	Composite Manifold, Valve & Flowmeter, Complete Kit	9 Branch	Each
	3811000	Composite Manifold, Valve & Flowmeter, Complete Kit	10 Branch	Each
	3811100	Composite Manifold, Valve & Flowmeter, Complete Kit	11 Branch	Each
	3811200	Composite Manifold, Valve & Flowmeter, Complete Kit	12 Branch	Each



PART#	TYPE	A	B	C	D
3810200	2 Branches	3.125"	4"	3"	1"
3810300	3 Branches	5.125"	4"	3"	1"
3810400	4 Branches	5.125"	4"	5"	2.875"
3810500	5 Branches	5.125"	6"	5"	2.875"
3810600	6 Branches	5.125"	6"	5"	2.875"
3810700	7 Branches	7.125"	7.875"	5"	2.875"
3810800	8 Branches	7.125"	7.875"	7"	4.875"
3810900	9 Branches	7.125"	9.875"	7"	4.875"
3811000	10 Branches	9"	9.875"	7"	4.875"
3811100	11 Branches	9"	11.875"	7"	4.875"
3811200	12 Branches	9"	11.875"	9"	6.875"

1 1/2" BRASS MANIFOLDS

MrPEX 1 ½" Brass Manifold is made from high quality alloy extruded and chrome plated after machining, and is offered in 2 through 12 loop configurations. The manifold comes mounted on brackets and it is equipped with high flow ball valves provided with thermometers, manual air vents and fill/drain valves.

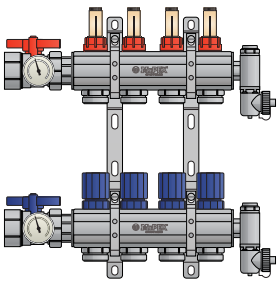
The SUPPLY (upper) manifold is fitted with balancing flowmeters with readable range of 0 to 2 GPM that allow flow adjustment of each individual loop. The flow meters have a brass body and the sight glass is made from temperature and impact resistant plastic material, all components are antifreeze resistant up to a 50% mix.

The RETURN (lower) manifold, has manual on/off valves that controls the flow for each individual circuit. The manual knob can be removed to accommodate the MrPEX actuators (part#5120700 & 5120701).

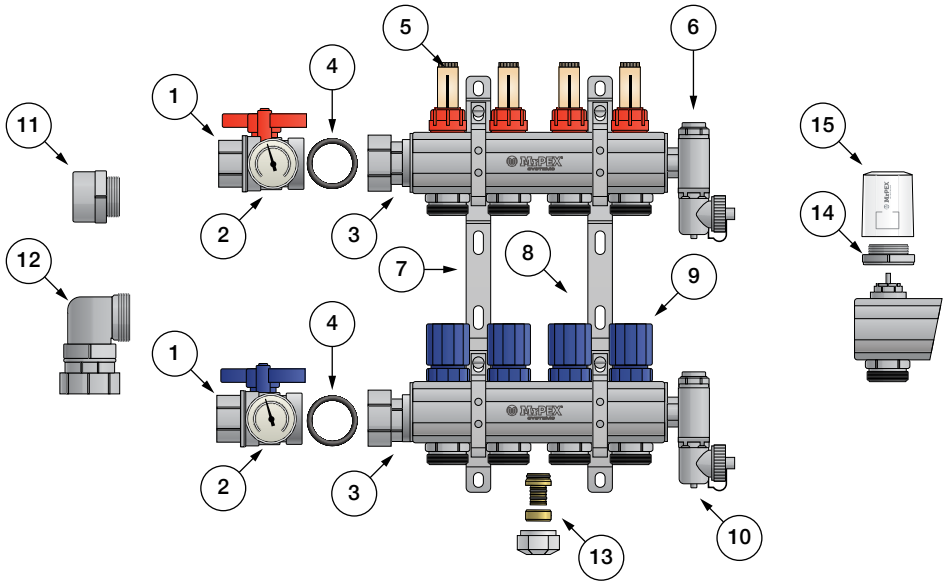
Supply and return mains can be connected from either left or right sides. The manifold comes ready for a left-hand connection. Connection from the right can be done by removing the manifold body from the brackets and flipping them over.

1 1/2" Manifold Valve & Balancing Flow Meter Fully Assembled

PART#	TYPE	UNIT
3320200	2 Branches	Each
3320300	3 Branches	Each
3320400	4 Branches	Each
3320500	5 Branches	Each
3320600	6 Branches	Each
3320700	7 Branches	Each
3320800	8 Branches	Each
3320900	9 Branches	Each
3321000	10 Branches	Each
3321100	11 Branches	Each
3321200	12 Branches	Each

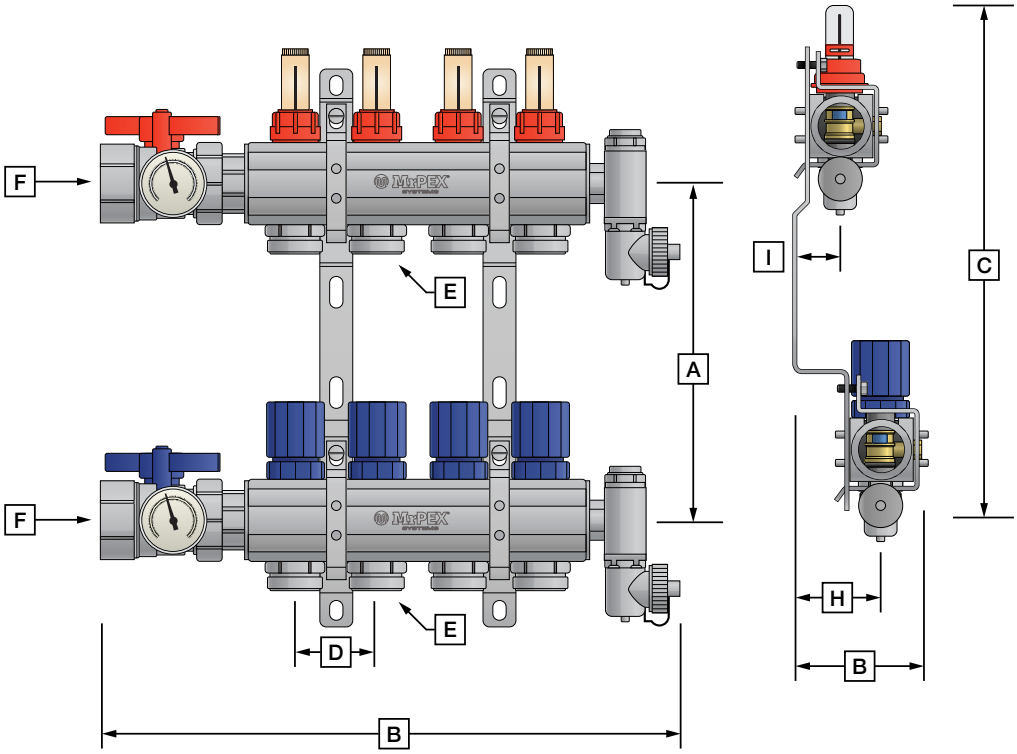


* Shipped as shown



Manifold Options

#	PART#	DESCRIPTION	TYPE	UNIT
1	3320018	Manifold Ball Valves , supply & return, straight , w/ thermometer, spare part	1-1/4" NPT X G 1-1/4 " Flat Gasket	Set of 2
2	3250001	Thermometer, spare part	32 °F to 175 °F	Each
3	3320002	1-1/4" BSP Manifold Connect ion X G 1-1/4" Union Flat Gasket, spare part		Set of 2
4	3761175	Flat Gasket 1-1/4", spare part	Rubber EPDM 60 SH	Set of 10
5	3741172	Flow meter for manifold series 325XXX and 332XXX, spare part	0 to 2 GPM	Each
6	3740011	Manual Air Vent , spare part		Each
7	3761171	1-1/2 " Manifold Bracket for manifold series 332XXXX, spare part		Set of 2
8	3741173	Plastic Valve Cap, spare part	Threaded M30xl.5 - Blue	Each
9	3741174	On/ Off Valve for manifold series, 325XXX and 332XXX, spare part	Threaded M30xl .5	Each
10	3740002	Fill/ Drain Valve for manifold series 325XXXX and 332XXXX, spare part	3/4" GHT	Each
11	3250010	G 1-1/4 " Flat Gasket X 1" Female NPT Straight Fitting Kit		Set of 2
12	3250007	G 11/4 Flat Gasket X G 11 /4 Flat Gasket Union Elbow Kit		Set of 2
13	***	Compression fitting for "MrPEX PEX Tubing"	For sizes 5/ 8" - 3/ 4"	Set of 2
14	5700010	Plastic Adapter for electrothermal actuator 5120701	Threaded M30xl.5 - Type VAl0	Each
15	5120700	MrPEX electrothermal actuator 24V AC 4-wire w/ End Switch	Quick connection	Each
15	5120701	MrPEX electrothermal actuator 24V AC 2-wire	Quick connection	Each



1 1/2" Brass Manifold, Valve & Balancing Flow Meter

PART#	TYPE	A	B	C	D	E	F	G	H	I
3320200	2 Branches	8.1"	10.2"	13.6"–13.8"	1.97"	EK25	1 1/4" FIP	4.21"	2.72"	1.26"
3320300	3 Branches	8.1"	12.2"	13.6"–13.8"	1.97"	EK25	1 1/4" FIP	4.21"	2.72"	1.26"
3320400	4 Branches	8.1"	14.2"	13.6"–13.8"	1.97"	EK25	1 1/4" FIP	4.21"	2.72"	1.26"
3320500	5 Branches	8.1"	16.1"	13.6"–13.8"	1.97"	EK25	1 1/4" FIP	4.21"	2.72"	1.26"
3320600	6 Branches	8.1"	18.1"	13.6"–13.8"	1.97"	EK25	1 1/4" FIP	4.21"	2.72"	1.26"
3320700	7 Branches	8.1"	20.1"	13.6"–13.8"	1.97"	EK25	1 1/4" FIP	4.21"	2.72"	1.26"
3320800	8 Branches	8.1"	22.0"	13.6"–13.8"	1.97"	EK25	1 1/4" FIP	4.21"	2.72"	1.26"
3320900	9 Branches	8.1"	26.0"	13.6"–13.8"	1.97"	EK25	1 1/4" FIP	4.21"	2.72"	1.26"
3321000	10 Branches	8.1"	26.0"	13.6"–13.8"	1.97"	EK25	1 1/4" FIP	4.21"	2.72"	1.26"
3321100	11 Branches	8.1"	28.0"	13.6"–13.8"	1.97"	EK25	1 1/4" FIP	4.21"	2.72"	1.26"
3321200	12 Branches	8.1"	29.9"	13.6"–13.8"	1.97"	EK25	1 1/4" FIP	4.21"	2.72"	1.26"

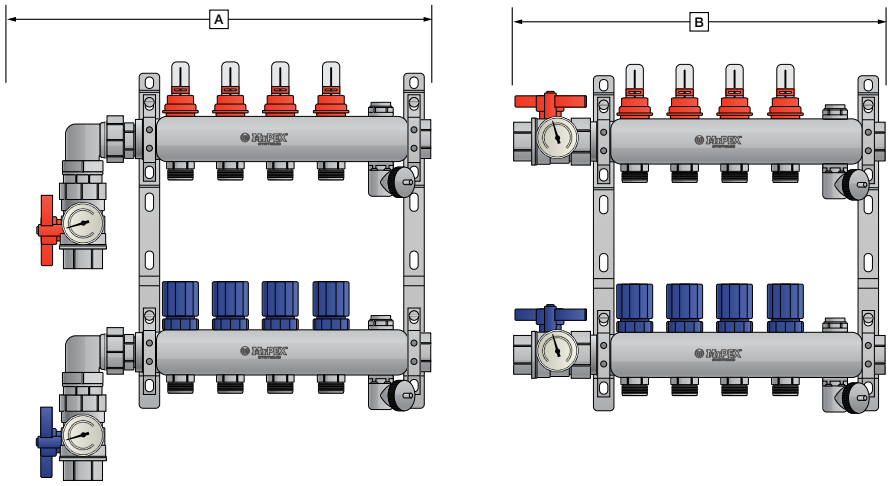
MANIFOLD INSTALLATION

Once a location for the manifold is determined, you can surface mount the manifold or recess it into the wall. Always consider enclosing the manifold in a manifold box or frame out an enclosure with an access door. Make sure the manifold area is big enough to accommodate the manifold and any valves or zone boxes. See dimension tables below to determine the total width of your manifold.

The manifold can be mounted in any direction without impacting the performance. However, if the manifold is mounted upside down, the flowmeters will not show 100% accurate flow due to the fact that the flowmeter assembly is forced down a little by gravity, thus indicating a slightly larger flow. Instead of mounting the manifold upside down to feed loops up, consider mounting the manifold sideways with the supply and return mains entering from the bottom, that way you can easily purge the manifold body using the end cap drain valve. The loops will then exit the manifold horizontally, then making a 90° turn up to feed the floor above.

Consider how you will feed the supply and return mains to the manifold location. The manifold can be fed from left or right, top or bottom. It is sometimes helpful to cross feed the manifold by feeding the supply from one side and return from the other. That way you have more room and the flow of the water will also flow in a counter-flow manner. It is a good idea to have the manifold already prepared and ready for mounting prior to arriving at the jobsite. Mount the manifold on brackets and/or on a board, or even in a manifold cabinet. Attach pressure test gauges and plugs as necessary.

See illustration below for frame-out cavity dimensions, along with MrPEX® Manifold Cabinets on page 28.

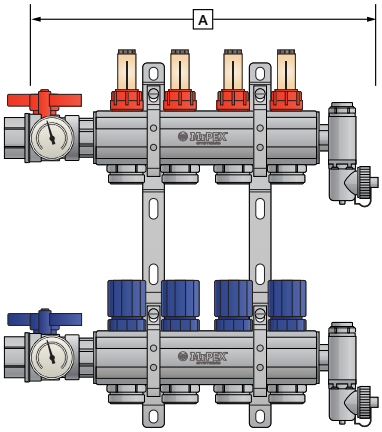


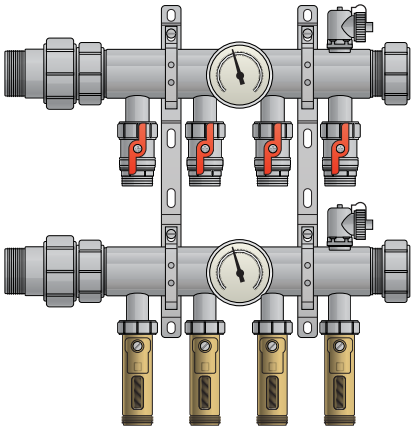
PART#	LOOPS	WIDTH INCLUDING	
		WITH ELBOW KIT	STRAIGHT VALVE & ADAPTER "B"
3250300	2	10.1"	10.6"
3250400	3	12.1"	12.6"
3250500	4	14.1"	14.6"
3250600	5	16.0"	16.5"
3250700	6	18.0"	18.5"
3250800	7	19.9"	20.4"
3250900	8	21.9"	22.4"
3251000	9	23.9"	24.4"
3251100	10	25.8"	26.3"
3251200	11	27.8"	28.3"
3251300	12	29.8"	30.3"

A

B

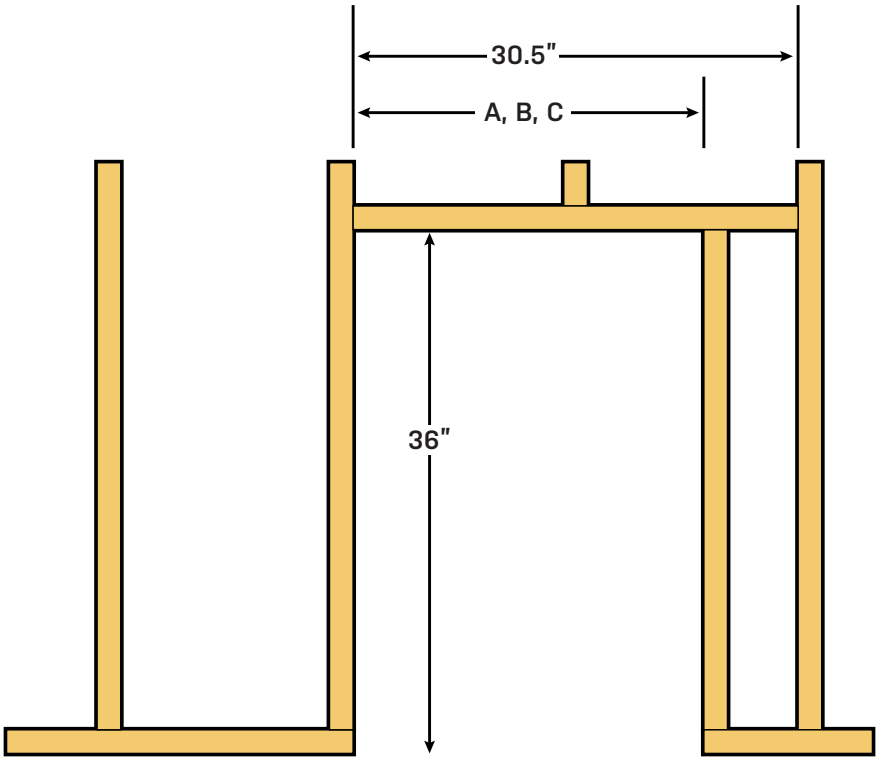
PART#	TYPE	A	B
3810200	2 Branches	13"	10.75"
3810300	3 Branches	15"	12.75"
3810400	4 Branches	17"	14.75"
3810500	5 Branches	19"	16.75"
3810600	6 Branches	21"	18.75"
3810700	7 Branches	23"	20.75"
3810800	8 Branches	25"	22.75"
3810900	9 Branches	27"	24.75"
3811000	10 Branches	29"	26.75"
3811100	11 Branches	31"	28.75"
3811200	12 Branches	33"	30.75"





PART#	LOOPS	WIDTH INCLUDING ADAPTER ONLY "A"
3320200	2	10.2"
3320300	3	12.2"
3320400	4	14.2"
3320500	5	16.2"
3320600	6	18.1"
3320700	7	20.1"
3320800	8	22.0"
3320900	9	24.0"
3321000	10	26.0"
3321100	11	28.0"
3321200	12	29.9"

PART#	LOOPS	WIDTH INCLUDING ADAPTER ONLY "A"
3260300	3	11.8"
3260400	4	14.55"
3260500	5	17.30"
3260600	6	20.05"
3260700	7	22.80"
3260800	8	25.55"
3260900	9	28.30"
3261000	10	31.05"
3261100	11	33.80"
3261200	12	36.55"
3261300	13	39.30"



MANIFOLD CABINETS, UNASSEMBLED

New Style manifold cabinets offer many new features providing fast field assembly time, door latch, durable white paint, knock outs to accommodate supply and return entry points, and adjustable manifold mounting brackets inside. Additionally, recess model has adjustable depth and height to better fit construction.

Surface Mount Manifold Cabinet

PART#	TYPE	UNIT	UNIT
6212421	Manifold Cabinet, Un-assembled, W20.8" , H31.1", D5.1"	Surface	Each
6212431	Manifold Cabinet, Un-assembled, W26.8" , H31.1", D5.1"	Surface	Each
6212451	Manifold Cabinet, Un-assembled, W40.5" , H31.1", D5.1"	Surface	Each

Surface Mount Manifold Cabinet

PART#	1 1/4" STAINLESS NO BALL VALVE	1 1/4" STAINLESS WITH BALL VALVE	COMPOSITE	1 1/2" STAINLESS	1 1/2" BRASS
6212421	Up to 7 Loops	Up to 6 Loops	Up to 6 Loops	Up to 4 Loops	Up to 5 Loops
6212431	Up to 11 Loops	Up to 10 Loops	Up to 10 Loops	Up to 8 Loops	Up to 8 Loops
6212451	Up to 12 Loops	Up to 12 Loops	Up to 12 Loops	Up to 13 Loops	Up to 12 Loops

Recessed Manifold Cabinet

PART#	TYPE	UNIT	UNIT
6213421	Manifold Cabinet, Un-assembled, W20.8" , H27.2"-31.1", D4.3"- 6.3"	Recessed	Each
6213431	Manifold Cabinet, Un-assembled, W26.8" , H27.2"-31.1", D4.3"- 6.3"	Recessed	Each
6213451	Manifold Cabinet, Un-assembled, W40.5" , H27.2"-31.1", D4.3"- 6.3"	Recessed	Each

Recessed Mount Manifold Cabinet

PART#	1 1/4" STAINLESS NO BALL VALVE	1 1/4" STAINLESS WITH BALL VALVE	COMPOSITE	1 1/2" STAINLESS	1 1/2" BRASS
6213421	Up to 7 Loops	Up to 6 Loops	Up to 6 Loops	Up to 4 Loops	Up to 5 Loops
6213431	Up to 11 Loops	Up to 10 Loops	Up to 10 Loops	Up to 8 Loops	Up to 8 Loops
6213451	Up to 12 Loops	Up to 12 Loops	Up to 12 Loops	Up to 13 Loops	Up to 12 Loops

INSTALLING MrPEX® TUBING

INSTALLING THE TUBING

Now that you are ready to install the tubing, take a minute to decide which loop to start with first. Typically, working your way from left to right as you are facing the manifold is a good general guideline. Mark the area in front of the manifold to make sure all leaders fit without getting too crowded or crossed. No joints should be made in tube installed within inaccessible areas unless the type of joint is approved by MrPEX® for that application. For repairs, please see pages 60–65.

› The tubing loop length, spacing and layout pattern is designed to meet the heating and comfort needs of the occupants at design condition. All attached mechanical equipment is sized to support those needs. If a loop's length, spacing or pattern is changed from its design, it may have an adverse impact on the performance of the system. Use the following recommendations as a guideline unless otherwise specified in a MrPEX® design document.

GENERAL LOOP LENGTH GUIDELINES		
TUBE SIZE	**RECOMMENDED**	**MAXIMUM**
3/8" I.D.	200 feet	250 feet
1/2" I.D.	300 feet	350 feet
5/8" I.D.	350 feet	500 feet
3/4" I.D.	450 feet	600 feet
1" I.D.	500 feet	750 feet

NOTE: Loop lengths are designed to deliver a certain heat load at a given temperature drop and pressure drop. The higher the heat load requirement, the higher the flow, resulting in a higher pressure drop. Shorter loops are required for higher heat loads. But if the heat load is low, the loops can be longer.

GENERAL TUBE SPACING AND LAYOUT PATTERN GUIDELINES*		
	RECOMMENDED	**MAXIMUM**
Embedded in Slab	6–12"	12"
Poured Underlayment	6–12"	12"
Heat Transfer Plates Above Subfloor	6–12"	12"
Between Joists	8"	8"

** Spacing shown is only a guideline. In many cases, the tube spacing in front of windows will be tighter to accommodate the higher heat-loss while the rest of the room will remain at normal spacing.*

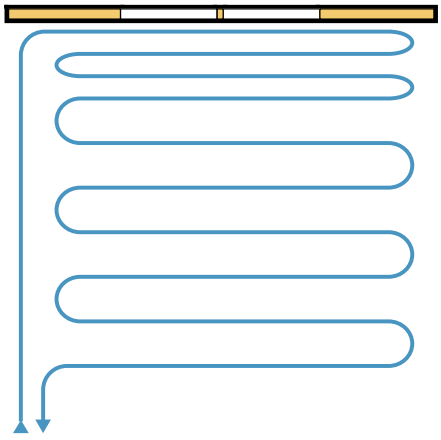
NOTE: This chart is for indoor radiant heating (not snow melting) applications. Tube spacing may need to be closer in high heat-loss areas by windows (check with designer) and in barefoot areas such as bathrooms where surface temperatures need to be extremely even.

TIP: If MrPEX® LoopCAD design software is used, you can easily try different scenarios to see how it affects the system pressure drop, flow, and water temperature.

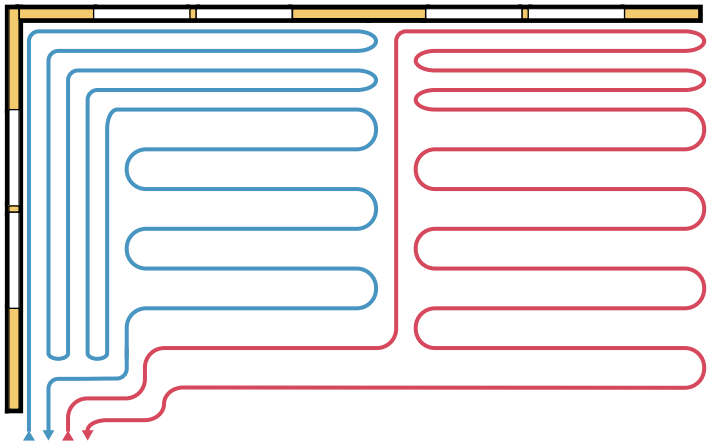
COMMON LAYOUTS

The tubing layout pattern is selected to meet the heat loss and use pattern of the room. The heat loss of a room is always greater at the outside walls or by large windows, and gets gradually less as you move towards the inside of the room. The most common pattern is the Serpentine layout. This pattern sends the warmer supply water to follow the outside wall where the need is the greatest, and then serpentines back towards the inside of the room. Since the flow of the warm water is designed to allow it to only drop between 10° F - 20° F from the beginning of the loop to the end of the loop, it actually then better matches the heat loss profile of the room. The spacing of the tubing is also determined by the heat loss, but also by surface floor covering and the needs of the home owner. The higher the heat loss, the closer the spacing required. However, in areas where you will walk barefoot on a tile floor, a 12" spacing may actually not be the best even if the heat loss is low, only because you could possibly feel the difference between the pipes. This is typical for bathrooms.

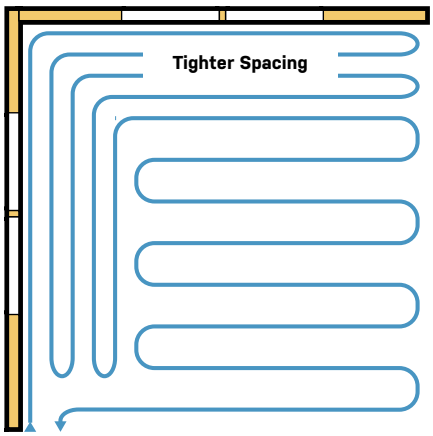
See the "Common Layouts" below. This gives you some ideas as to which patter to use for your project. Also keep the "General Loop Length and Spacing Guidelines" from previous page in mind.



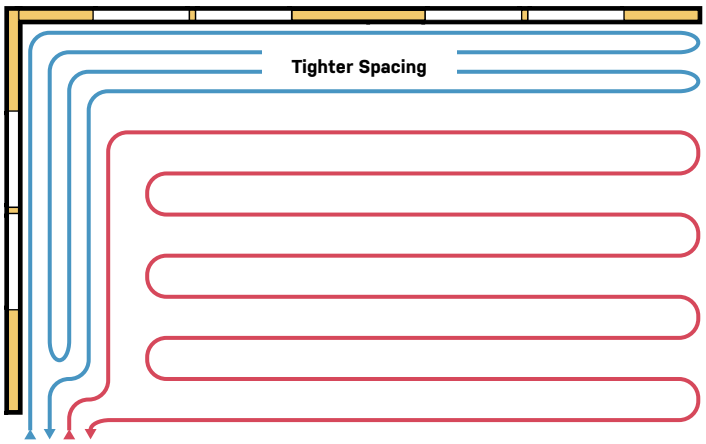
Single-Wall Serpentine



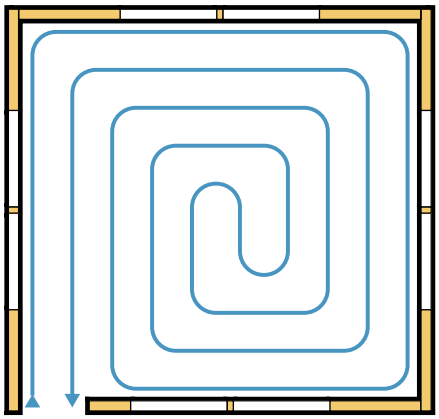
Two-Wall Serpentine. Two Loops Vertical.



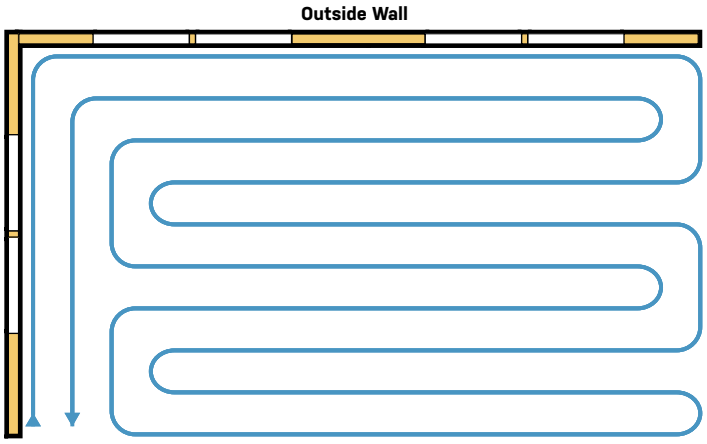
Two-Wall Serpentine



Two-Wall Serpentine. Two Loops Horizontal.



Counter-Flow Spiral



Counter-Flow Serpentine

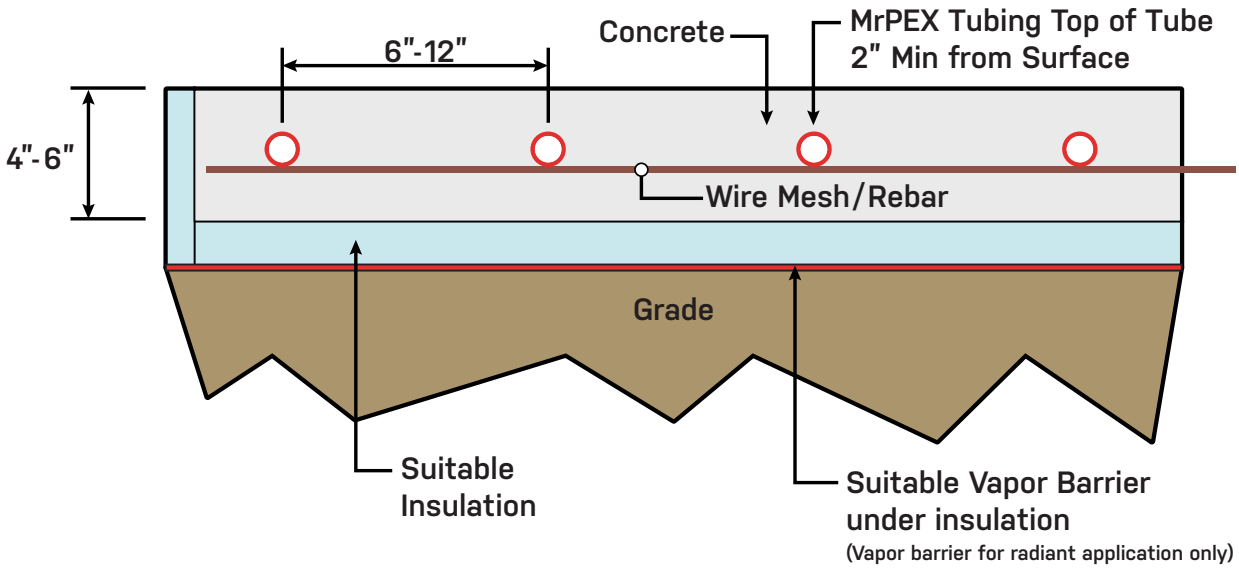
SLAB ON OR BELOW GRADE WITH INSULATION

NOTE: Use MrPEX® Design Software to establish heat loss for the structure, and to calculate output, surface temperature, water temperature and tubing/manifold pressure drops.

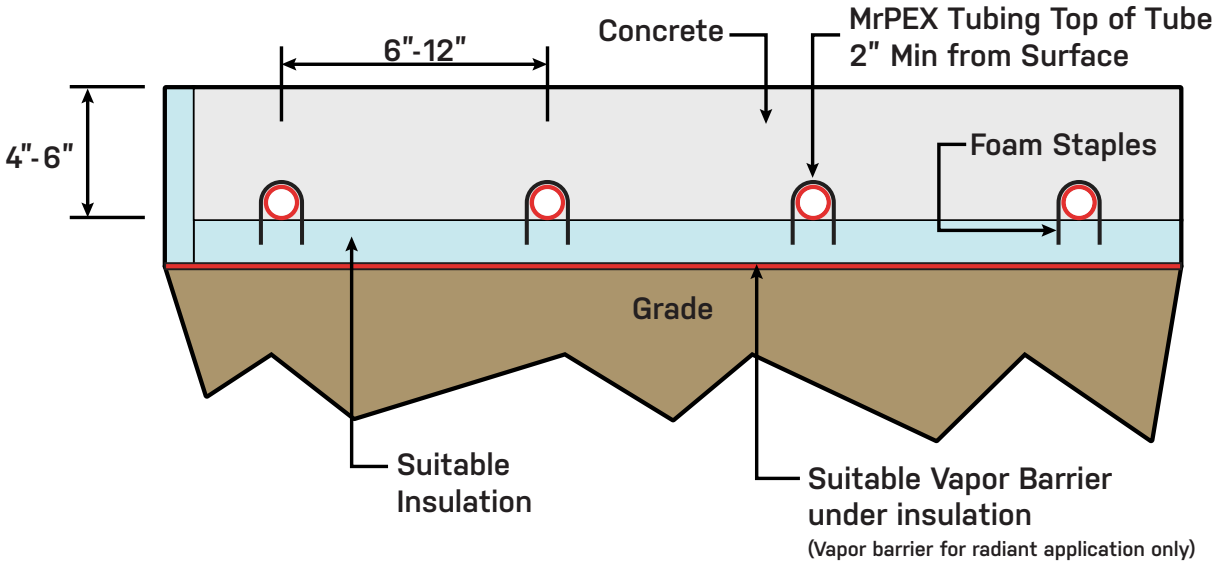
STRUCTURAL NOTE: Project Engineer, Project Architect or System Designer need to verify and approve the structural impact of the radiant system on the building prior to installation.

- Review "Installing Insulation" on page 10–11, to make sure adequate R-value is used. Also, follow local building codes or check with structural engineer for correct compressive strength (PSI) for your application.
- Lay down suitable foam insulation, covering the complete area. If a vapor barrier is required, make sure a suitable type is put down before the foam insulation. If there are areas that are uneven, you may need to adjust the grade to make sure the foam does not break when walked on. Tape the seams with suitable tape.
- If you are using foam staples or clips, it is helpful to use a tape measure or story pole to mark the spacing on the insulation at certain intervals to aid the routing of the tubing and to keep the correct spacing. It is especially helpful around the manifold and where closer spacing is needed.
- If wire mesh or rebar is used, spacing is easier to maintain, but it is still helpful to mark the spacing on the insulation to plan the routing of the loops.
- Place the uncoiler in an out of the way area, still close enough to easily feed the tubing to the area you are working on. Place the tubing coil on uncoiler and remove tape/straps. To keep uncoiler from tipping over, you can fasten it to a piece of plywood.
- Pull the loose end of the coil over to the manifold and record the footage mark on tubing. Cut the end of the tubing with a suitable tubing cutter making sure the end is square and clean. If PEX-AL-PEX is used, also ream the end of the tubing using the MrPEX® Reaming tool. Attach a bend support to the tube. Connect to the supply of the first loop on the manifold using the correct fitting assemblies as outlined beginning on page 49, "Connecting the Loops to the Manifold."
- Start routing the tubing along the supply path (typically along the outside wall) attaching it with foam staples, clips or ties to the wire mesh every 2–3 feet on the straights as necessary and every 1 foot on the bends. It is important to secure the tubing enough so that it does not float up to the surface during the slab pour.
  NOTE: If chairs are to be used to lift the tubing into the slab, then leave mesh flat while installing tubing, then lift the mesh assembly with the tubing placing it on the chairs.
- The top of the tube should be embedded in the slab at a minimum of 2 inches below the surface.
- Complete the loop following the design. Once back at the manifold record the footage mark on tubing. Attach another bend support to the tube. Cut the end of the tubing with a suitable tubing cutter making sure the end is square and clean. If PEX-AL-PEX is used, also ream the end of the tubing using the MrPEX® Reaming tool. Connect to the return of the first loop on the manifold using the correct fitting assemblies as outlined beginning on page 46, "Connecting the Loops to the Manifold."
- Mark each tube end as the supply or return and what area it is providing for.
- Repeat the same process for remaining loops.

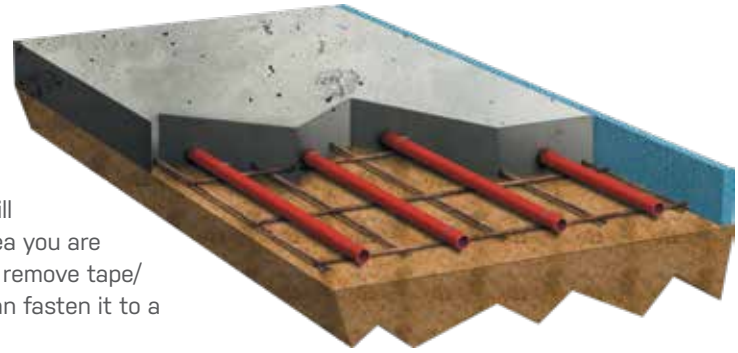
CONCRETE SLAB ON GRADE WITH REBAR WITH INSULATION



CONCRETE SLAB ON GRADE WITH STAPLES WITH INSULATION



SLAB ON OR BELOW GRADE WITHOUT UNDERSLAB INSULATION

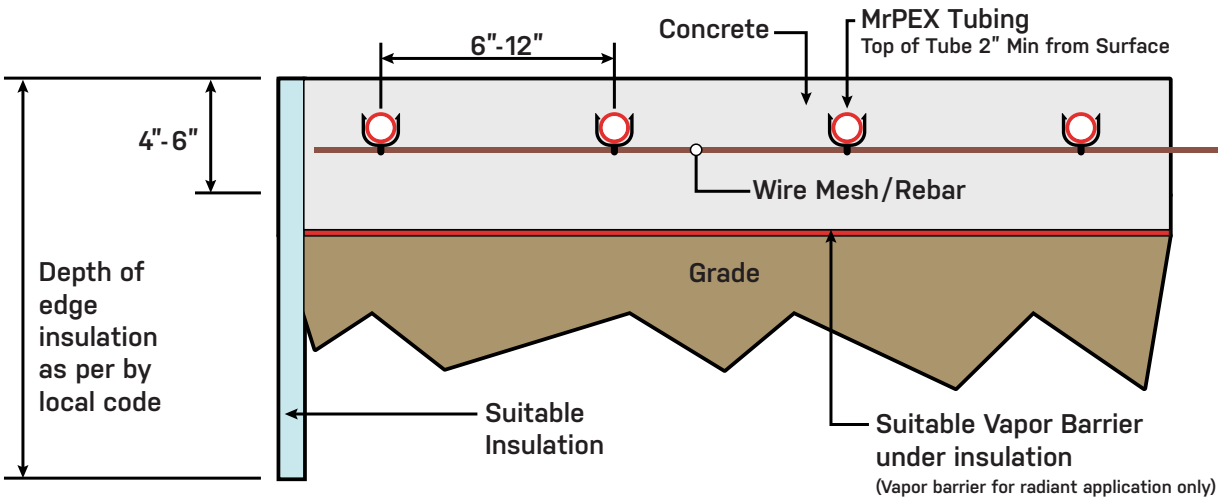


- Although not recommended for most applications by MrPEX® Systems, this is the prescribed method. Follow local building codes or check with structural engineer for correct compressive strength (PSI) for your application.
- Place the uncoiler in an "out of the way area", still close enough to easily feed the tubing to the area you are working on. Place the tubing coil on uncoiler and remove tape/straps. To keep uncoiler from tipping over, you can fasten it to a piece of plywood.
- Pull the loose end of the coil over to the manifold and record the footage mark on tubing, if using a longer coil than needed. Cut the end of the tubing with a suitable tubing cutter making sure the end is square and clean. If PEX-AL-PEX is used, also ream the end of the tubing using the MrPEX® Reaming tool. Attach a bend support to the tube. Connect to the supply of the first loop on the manifold using the correct fitting assemblies as outlined beginning on page 49, "Connecting the Loops to the Manifold."

Start routing the tubing along the supply path (typically along the outside wall/edge) attaching it with quip clips or ties to the wire mesh every 2–3 feet on the straights as necessary and every 1 foot on the bends. It is important to secure the tubing enough so that it does not float up to the surface during the slab pour. NOTE: If chairs are to be used to lift the tubing into the slab. To aid installation, leave mesh flat while installing tubing, then lift the mesh assembly with the tubing placing it on the chairs.

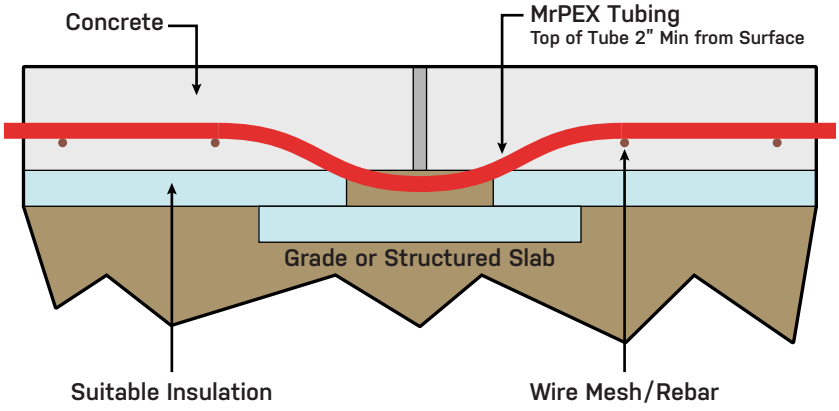
- The top of the tube should be embedded in the slab at a minimum of 2 inches below the surface.
- Complete the loop following the design. Once back at the manifold record the footage mark on tubing. Attach another bend support to the tube. Cut the end of the tubing with a suitable tubing cutter making sure the end is square and clean. If PEX-AL-PEX is used, also ream the end of the tubing using the MrPEX® Reaming tool. Connect to the return of the first loop on the manifold using the correct fitting assemblies as outlined beginning on page 49, "Connecting the Loops to the Manifold."
- Mark each tube end as the supply or return and what area it is providing for
- Repeat the same process for remaining loops.

SLAB ON GRADE USING QUIP CLIPS

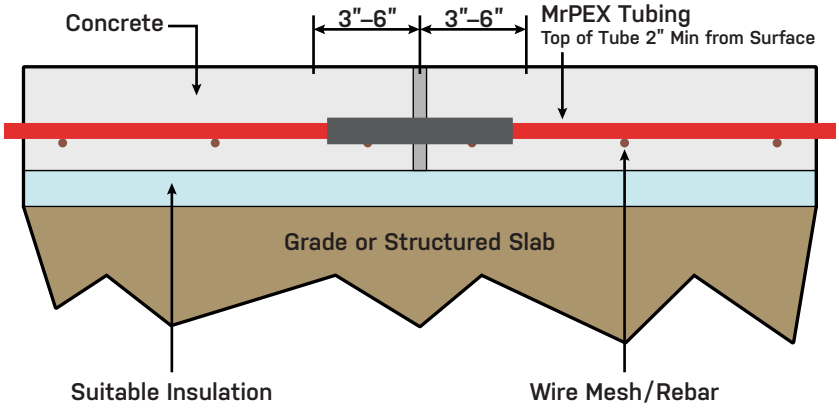


EXPANSION/CONTROL JOINTS

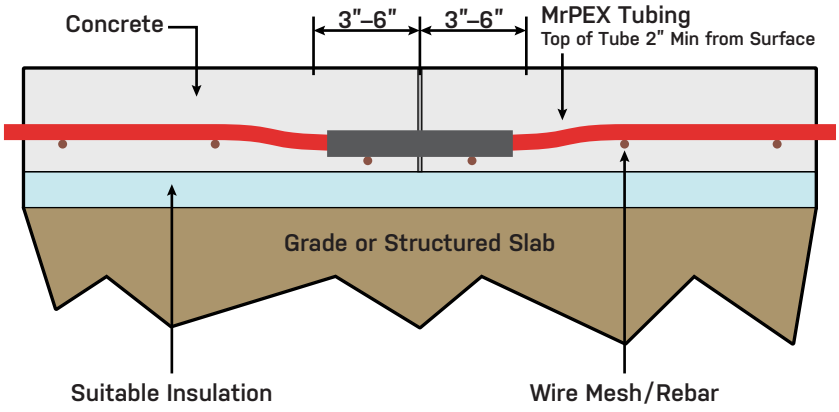
Note 1, Expansion Joint
Dipping the tubing underneath the expansion joint prior to where the joint is installed greatly aids the installation. This method completely avoids the tubing being subjected to any movement of the slab.



Note 2, Expansion Joint
For installations where tubing has to penetrate the expansion joint. Sleeve the tubing with 3/8" closed foam pipe insulation such as armoflex. This allows the slab to move at least 3/8" before interfering with the tubing.



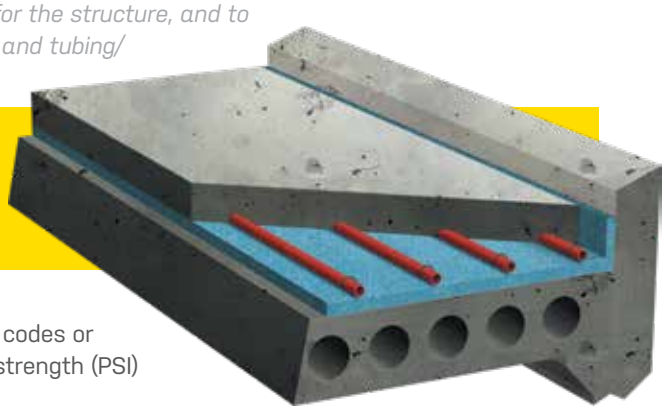
Note 3, Control Joint (Sawcut or formed)
For installations where tubing has to penetrate through or under a control joint. For protection against shifting slab, sleeve the tubing with 3/8" closed foam pipe insulation such as armoflex. This allows the slab to move at least 3/8" before interfering with the tubing. It is however not necessary to do this if there is no risk of the concrete shifting.



SUSPENDED SLAB OR SLAB ON DECK

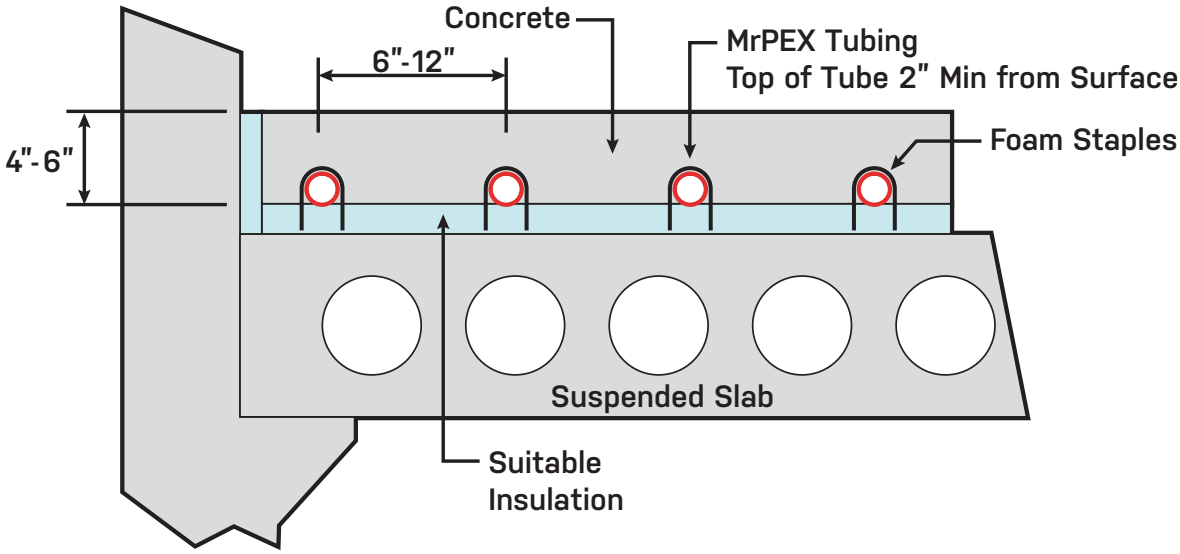
NOTE: Use MrPEX® Design Software to establish heat loss for the structure, and to calculate output, surface temperature, water temperature and tubing/ manifold pressure drops.

STRUCTURAL NOTE: Project Engineer, Project Architect or System Designer need to verify and approve the structural impact of the radiant system on the building prior to installation.

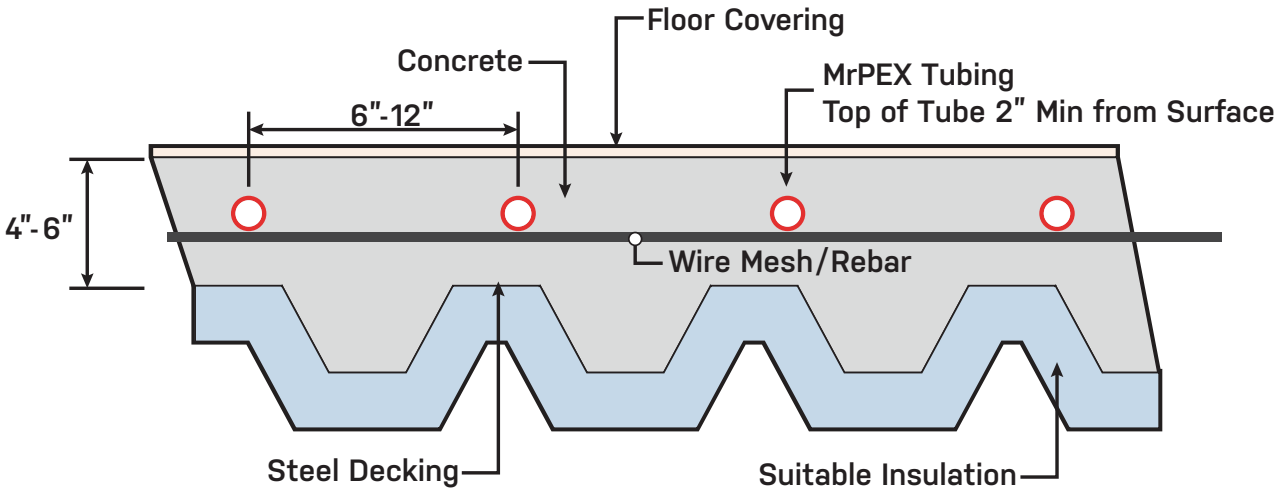


- Review "Installing Insulation" on page 10–11 to make sure adequate R-value is used. Also, follow local building codes or check with structural engineer for correct compressive strength (PSI) for your application.
- Lay down suitable foam insulation, covering the complete area. If there are areas that are uneven, you may need to adjust the grade to make sure the foam does not break when walked on. Tape the seams with suitable tape.
- If you are using foam staples or clips, it is helpful to use a tape measure or story pole to mark the spacing on the insulation at certain intervals to aid the routing of the tubing and to keep the correct spacing. It is especially helpful around the manifold and where closer spacing is needed.
- If 6 x 6 wire mesh is used, spacing is easier to maintain, but it is still helpful to mark the spacing on the insulation to plan the routing of the loops. *NOTE: It is helpful to leave mesh flat on the surface while tying the tubing layout to it, and then lifting the entire assembly up on chairs. Make sure that the top of the tubing is at least 2" from the surface of the finished slab.*
- Place the uncoiler in an out of the way area, still close enough to easily feed the tubing to the area you are working on. Place the tubing coil on uncoiler and remove tape/straps. To keep uncoiler from tipping over, you can fasten it to a piece of plywood.
- Pull the loose end of the coil over to the manifold and record the footage mark on tubing. Cut the end of the tubing with a suitable tubing cutter making sure the end is square and clean. If PEX-AL-PEX is used, also ream the end of the tubing using the MrPEX® Reaming tool. Attach a bend support to the tube. Connect to the supply of the first loop on the manifold using the correct fitting assemblies as outlined beginning on page 49, "Connecting the Loops to the Manifold."
- Start routing the tubing along the supply path (typically along the outside wall) attaching it with foam staples, clips or ties to the wire mesh every 2–3 feet on the straights as necessary and every 1 foot on the bends.
  NOTE: If pressure testing is made with air, it is important to secure the tubing enough so that it does not float up to the surface during the slab pour.
  NOTE: If chairs are to be used to lift the tubing into the slab. To aid installation, leave mesh flat while installing tubing, then lift the mesh assembly with the tubing placing it on the chairs.
- The top of the tube should be embedded in the slab at a minimum of 2 inches below the surface.
- Complete the loop following the design. Once back at the manifold record the footage mark on tubing. Attach another bend support to the tube. Cut the end of the tubing with a suitable tubing cutter making sure the end is square and clean. If PEX-AL-PEX is used, also ream the end of the tubing using the MrPEX® Reaming tool. Connect to the return of the first loop on the manifold using the correct fitting assemblies as outlined beginning on page 49, "Connecting the Loops to the Manifold."
- Mark each tube end as the supply or return and what area it is providing for
- Repeat the same process for remaining loops.
- Organize the loops leading into the manifold before pouring the concrete.

SUSPENDED SLAB



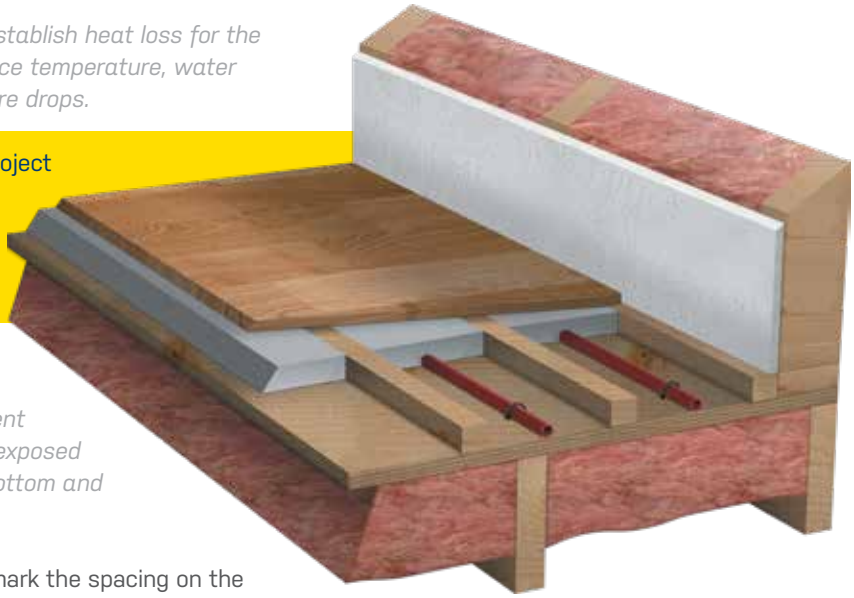
SLAB ON DECK



SUSPENDED FLOORS WITH POURED UNDERLAYMENT

NOTE: Use MrPEX® Design Software to establish heat loss for the structure, and to calculate output, surface temperature, water temperature and tubing/manifold pressure drops.

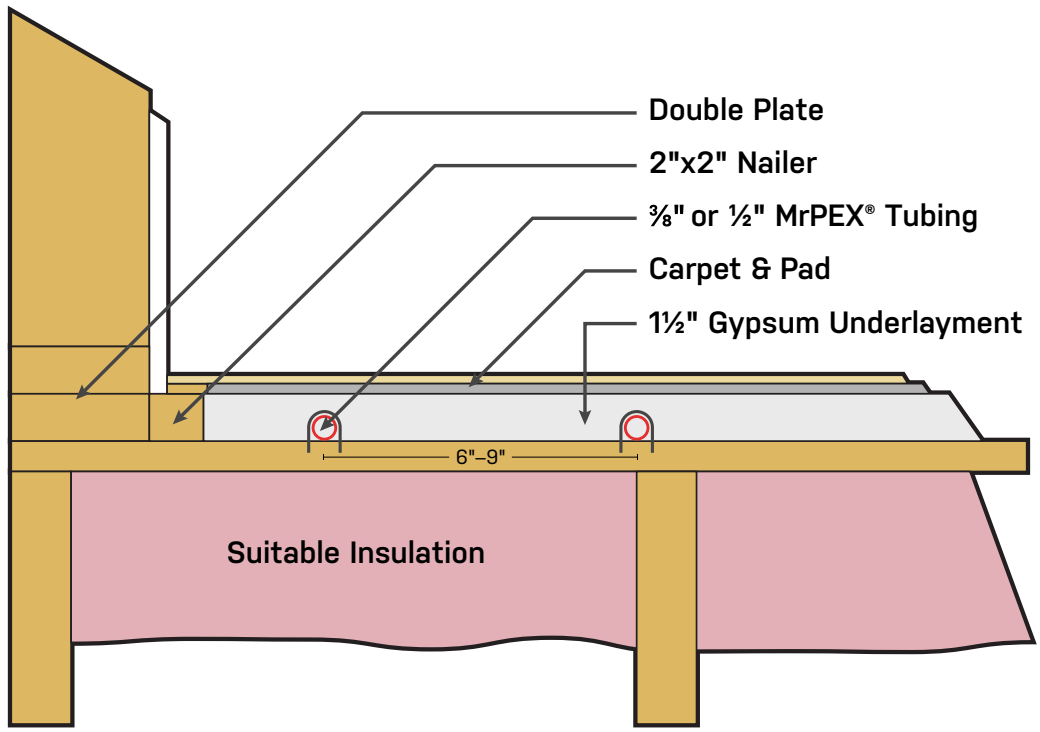
STRUCTURAL NOTE: Project Engineer, Project Architect or System Designer need to verify and approve the structural impact of the radiant system on the building prior to installation.



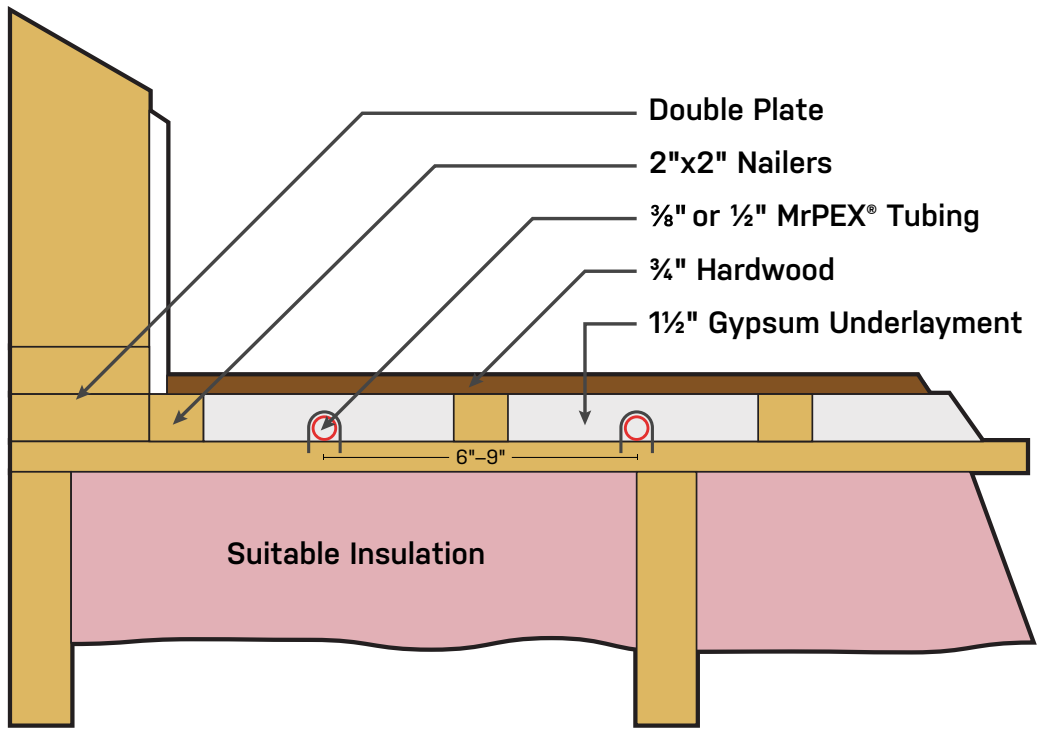
NOTE: In this method, walls should be framed with double plate on the bottom to accommodate the underlayment thickness. This leaves the second plate exposed to be screwed to the sheetrock at the bottom and accommodates normal door hights.

- Use a tape measure or story pole to mark the spacing on the subfloor at certain intervals to aid the routing of the tubing and to keep the correct spacing. It is especially helpful around the manifold and where closer spacing is needed.
- Place the uncoiler in an out of the way area, still close enough to easily feed the tubing to the area you are working on. Place the tubing coil on uncoiler and remove tape/straps. To keep uncoiler from tipping over, you can fasten it to a piece of plywood.
- Pull the loose end of the coil over to the manifold and record the footage mark on tubing. Cut the end of the tubing with a suitable tubing cutter making sure the end is square and clean. If PEX-AL-PEX is used, also ream the end of the tubing using the Mr PEX® Reaming tool. Attach a bend support to the tube. Connect to the supply of the first loop on the manifold using the correct fitting assemblies as outlined in "Connecting the Loops to the Manifold" beginning on page 49.
- Start routing the tubing along the supply path (typically along the outside wall) attaching it with a suitable staple gun every 2–3 feet or so on the straights as necessary and every 1 foot on the bends. It is important to secure the tubing enough so that it does not float up to the surface during the underlayment pour.
- Tube embedded in gypsum or lightweight concrete should have a minimum of 3/4" underlayment material over the highest point of the tube
- Complete the loop following the design. Once back at the manifold record the footage mark on tubing. Attach another bend support to the tube. Cut the end of the tubing with a suitable tubing cutter making sure the end is square and clean. If PEX-AL-PEX is used, also ream the end of the tubing using the Mr PEX® Reaming tool. Connect to the return of the first loop on the manifold using the correct fitting assemblies as outlined in "Connecting the Loops to the Manifold" beginning on page 49.
- Mark each tube end as the supply or return and what area it is providing for.
- Repeat the same process for remaining loops.

WITH CARPET & PAD



WITH HARDWOOD FLOORING



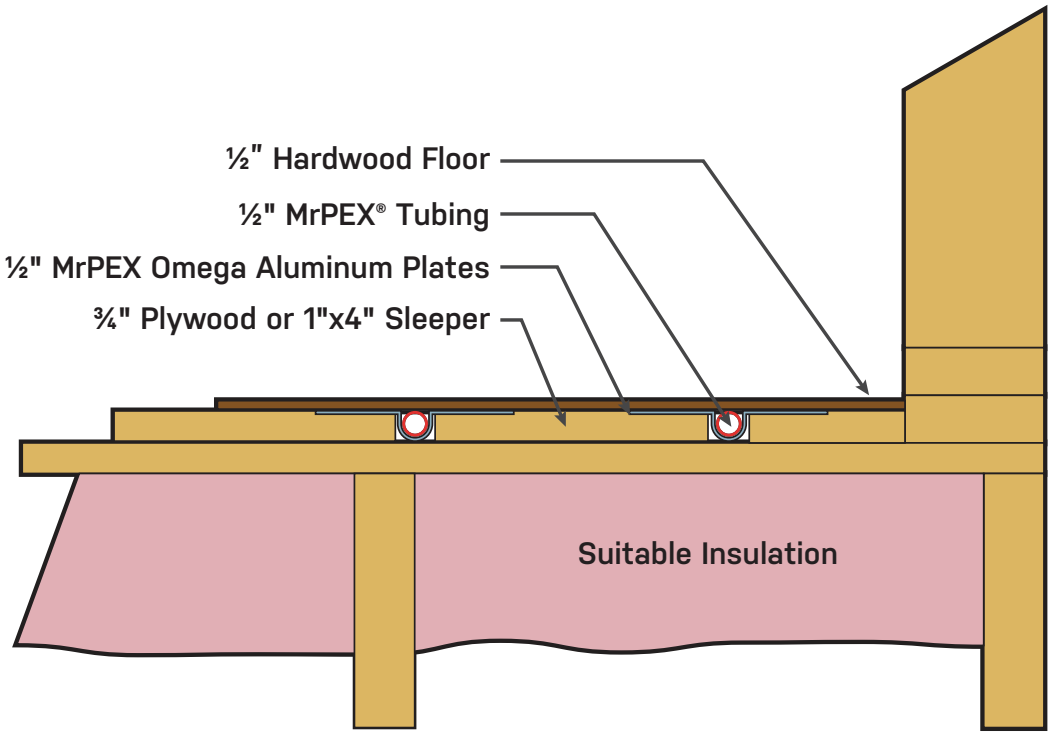
SUSPENDED FLOORS WITH ALUMINUM HEAT EMISSION PLATES ON TOP OF THE SUBFLOOR

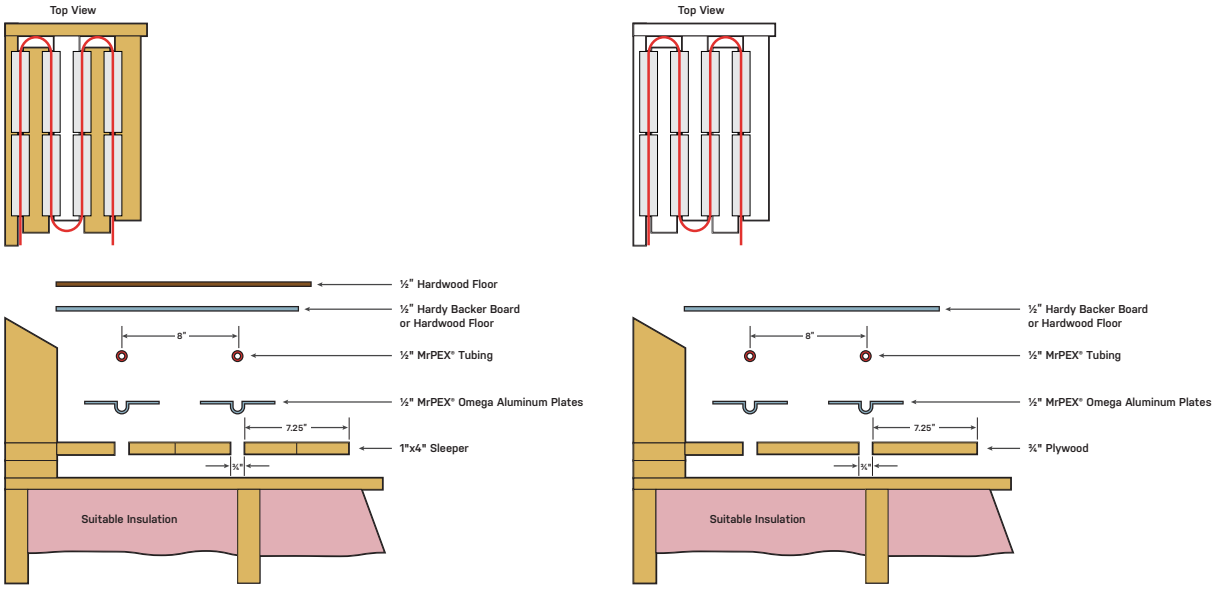
NOTE: Use MrPEX® Design Software to establish heat loss for the structure, and to calculate output, surface temperature, water temperature and tubing/manifold pressure drops.

STRUCTURAL NOTE: Project Engineer, Project Architect or System Designer need to verify and approve the structural impact of the radiant system on the building prior to installation.

- Make sure subfloor is clean and free of nails/screws etc..
- For this application use either 1 x 4 sleepers, ripped plywood, or MrPEX® WoodTrac Panels.
- Frame-in two walls of the area to be covered with wood sleepers. Make sure to keep as close to a 90 degree angle as possible. Glue and screw the sleepers to the sub-floor.
- Following the first sleeper, leave a 1" gap and then continue to fasten two 1 x 4 sleepers next to each other to the subfloor covering the rest of the area, or one piece of ripped plywood. Stagger the sleepers at the end at least 8"-12" at the end of each run to leave ample room for tube turn. Accommodate for the return tube run back to the manifold.
- Place omega plates in the 1" grooves. Leave ¼" - ½" space between plates. Using a pneumatic stapler, staple only one side of the omega plate to the sleeper.
- Start laying the tube snapping it into the omega plates as you go along. Connect the tubing to the manifold and repeat process for next loop.
- Once tubing is installed, perform a pressure test of 40 – 60 psi for 24 hrs to ensure that the tubing has not been damaged during installation.
- Install adequate underlayment for planned floor covering. For carpeting and tile it is recommended to use ¼" hardy backer board or similar. Pay close attention to where the tubes are located before gluing and screwing down the backer board. For hard wood floor, follow wood floor manufacturers recommendations. Leave system under pressure on to notice any damage during installation.

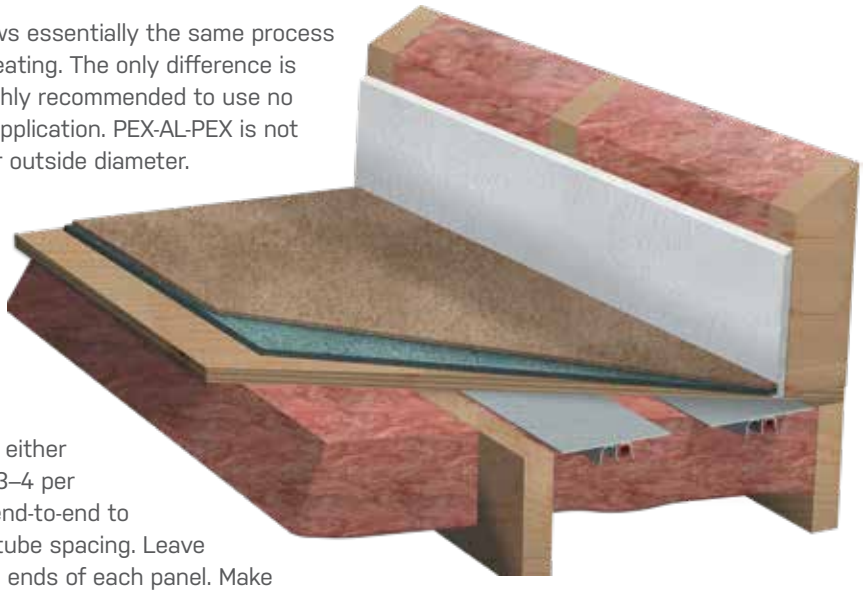
WITH HARDWOOD OR HARDY BACKER BOARD FLOORING





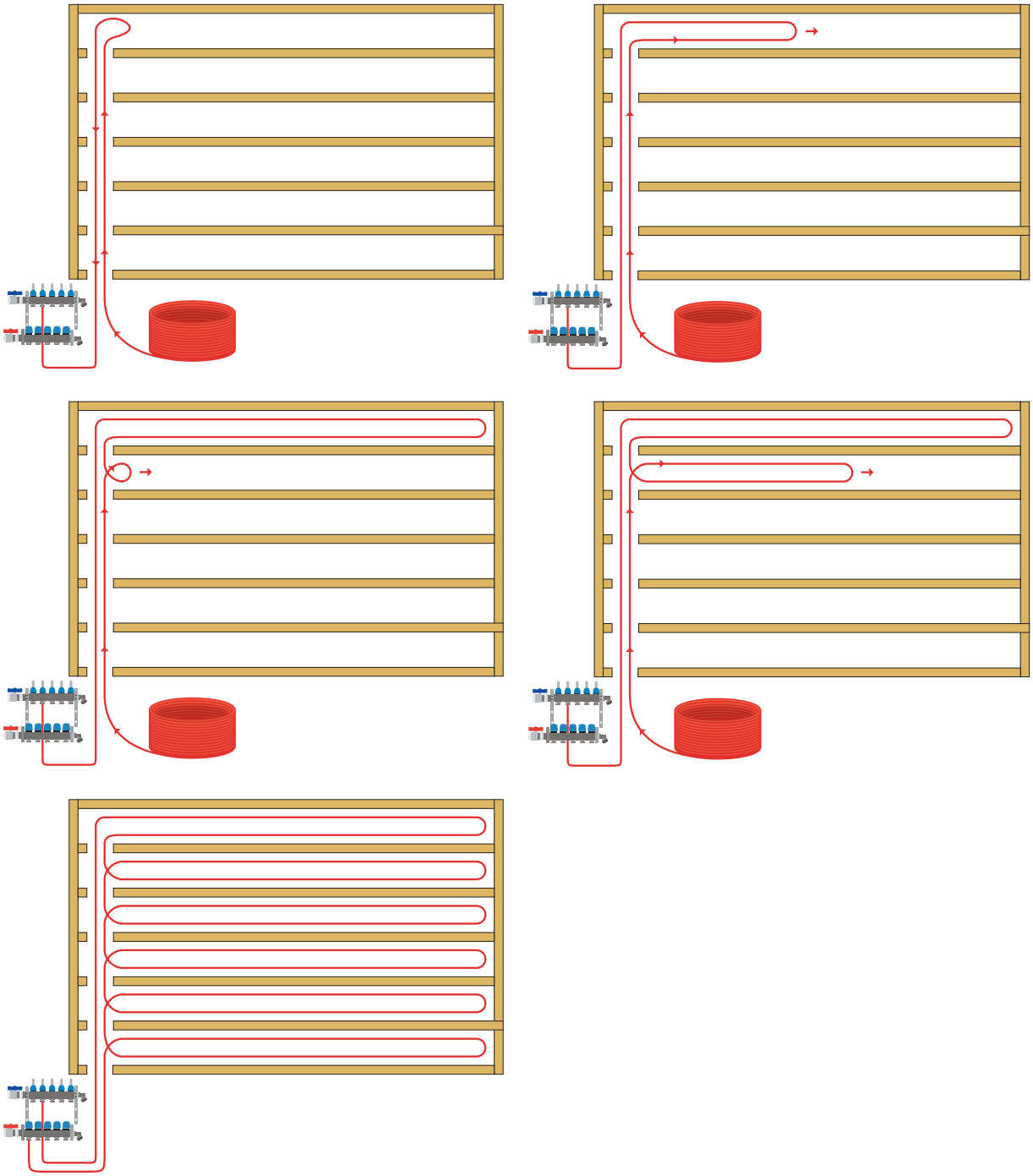
SUSPENDED FLOORS WITH ALUMINUM HEAT EMISSION PLATES BETWEEN JOISTS BELOW

Tubing installed in the joist cavity follows essentially the same process for Duo-Track, Omega Plates or Joist Heating. The only difference is the way the tubing is attached. It is highly recommended to use no larger than 1/2" MrPEX® tubing for this application. PEX-AL-PEX is not used in this application due to its larger outside diameter.



- Review design to determine how tubing should be routed in the joist cavity. Drill suitable holes through the joist (follow local codes to maintain structural integrity).
- For Duo-Track installation only, using either screws or other suitable fasteners (3–4 per side), start by attaching the plates end-to-end to the bottom of the subfloor at an 8" tube spacing. Leave about a 1/4"–1/2" space between the ends of each panel. Make sure tubing groove is free from sharp edges and burrs. Use a dowel or piece of pipe in the groove to line up the plates.
- Place the uncoiler in an out of the way area, still close enough to easily feed the tubing to the area you are working on. Place the tubing coil on uncoiler and remove tape/straps.
- Pull the loose end of the coil and feed the tubing through the holes in the joists from the area closest to the manifold to the joist cavity for the loop farthest away. Make a large loop with tubing and start threading the loose end back through the same holes over to the manifold leaving the large loop of tubing at the far joist cavity. You have to continually feed the tubing from the uncoiler as you thread the tubing back. Record the footage mark on tubing. Attach a bend support to the tubing as necessary. Cut the end of the tubing with a suitable tubing cutter making sure the end is square and clean. Connect to the supply of the first loop on the manifold using the correct fitting assemblies as outlined in "Connecting the Loops to the Manifold" beginning on page 46.
- At the farthest joist cavity, start expanding the large loop by pulling on the end that is fed from the uncoiler, at the same time, carefully twist it 180 degrees to make a pig-tail. Extend the loop end all the way to end of the joist cavity. Temporarily attach the loop end to hold it in place.
  - For Joist Heating, starting from the loop end, hang the tubing in the joist cavity using suitable clips or hangers. Leave about a 1–2" air gap between the tubing and the bottom of the subfloor. Work your way all way down to the beginning of the joist cavity. Arrange tubing, making sure everything looks professional and neat. Complete next loop cavity following steps above.
- Once back at the manifold, record the footage mark on tubing. Attach another bend support to the tube as necessary. Cut the end of the tubing with a suitable tubing cutter making sure the end is square and clean. Connect to the return of the first loop on the manifold using the correct fitting assemblies as outlined in "Connecting the Loops to the Manifold" beginning on page 49.
- Mark each tube end as the supply or return and what area it is providing for.
- Repeat the same process remaining loops.

INSTALLING MrPEX® TUBING IN JOIST CAVITY

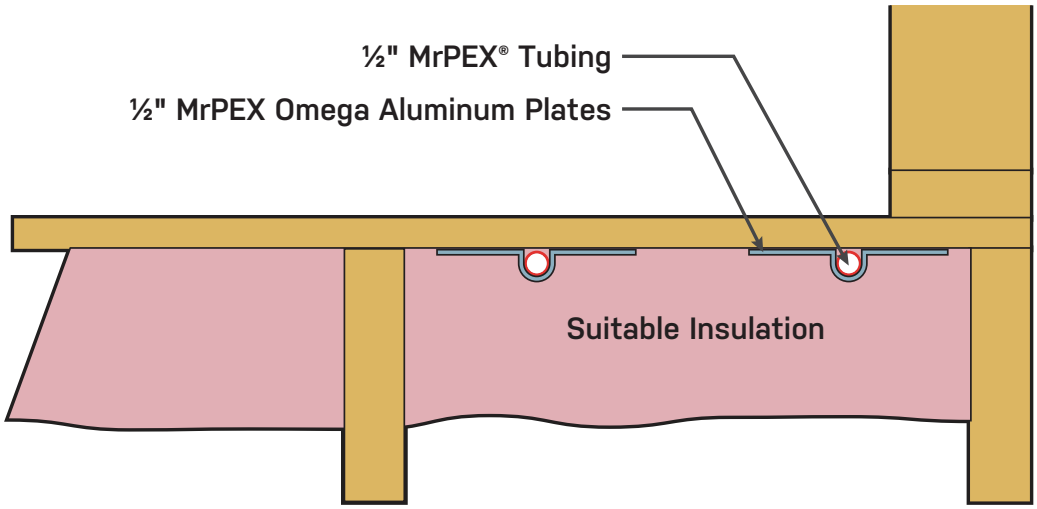


BELOW FLOORING (cont.)

NOTE: Use MrPEX® Design Software to establish heat loss for the structure, and to calculate output, surface temperature, water temperature and tubing/manifold pressure drops.

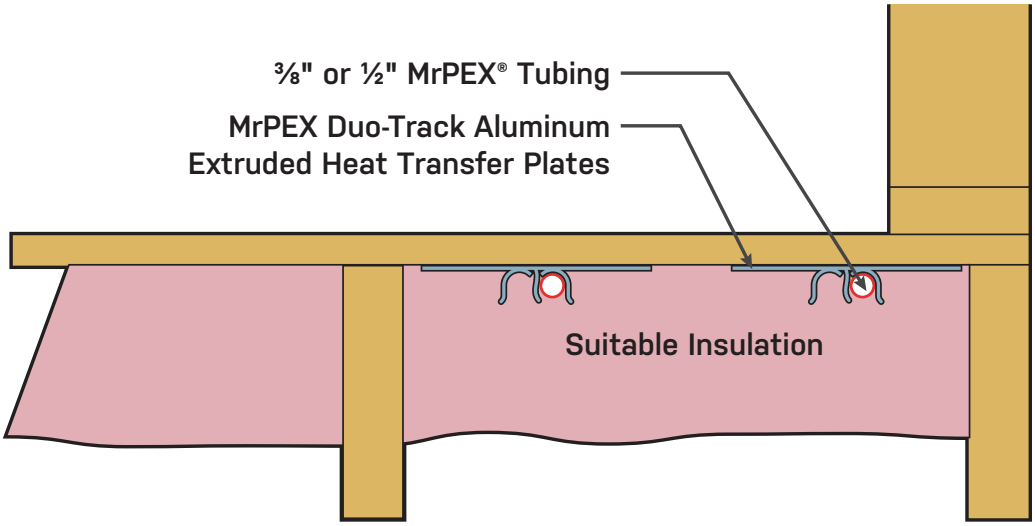
STRUCTURAL NOTE: Project Engineer, Project Architect or System Designer need to verify and approve the structural impact of the radiant system on the building prior to installation.

› For Omega Plates, starting from the loop end, put the first Omega plate up against the subfloor at the same time snapping the tubing into the groove. Attach the plate to the subfloor using suitable fasteners such as 5/8" staples (2–3 per side). Leave about a 1/4"–1/2" space between the ends of the panels. Work your way all way down to the beginning of the joist cavity. Arrange tubing, making sure everything looks professional and neat. Make sure tubing groove is free from sharp edges and burrs. Complete next loop cavity following steps above.



DUO-TRACK

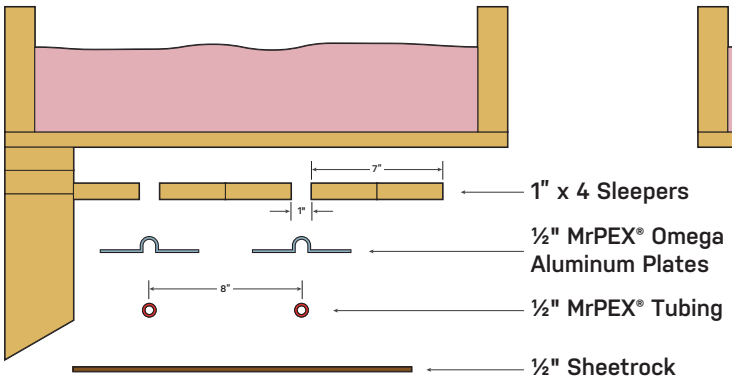
› For Duo-Track (installed before running tubing), start from the loop end and snap tubing into the grooves using a rubber mallet or palm-nailer. Work your way all way down to the beginning of the joist cavity. Arrange tubing, making sure everything looks professional and neat. Complete next loop cavity following steps above.

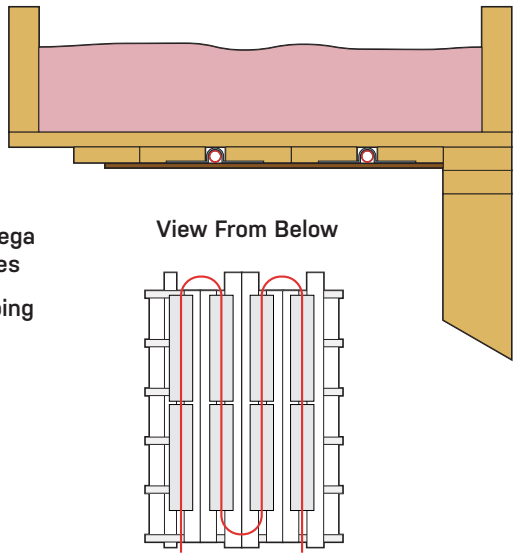


RADIANT CEILING WITH ALUMINUM HEAT EMISSION PLATE

NOTE: Use MrPEX® Design Software to establish heat loss for the structure, and to calculate

- Make sure the bottom of the ceiling joists are clean and free of nails/screws etc..
- For fastest installation, use 1 x 4's as sleepers.
- Start by the outside wall and attach one run of the 1 x 4 sleeper perpendicular (90 degrees) to the ceiling joists.
- Following the first sleeper, leave a 1" gap and then continue to fasten two 1 x 4 sleepers next to each other to the ceiling joists covering the rest of the area. Stagger the sleepers at the end at least 8"-12" at the end of each run to leave ample room for tube turn. Accommodate for the return tube run back to the manifold.
- Place omega plates in the 1" grooves. Leave ¼" - ½" space between plates. Using a pneumatic stapler, staple only one side of the omega plate to the sleeper.
- Start laying the tube snapping it into the omega plates as you go along. Connect the tubing to the manifold and repeat process for next loop.
- Once tubing is installed, perform a pressure test of 40 – 60 psi for 24 hrs to ensure that the tubing has not been damaged during installation.
- Install sheetrock making sure not to damage the tubing. Leave system under pressure on to notice any damage during installation.

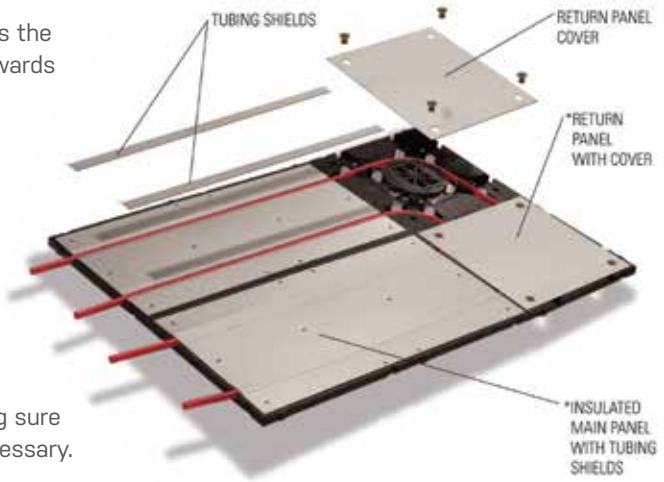




RETROPANEL ON EXISTING CONCRETE

NOTE: Use MrPEX® Design Software to establish heat loss for the structure, and to calculate output, surface temperature, water temperature and tubing/manifold pressure drops.

- Review layout and start by identifying the manifold location. If the manifold is located behind a stud wall, cut out the bottom plate and about 1.5" of the sheet rock at the bottom.
- Make sure concrete floor is level, clean, and knock down or grind off any bumps or high spots that may interfere with the panels. If necessary, do a skim coat of self leveling concrete as per manufacturers instructions.
- Cover complete area where the panels will be with a 2 mil vapor barrier. It is helpful to hold the vapor barrier in place with tape.
- Start in a far corner by laying the RetroPanels across the width of the room row by row building the layout towards the manifold.
- Once the layout is complete for that room, slide the RetroPanel floor assembly so that it has at least 3" around the perimeter of the whole assembly. Typically one or two sides will be bigger than the other two. If there is an uneven spot where there's too much movement. Use tapcon masonry screws as necessary to tighten down the panels.

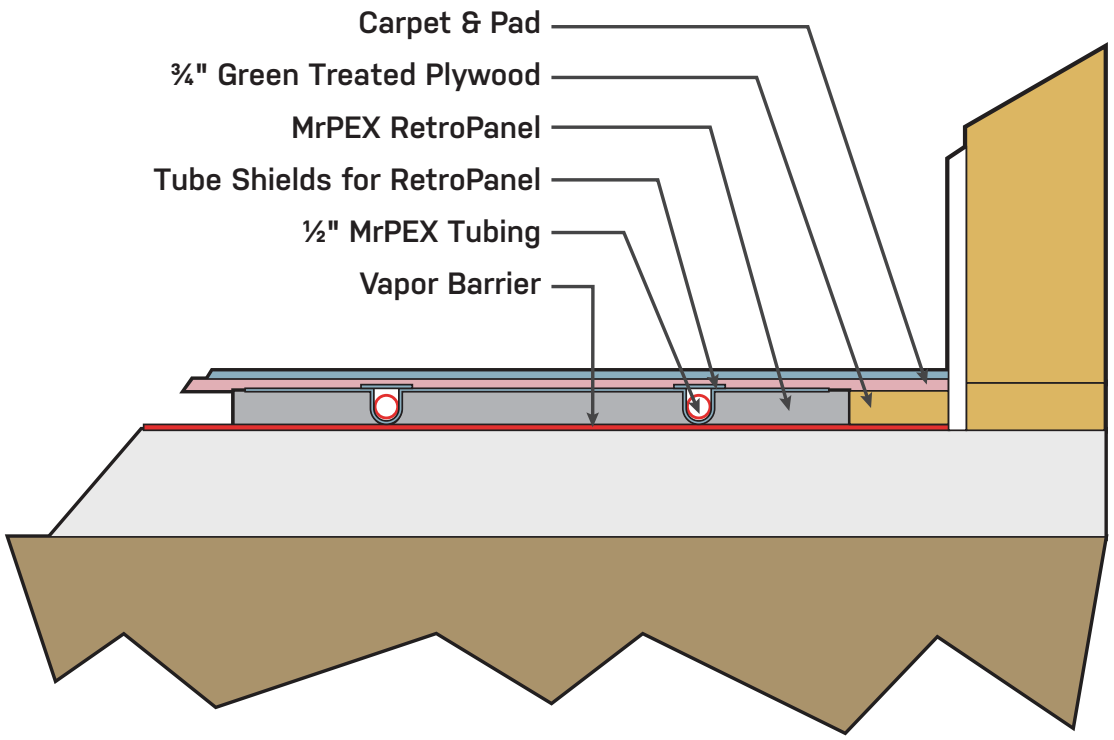


- Complete the remaining rooms the same way making sure to follow the design layout. Make adjustments if necessary.
- To start the tube installation, run the end of the PEX coil under the sheetrock wall and up about 3'–4' up the wall at the manifold location. Keep tubes organized and labeled.
- Follow the design walking the tubing into the grove of the RetroPanel. Use work boots or other hard-sole shoes to push the tubing to make it seat fully in the grove.

NOTE: Do not use a rubber mallet as it may dent or deform the metal.

- Once back at the manifold, estimate the tubing needed to complete the run, cut it and run it under the wall and tie it together with the supply for that loop.
- Mark each tube end as the supply or return and what area it is providing for.
- Complete all the loops in the same fashion.
- Once all the loops are installed, mount the manifold and connect the tubes, perform a pressure test of 40–60 psi for 24 hrs to ensure that the tubing has not been damaged during installation. Leave the pressure on until all construction is completed.

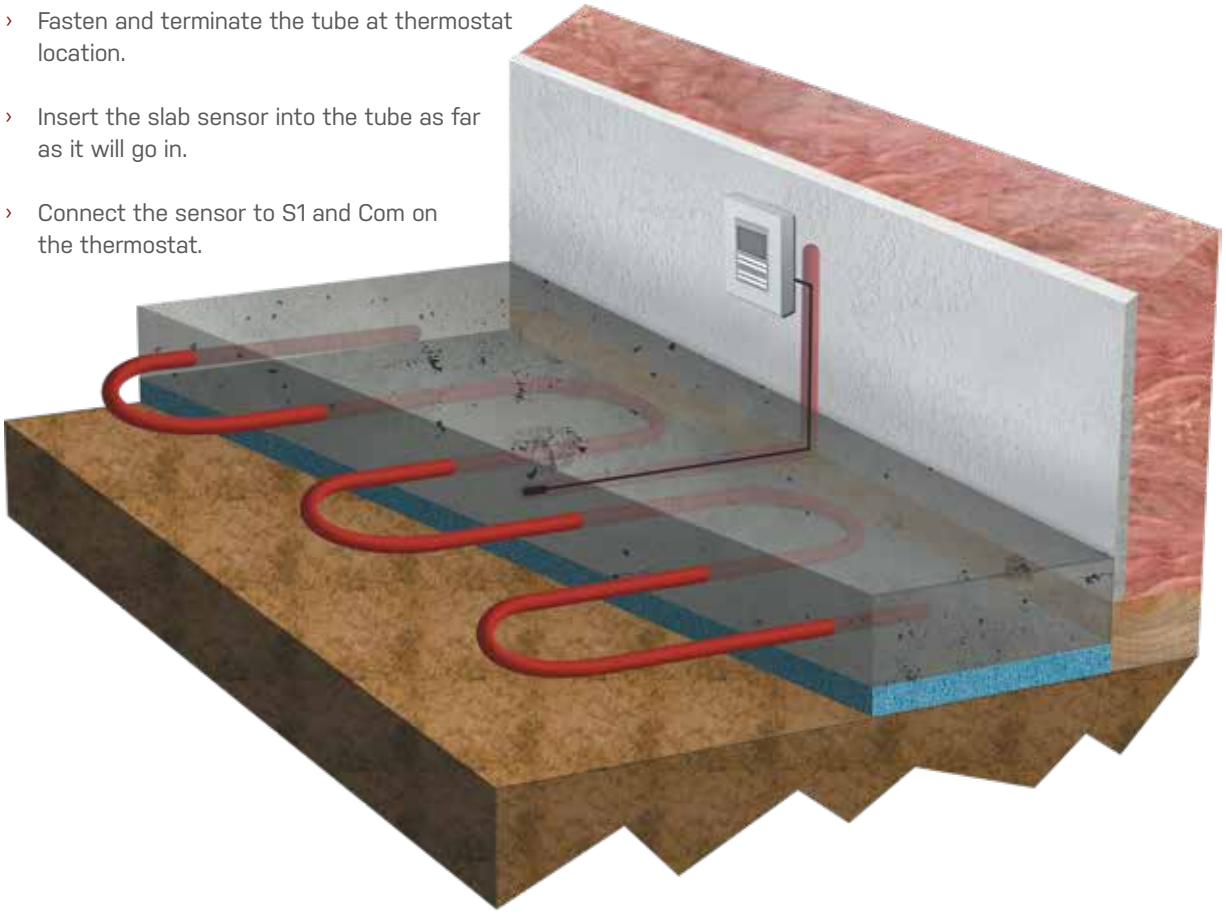
- Use 3/4" green treated plywood to fill in the areas not covered by the RetroPanels. Plan a 1/4" gap between the panels and the plywood to accommodate any movement. When securing the plywood to the concrete, use tapcon masonry screws or ramsets to adequately secure the plywood.
- For the area around the manifold, organize the tubes and make sure they lay flat. Use conduit clamps screwed to the concrete if necessary. Then fill in the area with self-leveling patching concrete to the level of the panels and let fully harden over night. Touch up if necessary.
- Attach covers for the turn-around panels using supplied plastic clips. Place tube shields over the exposed tubing in the straight panels. Use packing tape to secure the tube shields. Make sure the panels are clean prior to taping to ensure adequate adhesion.
- For carpeting, make sure the carpet installer is aware of where the tubes are when installing the tack-strips. In areas close to the tubing, use construction glue and let harden over night. Install carpet and pad as usual.
- For tile, it is only recommended to use in smaller areas such as bathrooms or in front of sliding doors etc. Use 1/4" cement backer board or similar. Pay close attention to where the tubes are located before gluing and screwing down the backer board. Follow tile installer recommendations.
- Only floating wood floors are recommended. Follow wood floor manufacturers recommendations.



INSTALLING THE SLAB SENSOR

When Using MrPEX® air and floor sensing thermostats (part # 5110519 and 5110521), and you want to use the floor (slab) sensor, follow the recommended steps.

- Determine the thermostat location.
- Use 1/2" or 5/8" Pex tubing, start with capping one end of the tube, place capped end directly between MrPEX® tubing runs, preferably a foot or two from the wall. Fasten capped end to subfloor with staple or straps from capped end to the wall.
- Install a bend support onto the tube to direct the up the wall cavity..
- Fasten and terminate the tube at thermostat location.
- Insert the slab sensor into the tube as far as it will go in.
- Connect the sensor to S1 and Com on the thermostat.

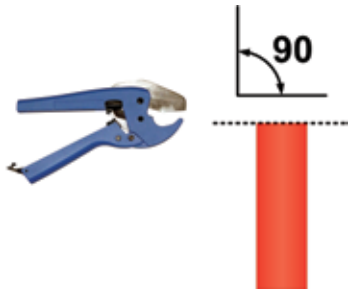


CONNECTING THE LOOPS TO THE MANIFOLD

The MrPEX® residential manifolds use a 20mm Eurokonus (EK20) connection also know as G 3/4". You must use one of the MrPEX® fitting assemblies that fit our manifold. Use either an EK compression fitting assembly for "MrPEX® PEX Tubing" and "MrPEX® PEX-AL-PEX Tubing", the press fitting to EK for "MrPEX® PEX-AL-PEX Tubing" only, or a F1960 PEX expansion fitting.. All types of tubing can be connected to our manifolds using one of these style fittings.

FOR PEX FITTING ASSEMBLY

› Start by making a square cut at the end of the tube even with the bottom of the manifold outlet nipple (without the fitting) using a suitable tubing cutter.
If PEX-AL-PEX tubing is used, also ream the tubing using our reaming tool.



› For three piece compression fittings:

STEP 1–2 Slide on the large nut over the tubing (threads facing up).

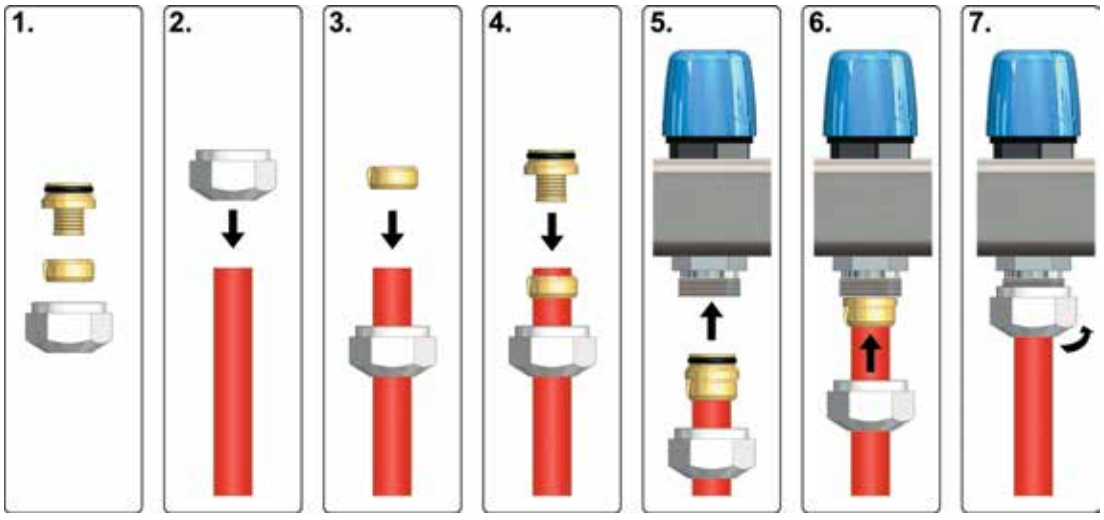
STEP 3 Slide the compression ring on the pipe if applicable.

STEP 4 Put the insert into the end of the pipe and push it all the way in until it stops. You can use a non-metallic object such as a block of wood and gently tap it to make sure it is completely seated.

STEP 5 Slide the compression ring up against the insert. Lubricate the o-ring at the top of the insert.

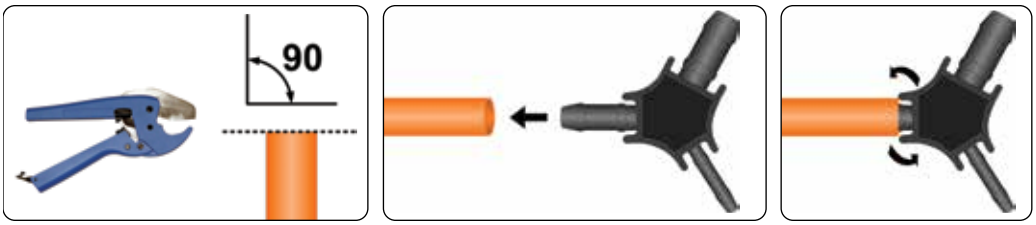
STEP 6 Gently push the insert into the manifold seat making sure the o-ring doesn't get caught.

STEP 7 Holding the tubing straight and in place, slide up the compression nut and thread it onto the manifold outlet. Tighten nut with suitable wrench. The tubing will relax slightly under the pressure, so the fitting needs to be tightened a second time after about 20–30 minutes to ensure tightness.



FOR PEX-AL-PEX PRESS FITTING ASSEMBLY:

› Start by making a square cut at the end of the tube even with the bottom of the manifold outlet nipple (without the fitting) using a suitable tubing cutter.
If PEX-AL-PEX tubing is used, also ream the tubing using our reaming tool.

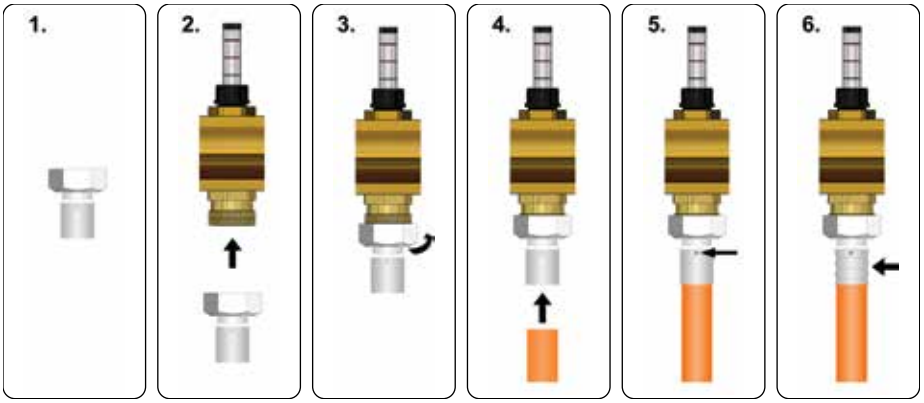


STEP 1–2 Start by attaching the press fitting assembly to the manifold.

STEP 3 Tighten nut with suitable wrench.

STEP 4–5 Slide the tubing into the press fitting until you can see the end of the tube in the view port. Lubricating the inside of the pipe may aid the installation.

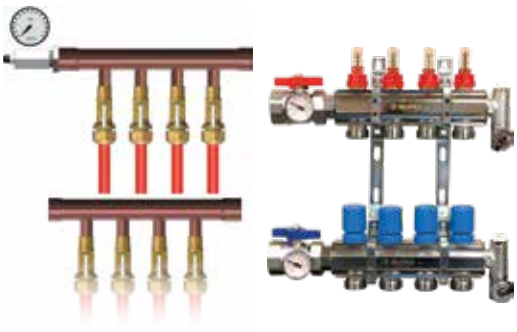
STEP 6 Using either a manual or battery press tool, complete the fitting. Make sure that the press jaw is up against the shoulder of the fitting.



PRESSURE TESTING THE LOOPS

TEMPORARY MANIFOLD FOR PRESSURE TESTING

Temporary manifolds can be quite simple since the only requirement you have is to connect the loops for pressure testing. A simple copper plumbing manifold will do fine. As mentioned in previous section, it is a good idea to have the manifold already prepared and ready for mounting prior to arriving at the jobsite. This includes mounting the pressure test kit on the manifold. Make sure to mount the temporary manifold slightly higher than the finish manifold to make sure that you have enough length of the tubing left after you remove the test manifold. For the finish manifold, the lower manifold ports should be at least 18"–24" off the floor to make sure that you have enough tubing to work with. Mount the temporary manifold about 6" higher. Use appropriate tools and fasteners to secure the manifold before starting the tubing installation.



PRESSURE TESTING THE LOOPS AND MANIFOLD

Pressure testing of a completed piping system is typically required by local code regulations and the piping manufacturer to ensure pressure tightness. In new construction, it is often difficult to test systems using pressurized water because of freezing conditions, insufficient water supply, or insufficient water pressure. It is the recommendation of MrPEX Systems that the system be allowed to be pressure tested with compressed air or inert gas in accordance with local codes. Once all loops have been installed and connected to the manifold, it is time to pressure test the tubing and manifold.

› Connect a pressure test kit with a 0–100 psi gauge and an air valve to the manifold. › prior to filling the system, make sure to open the manifold supply and return valves.

› Pressure test any portion of the system that will be embedded in the floors, walls or ceilings of the building to 40–60 psi or 1.5 times the operating pressure, whichever is greater, for at least 30 minutes or for a sufficient period of time to determine if any leaks exist in the system, and as consistent with local and mechanical codes. Reduce pressure to 30 psi prior to embedding the tubing. A 30–40 psi pressure test should remain during phases of construction to monitor system integrity.

NOTE: If tubing is to be left under pressure for a longer period, make sure to reduce the pressure to 30 psi. NOTE: Consult local mechanical code for specific requirement in your area.

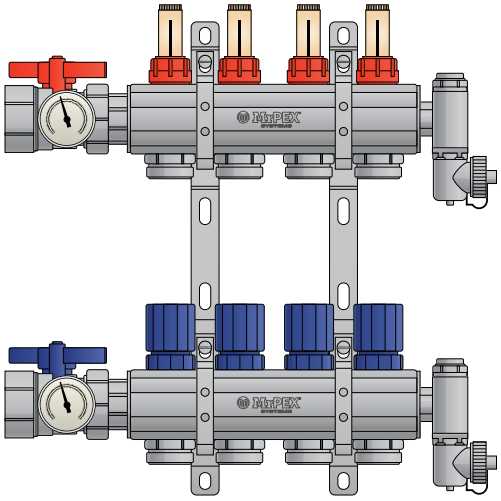
WARNING:

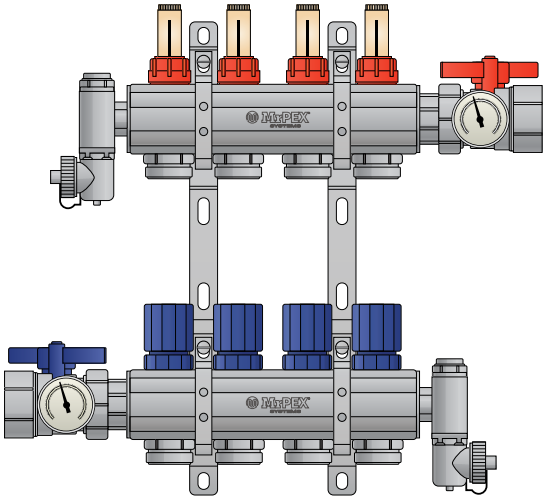
Hydro testing with plain water is not recommended in geographical areas where the temperature could dip below freezing. Even if the system is "Blown out", it is very difficult to get all the water out of the system. Remaining water after blowing the system out, will collect in low areas and will be subject to potential freezing that could cause damage to pipe and surrounding structure. Compressed air or inert gas (e.g. nitrogen) used for pressure testing has a high potential (stored) energy. Any uncontrolled release of that energy can present serious safety hazards. PEX is a flexible piping material. Therefore, a failure or separation of the piping may cause unrestrained piping to whip about as the energy of the suddenly decompressing air or gas escapes. PEX piping must be properly restrained to prevent or limit whipping in these cases. All fastening and securing requirements of the PEX manufacturer must be followed. Any incomplete or unrestrained fitting could become a projectile during pressure testing. Therefore, all fittings must be installed correctly and all pipes must be secured properly according to the installation instructions prior to pressure testing the system. Appropriate safety practices must be followed.

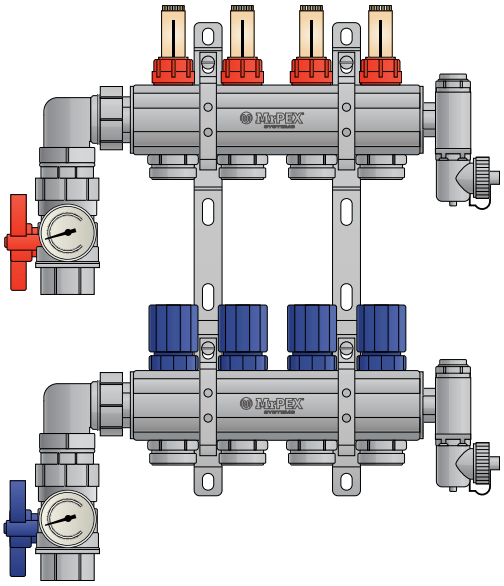
FINISH MANIFOLD

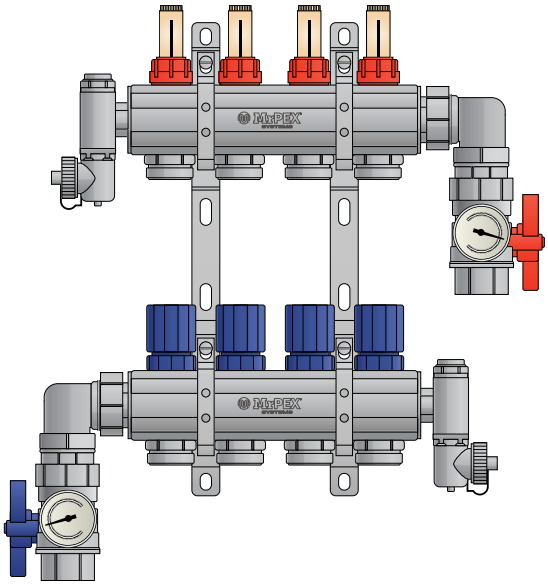
The finish manifold consists of a supply and a return header. The supply body is equipped with a balancing valve and flowmeter, and the return body is equipped with an on/off valve. A plastic knob comes standard on the on/off valve for manual control and can be removed to accommodate a valve actuator for electronic zone control. If you are using the finish manifold on the jobsite for pressure testing, take appropriate measures to protect the manifold from jobsite damage, dust, and/or paint etc. Make sure installation looks professional and neat. It is a good idea to have the manifold already prepared and ready for mounting prior to arriving at the jobsite. This includes mounting the pressure test kit on the manifold. For the finish manifold, the lower manifold ports should be at least 12"–18" off the floor to make sure that you have enough tubing to work with. Use appropriate tools and fasteners to secure the manifold before starting the tubing installation.

Finish manifolds should be equipped with a fully sealing ball valve on the supply and return to allow servicing the manifold and tube without interrupting the pressure in the rest of the system.









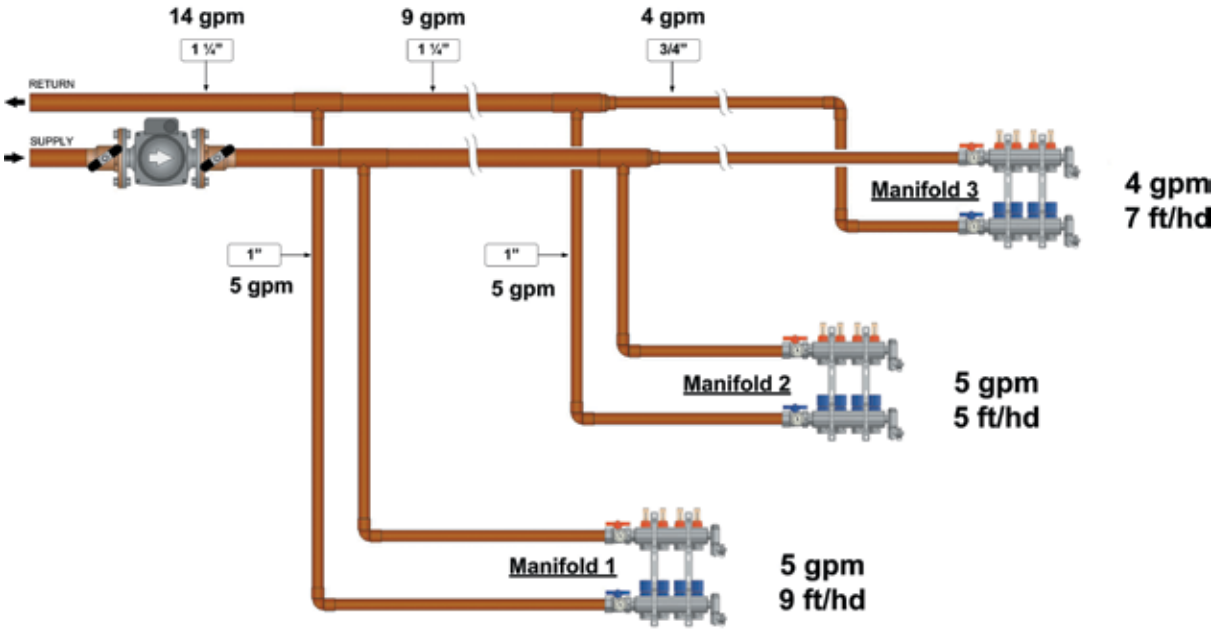
INSTALLING MAINS

ROUTING OF MAINS

There are two methods used to route the mains from the mechanical room to the manifold(s), Home Run or Branch and Tee. The decision of which to use depend on a couple of things. If the manifolds are zoned using zone valves or zone pumps, the Home Run method seems to work best since the zone valve and pumps are typically located in the mechanical room. This method does however utilize more piping for mains. If the manifolds are zoned using actuators, you can use either method. In either method, make sure to size the mains and pump to accommodate the flow for all the manifolds served by that pump, then as you branch off and flow is reduced, you can down size as needed.

Fluid Velocities should be between 1.5 and 4 feet per second for mains 1/2" through 2", and between 1.5 and 5 feet per second for mains 2.5" and larger.

GENERAL GUIDELINES	
GPM	MAIN SIZE
0–4	3/4"
4–8	1"
8–14	1.25"
14–25	1.5"
25–45	2"



Example of zoned loops (Branch System)

HEAT SOURCES

The heating source should be part of the design prescribed by the engineer or project manager that best fits the design parameters. Supply temperature exiting the heat source should not exceed the maximum supply temperature required by the floor panel unless tempered by a water temperature control device that insures that the maximum floor supply temperature will not be exceeded. Maximum supply water temperatures allowed for concrete is 150°F and for gypsum poured underlayment is 140°F.

DISCLAIMER: Manufacturers installation and operation instructions and local codes must be followed. MrPEX® does not take responsibility for heat source warranty or performance. System designer is responsible for sizing the heat source to meet actual demand.

Boiler Specifications

- The system designer should consult with the boiler manufacturer or supplier on the type of piping, operating fluid temperatures, and flow conditions appropriate for the application of the boiler in radiant panel or combination systems.
- Where the boiler manufacturer specifies a minimum return water temperature, flow rate and temperature rise, the designer will ensure the system arrangement and control method will automatically allow the system to operate at or above the manufacturer minimums for every normal operating cycle.

Boiler Output

- The boiler net output should be within 100% to 120% of the actual heat loss unless design factors, pipe losses or boiler ratings require exceeding this range.
- Additional output capacity should be allowed when other heating demands such as domestic water priority systems, hot-tub, swimming pool, snow-melting, etc. are serviced from the same source.
- Future system expansion should be considered.

Condensing Boilers

- A condensing boiler, in which the heat exchanger and venting system is specifically designed to operate with condensing flue gases, can be connected directly to the panel heating system without any type of boiler protection mixing device.
- These boilers should be operated at lowest possible temperature in order to maximize their efficiency.
- Consult with boiler manufacturer for any specific installation or application instructions.

Non-Condensing Boilers

- A non-condensing boiler, in which neither the heat exchanger nor the venting system is designed to handle condensed flue gases, must be properly protected from flue gas condensation.
- Non-condensing boilers should not have an operating temperature below the minimum fluid temperature recommended by the manufacturer.
- In many cases an appropriate mixing arrangement may be required to ensure the flue gases do not condense throughout the full operating range of the system.
- Consult with boiler manufacturer for any specific installation or application instructions

Dedicated Water Heaters

- Where permitted by code, a domestic water heater may be used as a heat source for hydronic radiant heating in a closed system providing all generally accepted piping practices for closed loop hydronic heating are used. This includes the use of a properly sized relief valve, expansion tank, fill valve, air eliminator and backflow preventer where required. The required temperature and pressure relief valve for the water heater must be installed regardless of whether a lower pressure relief valve is installed. Consult with water heater manufacturer and local codes for any specific installation instructions.

- The water heater net output should be within the range of 100% to 120% of the actual heat loss unless design factors, pipe losses or water heater ratings require exceeding this range.

- The dedicated water heater should be clearly and permanently marked "Not For Potable Water Use".

Combination Of Potable Water And Hydronic Heating Systems

- At the present time, some combined systems are approved by the major code councils, and some are not. MrPEX® reminds its customers and installers that they must protect the potability of the domestic water supply while complying with all relevant codes. MrPEX® further suggests that homeowners/end users be informed of the advantages and disadvantages of each system currently available. Consult with water heater manufacturer and local codes for any specific installation instructions.

- Use of water heater for a combination of potable and hydronic systems should conform to one of the following methods:

  - Water heater and heat exchanger:

    - Hydronic radiant heating and domestic use water may be heated by the same water heater provided a heat exchanger is used to separate the domestic water from the closed side of the system used for the radiant panel system.

    - The closed radiant panel side of the system should utilize all generally accepted piping practices for closed loop hydronic heating. This includes the use of a properly sized expansion tank, pressure reducing valve, fill valve, air eliminator, pressure relief valve and backflow preventer where required.

    - Heat exchanger may be integral to the water heater or external and must meet applicable codes for the separation of potable water from other fluids.

  - A domestic water heater may be used as a heat source for both hydronic heating and domestic potable water in an open system when all the pipe, fittings and fixtures used within both the heating system and domestic system are suitable for potable water and pressure tested to regulatory limitations for each.

    - A control device should be installed on the radiant heating portion of the system to insure that the water will be periodically circulated through the heating system to avoid stagnation during the off-season. This circulation should be at least one complete water change every seven days.

- Additional requirements for use of a water heater in combined systems

  - No chemical additives to the system

  - No water heater should replace an existing boiler

  - Anti-scald valve should be provided for proper domestic water temperature on the potable side.

***Please refer to MrPEX® Design Manual for further information*

PUMPS

The pump used should be a wet rotor circulator type for use in hydronic applications.

Delivering the correct BTU to the designated space is sole purpose of the pump. Verify that the designed pump is in conjunction with the design parameters, looking at the pressure drop of the system, along with the desired flow needed. Keeping in mind, the viscosity of anti-freeze that is being used.

There are two different pumps that are commonly used in installations. "Fixed speed" pumps are generally less expensive to purchase but cost more to operate and will only move a specific GPM depending on the amount off head loss/pressure drop. A "variable speed" pump has the ability to deliver different GPM with the same pump due to the fact that the speed can be changed depending on the systems parameters. Variable speed pumps use less energy to operate simply because the pump runs at a lower speed still delivering the proper amount of fluid.

DISCLAIMER: Manufacturers installation and operation instructions must be followed. MrPEX® does not take responsibility for pump warranty or performance. System designer is responsible for sizing the pump to meet actual system requirements.

WIRING

- Thinking about how the system will be controlled and the type of zoning (if any), is a must, at the time of installing MrPEX® tubing.
- Refer to design to pull correct wire to proper location.
- MrPEX® recommends using a thermostat with a slab sensor (part #5110741). Use 18Gauge wire, 4 conductor for this thermostat, pulling wire from the thermostat to either the manifold if using actuators to zone or to the heating plant to turn on the heat source.
- MrPEX® air sensing thermostat (part #5110519 or 5110521), uses 18/4 wire, pulling to either the manifold if using actuators to zone or to the heating plant to turn on the heat source.
- If using a remote manifold, power must be located at the manifold, either a 24volt transformer, or an 18/4 wire pulled to this location from the heat source. The 18/4 wire will be used for 24volt power along with an end switch.
- If transformer is mounted at manifold location, pull 18/4 wire to heat source for end switch.

FILLING/PURGING INSTRUCTIONS FOR CONVENTIONAL BOILER (UTILITY PUMP)

Safety tip: Before beginning, turn off power to boiler and circulator.

FILLING AND PURGING LOOPS THROUGH MANIFOLD

STEP 1 Close Manifold Isolation Ball Valves (#10) and (#12).

STEP 2 Open all the manifold flow meter valves (#11) by turning counter-clockwise.

STEP 3 Close all manifold valves (#13) except for the first loop by turning the plastic knob clockwise. Leave it wide open.

STEP 4 Connect a garden hose (#15) to the drain valve on the return manifold end cap (#14) and put the open end in a 5 gallon bucket. Place bucket over a drain or outside. Turn the cap over and use it to open the drain valve on the end cap valve fully.

STEP 5 Connect a double ended female washing machine hose (#17a) to the drain valve on the supply manifold end cap (#14a) and connect it to the outlet side of the utility pump (#16). Connect a garden hose or washing machine hose (#15) to the inlet side of the utility pump and put the open end in the 5 gallon bucket.

STEP 6 Fill bucket 3/4 full with distilled or RO (Reverse Osmosis) water. Have enough additional water ready to keep filling the bucket as it fills the system.

STEP 7 Turn over the cap for the supply manifold end cap (14a), and use it to open the drain valve fully. Turn on the utility pump and start filling the first loop on the manifold.

STEP 8 Water will start filling the first open loop and empty into the bucket. Let the water run until ALL air is purged from that loop. Monitor water for air bubbles in the 5 gallon bucket. This is a good indicator that the system is free of air. Close the on/off valve (#13) and repeat this process for each loop on the manifold. Add more water to the bucket as needed.

STEP 9 Repeat step 8 a second time. Leave all on/off valves (#13) closed for now. Close first return manifold end cap drain valve (#14), then the supply manifold end cap drain valve (#14a). Shut off the utility pump. Loops are now filled and purged.

FILLING AND PURGING THE REST OF THE SYSTEM

STEP 10 Remove the double ended washing machine hose (#17a) from supply manifold end cap drain valve (#14a) and connect it to Boiler Drain (#19).

STEP 11 Open Return Manifold Isolation Ball Valve (#12), and Ball Valves (#3) on supply and return side of the boiler.

STEP 12 Manually set Mixing Valve (#9) in a mid-position so that it allows water to flow through all ports.

STEP 13 Loosen cap on air eliminator (#6). *filling*

STEP 14 Start the utility pump and slowly open Boiler drain (#19) to fill the boiler and the rest of the system. *NOTE: Do NOT exceed 30 psi. Full water pressure may damage the expansion tank or force open the pressure relief valve. A second person may be needed to monitor pressure while filling.*

STEP 15 Water will start filling the boiler, boiler piping, and return piping and empty into the bucket. Let the water run until ALL air is purged from that loop. Monitor water for air bubbles in the 5 gallon bucket. This is a good indicator that the system is free of air. Add more water into the bucket as needed.

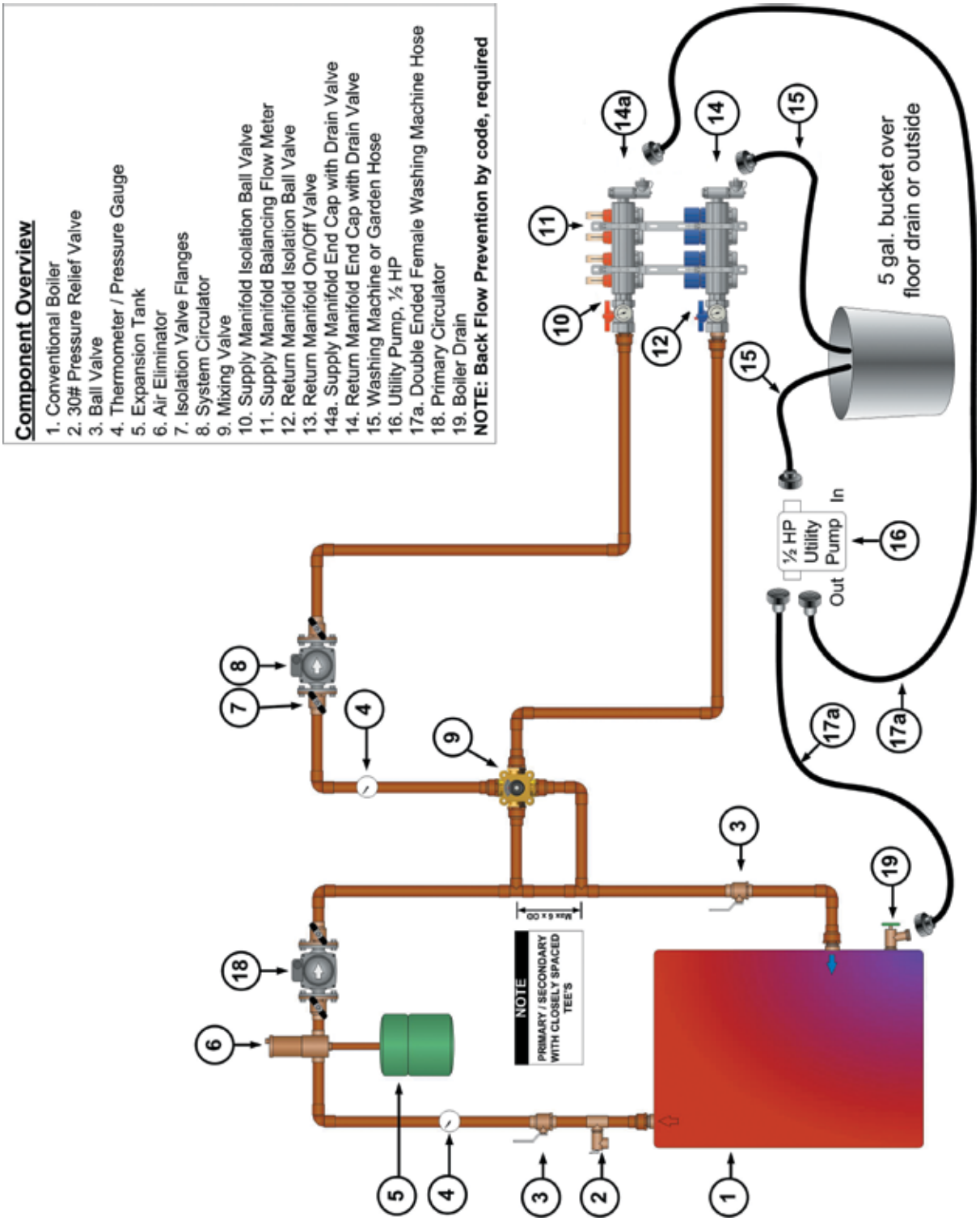
STEP 16 Close return manifold isolation ball valve (#12). Open all manifold on/off valves (#13) and supply manifold isolation ball valve (#10). Again, let the water run in bucket until all the air bubbles are gone.

*continued on **next page***

STEP 17 Slowly close the drain valve (#14) and monitor the system pressure. Close Boiler Drain (#19) when system pressure reaches about 12–18 psi.

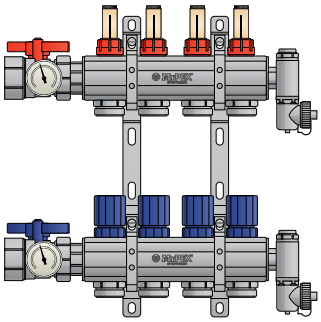
STEP 18 Open return manifold isolation ball valve (#12).

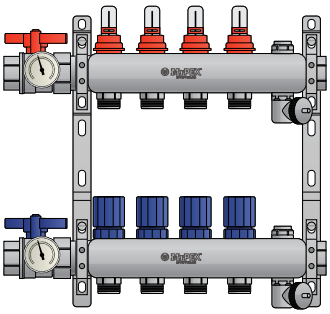
STEP 19 System is now ready for start-up. Turn power on for the circulator (#8) and (#18) and let run for about one hour before turning firing the boiler. Monitor the pressure. During this phase additional air may be vented from the system, lowering the system pressure. Add water with utility pump through Boiler Drain (#19) to maintain 12–20 psi. If zoning system is not yet connected, have the electrician make a temporary hook up to power the pumps.

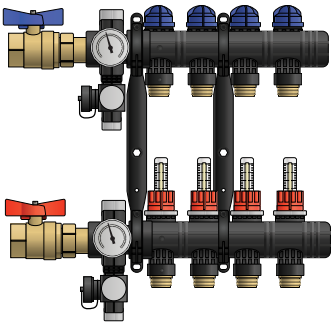


BALANCING THE MANIFOLDS

Balancing the manifold is the key to having the right heat delivered to the correct loop, zone, or room. The manifold is the distribution point where all the loops connect. Depending on design requirements, each loop will cover a specific area, and subsequently, its length and heat demand will be different from that of the other loops on the manifold. To meet the heat demand of a particular loop, first, flow needs to be established, then, the pressure drop of the worst loop so that a pump can be selected. The pump is sized to deliver the correct flow to the manifold. However, that's not the end of it. Water will travel the path of least resistance. A longer loop will have a higher pressure drop compared to a shorter loop, so, given the opportunity, the water will try to go the path of least resistance, through the short loop. This results in too much flow through the short loops (potentially over heating), and too little flow (never satisfying the thermostat) in the long loops. Balancing takes in account the heat demand (flow) needed and the pressure drop, and diverts the flow to accurately give all the loops their required amount. All MrPEX® Manifolds have loop flow meters available. Use the MrPEX® Design Software to complete the design, each manifold and loop will have a target design flow and pressure drop. The manifold info is used for pump sizing (see Pump Sizing Section) and the loop flow for balancing the loops by dialing in the correct flow on the flow meters.







PROPORTIONAL BALANCING

In areas where all the loops on a manifolds are in the same zone/room and have the same heat demand, proportional balancing can be used as long as the valve authority is setup as a straight line curve, meaning 50% open = 50% flow and 100% open = 100% flow. A lot of valves are not calibrated in this manner so please make sure you know. In the case of proportional balancing, we just need to make sure that the water entering the manifold gets distributed evenly across the loops i.e. making the water think all loops are the same length by creating artificial resistance. Our MrPEX 1 ½" Stainless Steel manifold offers as an example the on/off valve with balancing (part# 3240003). This valve has a straight line balancing valve with 10 turns from closed to open. Here is how you balance with this valve. Let's say we have a manifold with 3 loops, Loop 1 is 350ft, Loop 2 is 300ft, and Loop 3 is 200ft. The longest loop will have the highest restriction for the water, so we leave this wide open at 10 turns. Now, to balance the next loop, you simply take the loop length x 10 / longest loop (300 x 10 = 3000 / 350) = turns from closed to open (8.6). Same thing for the next loop, 200 x 10 = 2000 / 350 = 5.7. As you can see, the shorter loop has the least amount of turns open. This is due to the fact that we are creating artificial resistance so that the water thinks all three loops are equal. This eliminates one loop getting too much or too little flow/heat.

REPAIRING DAMAGED PEX

REPAIRING A KINK (PEX ONLY)

Note: When repairing a kink in a Pex-al-Pex tubing follow step 3 only!

Although MrPEX® Tubing is the most flexible and kink-resistant tubing on the market, it may still happen that a kink could occur. PEX-a (peroxide cross-linked PEX) has the very important property of being extremely crack-resistant, so that the kink will not result in a crack. This property results in a couple of "extra" options to repair kinks:

If the kink is not very accentuated, just rounding the tubing carefully with a pair of smooth pliers is acceptable. However, if the kink is in a place where there has to be a bend, there could be a risk that the kink re-develops. If so, measures have to be taken in order to prevent this from happening. One option is to apply a bend support in such a way that the kink gets firm support.

A kink will disappear if the kinked section of the tubing is heated to a temperature above the material's crystalline melting point, 270°F. This temperature can be reached with a thermostat controlled hot air gun. It is quite important that the hot air reaching the tubing surface does not exceed 330°F. Please check with a thermometer. First, relieve the tension on the kink by straightening the tubing. Carefully heat the tubing while continuously turning the hot air gun, allowing all sides of the kinked tubing section receive the same heat. The tubing wall will turn transparent in 2–4 minutes. When turning transparent, the kink will disappear. Stop heating and let the tubing cool down to room temperature, untouched, before continuing the installation. Applying cool water will speed up the cooling. The Tubing wall will turn opaque again. The very thin barrier layers may be slightly damaged during this process, but the core of the PEX Tubing will be fine. Local damage to the barrier layers will not affect the integrity of the installation. You may notice a very slight expansion of the heated section. That is because of the slight dimensional calibration performed during manufacturing will disappear, and that is okay. Never use a torch to heat the tubing! Overheating the tubing can lead to thermal degradation, which means that the life expectancy is compromised.

The third method to repair a kink is the "conventional repair method". See following pages 60–65 for instruction on specific coupling style used.

PEX COMPRESSION REPAIR COUPLING

Making the repair:

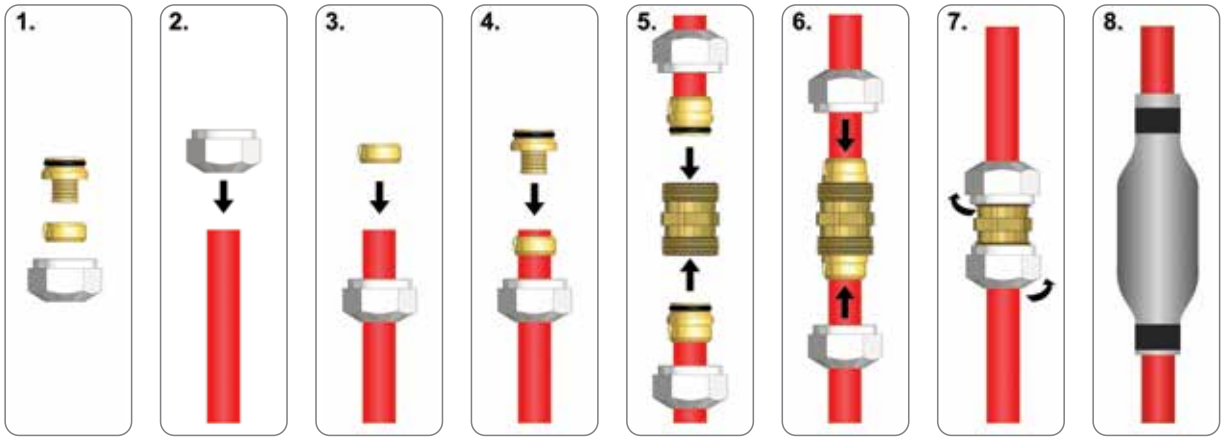
STEP 1 Start by cutting out the damaged piece of PEX, make sure the cut is square using a suitable tubing cutter.

STEP 2–3 After cutting the tubing, slide the nut then the compression ring onto each tubing end.

STEP 4 Push the inserts into the tubing until it stops.

STEP 5–7 Using a coupling nipple, connect each tubing end onto the nipple making sure not to damage the o-ring. Tighten the compression nuts using two suitable wrenches. Make sure to perform a pressure test prior to covering or burying the coupling.

STEP 8 Wrap coupling with suitable material such as foam insulation if coupling is to be buried to making sure the fitting is not in direct contact with the ground or concrete.



PEX F1807 PRESS BRASS REPAIR COUPLING

Note: This coupling method is considered a manufactured fitting and is approved by MrPEX® to be used to repair the MrPEX® PEX Tubing.

Making the repair:

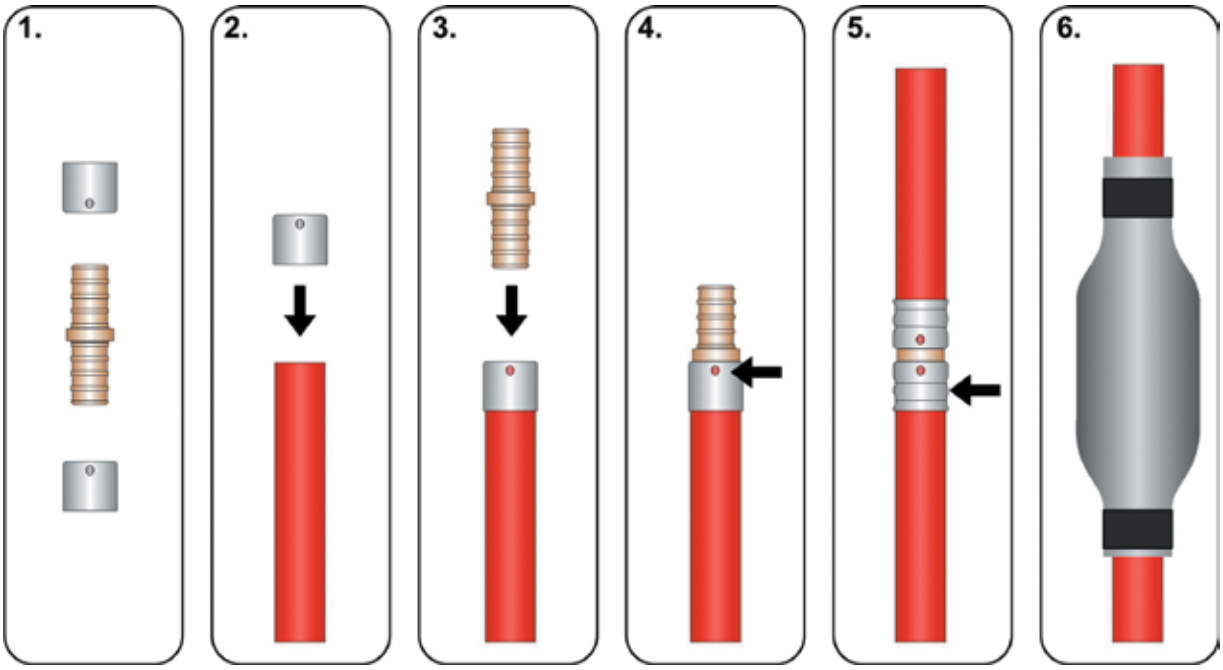
STEP 1 Start by making a square cut at the end of the tube using a suitable tubing cutter.

STEP 2 After cutting the tubing, slide the stainless steel press sleeve onto the tubing, making sure it seats all the way at the bottom. Tubing should be visible in the witness hole at the bottom of the press sleeve.

STEP 3 Push the tubing and sleeve onto the fitting until it stops.

STEP 4 Using either a manual or battery press tool, complete the fitting. Making sure that the press jaw is up against the shoulder of the fitting. Make sure to perform a pressure test prior to covering or burying the coupling.

STEP 5 Wrap coupling with suitable material such as foam insulation if coupling is to be buried to making sure the fitting is not in direct contact with the ground or concrete.



PEX PRESS F2159 PPSU REPAIR COUPLING

Note:This coupling method is considered a manufactured fitting and is approved by MrPEX® to be used to repair the MrPEX® PEX Tubing.

MAKING THE REPAIR:

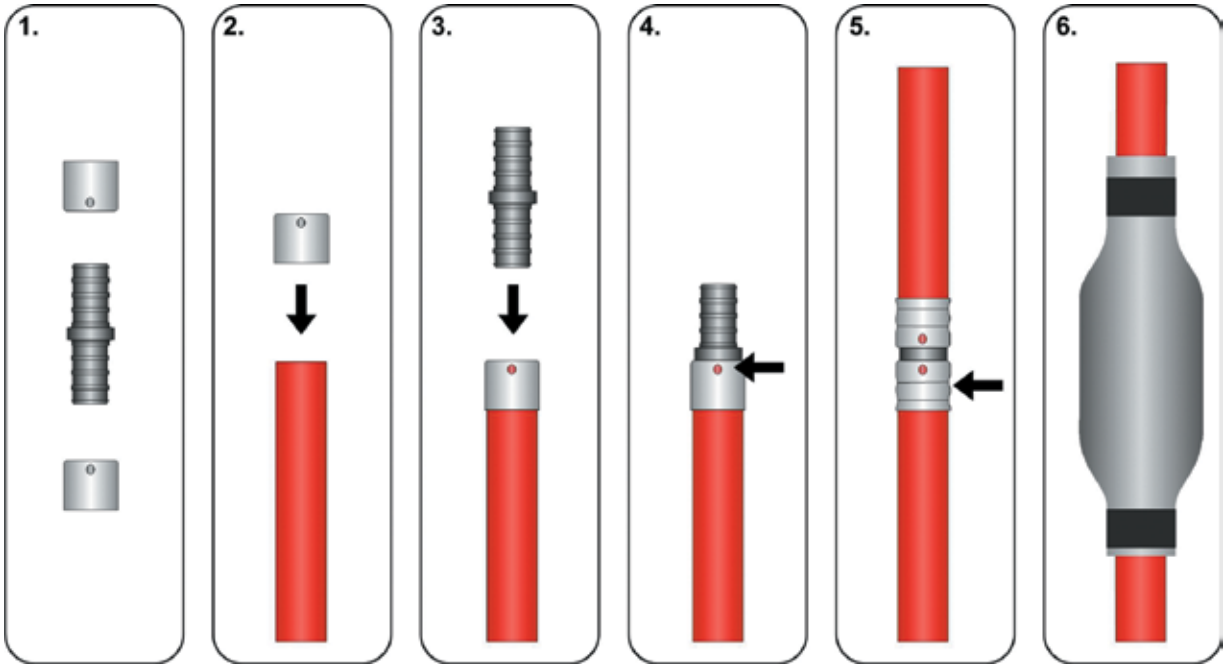
STEP 1 Start by making a square cut at the end of the tube using a suitable tubing cutter.

STEP 2 After cutting the tubing, slide the stainless steel press sleeve onto the tubing, making sure it seats all the way at the bottom. Tubing should be visible in the witness hole at the bottom of the press sleeve.

STEP 3 Push the tubing and sleeve onto the fitting until it stops.

STEP 4 Using either a manual or battery press tool, complete the fitting. Making sure that the press jaw is up against the shoulder of the fitting. Make sure to perform a pressure test prior to covering or burying the coupling.

STEP 5 Wrap coupling with suitable material such as foam insulation if coupling is to be buried to making sure the fitting is not in direct contact with the ground or concrete.



PEX F2080 AXIAL PRESS BRASS COUPLING

Note: This coupling method is considered a manufactured fitting and is approved by MrPEX® to be used to repair the MrPEX® PEX Tubing. Make sure to follow tool instructions.

MAKING THE REPAIR:

STEP 1 Start by making a square cut at the end of the tube using a suitable tubing cutter.

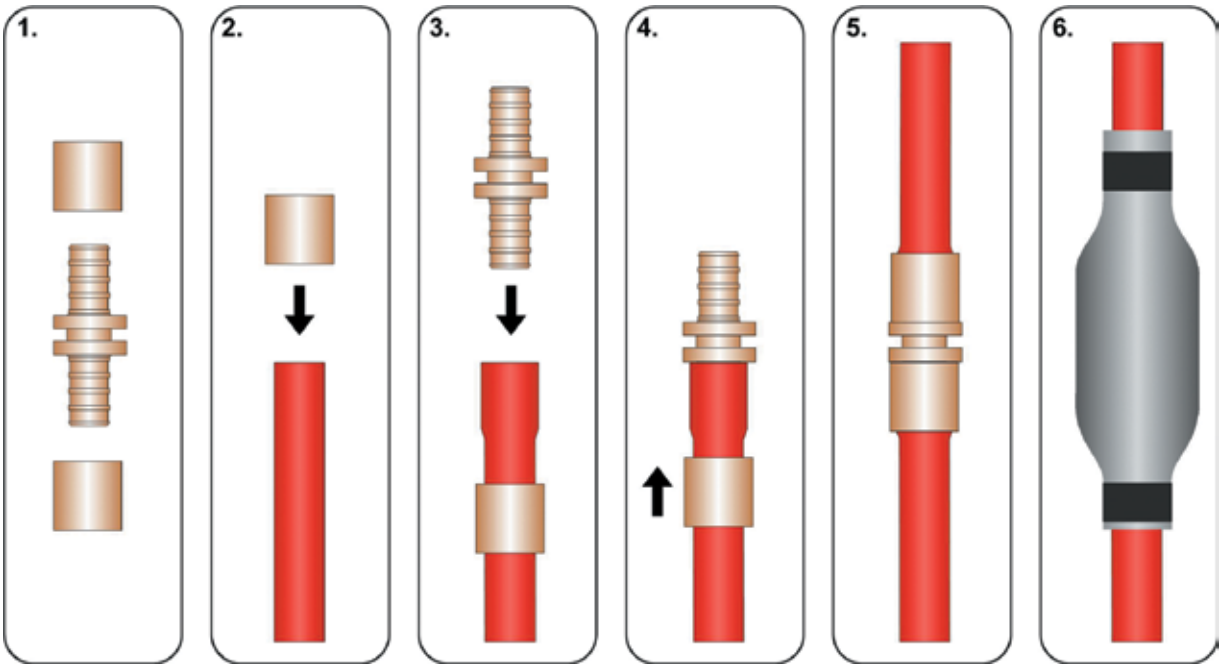
STEP 2 After cutting the tubing, slide the brass press sleeve onto the tubing. Using the blunt expander tool, expand the end of the tubing.

STEP 3 With the tubing expanded, push the fitting into the tubing until it stops.

STEP 4 Then using the ratchet tool, slide the brass sleeve up onto the fitting.

STEP 5 Secure the tubing until the sleeve seat against the brass shoulder. Make sure to perform a pressure test prior to covering or burying the coupling.

STEP 6 Wrap coupling with suitable material such as foam insulation if coupling is to be buried to making sure the fitting is not in direct contact with the ground or concrete.



PEX F1960 COLD EXPANSION COUPLING

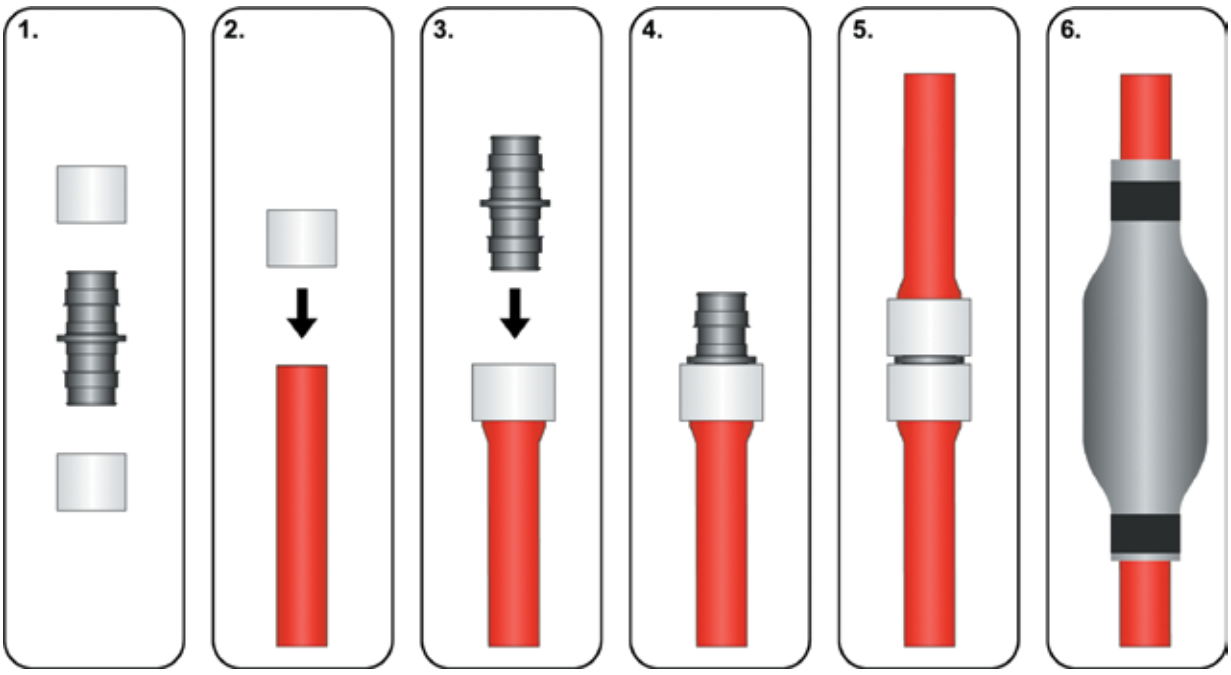
Note: This coupling method is considered a manufactured fitting and is approved by MrPEX® to be used to repair the MrPEX® PEX Tubing. Make sure to follow tool instructions.

MAKING THE REPAIR:

STEP 1–2 Start by making a square cut at the end of the tube using a suitable tubing cutter. After cutting the tubing, slide the PEX ring onto the tubing leaving about 1/16" over hang, or if the ring has a stop slide it until it stops. Using the expander tool, expand the tubing and ring as per instructions. Rotate tool ¼ turn

STEP 3–5 With the tubing and ring expanded, push the fitting into the tubing until it stops. Timing is critical since the tubing and ring wants to retract right away. If the fittings is not seated all the way, the fitting needs to be redone. Make sure to perform a pressure test prior to covering or burying the coupling.

STEP 6 Wrap coupling with suitable material such as foam insulation if coupling is to be buried.



PEX-AL-PEX PRESS COUPLING REPAIR

Note: This coupling method is considered a manufactured fitting and is approved by MrPEX® to be used to repair the MrPEX® Pex-Al-Pex Tubing.

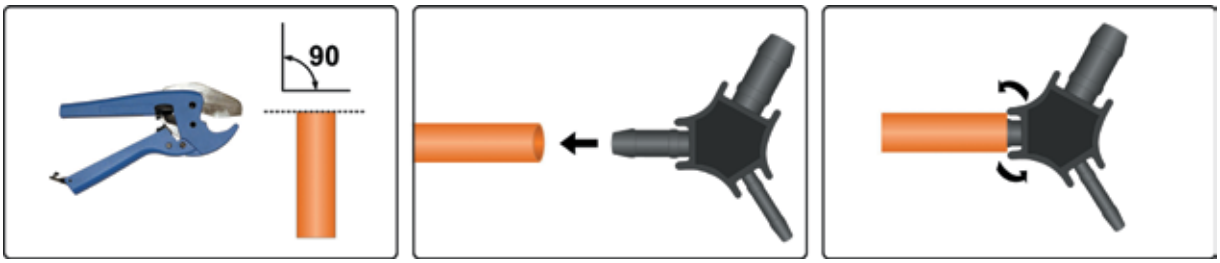
MAKING THE REPAIR:

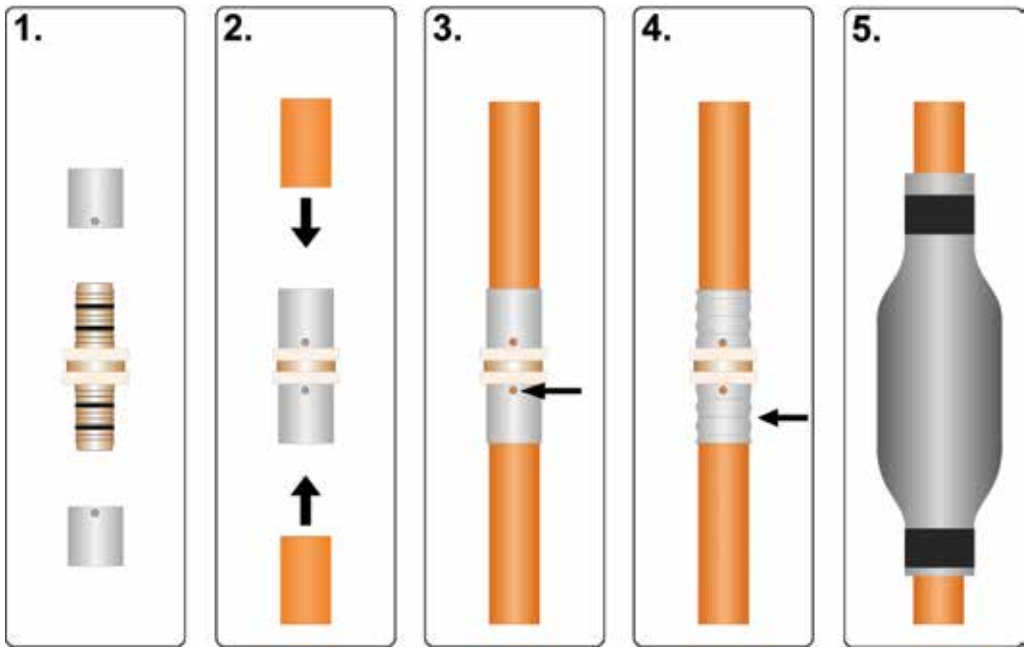
STEP 1 Start by making a square cut at the end of the tube using a suitable tubing cutter. If PEX-AL-PEX tubing is used, also ream the tubing using our reaming tool.

STEP 2 After reaming the tubing, push the tubing into the fitting making sure that the tubing seat all the way at the bottom. Tubing should be visible in the witness hole at the bottom of the press sleeve.
CAUTION: THE FITTING HAS 2 O-RINGS TO ENSURE TIGHNESS. IF TUBING IS NOT REAMED/CHAMFERED, IT COULD CUT THE O-RING AND RESULT IN A LEAK.

STEP 3 Using either a manual or battery press tool, complete the fitting. Making sure that the press jaw is up against the shoulder of the fitting. Make sure to perform a pressure test prior to covering or burying the coupling.

STEP 4 Wrap coupling with suitable material such as foam insulation if tubing is to be buried making sure the fitting is not in direct contact with the ground or concrete.





APPENDIX

COMPARATIVE R-VALUES OF FLOORING AND SUBFLOORS

MATERIAL	R VALUE / INCH	THICKNESS	R VALUE
Plywood	1.1	3/4"	0.825
OSB	1.4	3/4"	1.05
Softwood	1.1	3/4"	0.825
Sheet Vinyl	1.6	1/8"	0.2
Vinyl Composition Tile (VCT)	1.6	1/8"	0.2
Linoleum	1.6	1/4"	0.4
Linoleum	1.6	1/8"	0.2
Dense Rubber Flooring	1.3	21/64"	0.25
Recycled Rubber Flooring	2.2	1/2"	1.1
Cork	3	3/8"	1.125
Cork / MDF / Laminate	2.35	1/2"	1.175
Brick	2.25	1 1/2"	3.375
Marble	0.8	1/2"	0.4
Ceramic Tile	1	1/4"	0.25
Thinset Mortar	0.4	1/8"	0.05
MDF / Plastic Laminate	1	1/2"	0.5
Laminate Floor Pad	1.92	5/32"	0.3
Engineered Wood	1	1/4"	0.25
Engineered Wood	1	3/8"	0.375
Engineered Wood	1	5/8"	0.625
Engineered Wood	1	3/4"	0.75
Engineered Wood Flooring Pad	1.6	1/8"	0.2
Engineered Bamboo	0.96	3/4"	0.72
Oak	0.85	3/4"	0.638
Ash	1	3/4"	0.75
Maple	1	3/4"	0.75
Pine	1.3	3/4"	0.975
Fir	1.2	3/4"	0.9
Carpet Pad / Slab Rubber 33 lb.	1.28	1/4"	0.320
Carpet Pad / Slab Rubber 33 lb.	1.28	3/8"	0.480
Carpet Pad / Slab Rubber 33 lb.	1.28	1/2"	0.640
Carpet Pad / Waffle Rubber 25 lb.	2.48	1/4"	0.620
Carpet Pad / Waffle Rubber 25 lb.	2.48	1/2"	1.240
Carpet Pad / Frothed Polyurethane 16 lb.	3.53	1/8"	0.530
Carpet Pad / Frothed Polyurethane 12 lb.	3.48	1/4"	0.870
Carpet Pad / Frothed Polyurethane 10 lb.	3.22	3/8"	1.200
Carpet Pad / Frothed Polyurethane 10 lb.	3.22	1/2"	1.610
Hair Jute	3.88	1/2"	1.940
Hair Jute	3.88	21/64"	1.250
Synthetic Fiber Pad 20 oz.	1.80	15/64"	0.421
Synthetic Fiber Pad 27 oz.	1.98	18/64"	0.545
Synthetic Fiber Pad 32 oz.	2.10	19/64"	0.630
Synthetic Fiber Pad 40 oz.	2.20	11/32"	0.770
Prime Urethane	4.30	21/64"	1.400
Prime Urethane	4.30	1/2"	2.150

MATERIAL	R VALUE / INCH	THICKNESS	R VALUE
Bonded Urethane	4.20	21/64"	1.350
Bonded Urethane	4.20	1/2"	2.100
Carpet	2.80	1/4"	0.700
Carpet	2.80	3/8"	1.050
Carpet	2.80	1/2"	1.400
Carpet	2.80	5/8"	1.750
Carpet	2.80	3/4"	2.100
Wool Carpet	4.20	3/8"	1.575
Wool Carpet	4.20	1/2"	2.100

HEAT OUTPUT FORMULA

BTU / H = 501 X GPM X ΔT

(GPM is the flow, and ΔT (delta-T) is the temperature drop over the loop, 501 is the weight of 1 gallon of water x 60 minutes in 1 hour)

GPM FLOW FORMULA

GPM = BTU/H / ΔT / 501

(GPM is the flow, and ΔT (delta-T) is the temperature drop over the loop, 501 is the weight of 1 gallon of water x 60 minutes in 1 hour)

TO FIND AMOUNT OF TUBING REQUIRED TO COVER SQ.FT.

MULTIPLY SQUARE FEET WITH MULTIPLIER

TUBE SPACING	MULTIPLIER
6"	2
8"	1.5
9"	1.33
12"	1
18"	0.67
24"	0.5

TO FIND AREA COVERED BY LOOP AT SPACING

MULTIPLY LOOP LENGTH WITH MULTIPLIER

TUBE SPACING	MULTIPLIER
6"	0.5
8"	0.67
9"	0.75
12"	1
18"	1.5
24"	2

FLOOR SURFACE TEMPERATURE APPROXIMATION

T_{ROOM} + HEAT INTENSITY ÷ 2 *[HEAT INTENSITY EXPRESSED AS BTU / (H X SQ.FT)]*

- For snowmelt applications use 2.2 (Instead of 2) in above formula—at no wind.
- For snowmelt applications use 3.7 (Instead of 2) in above formula—at 10 mph official wind speed.
- For radiant ceiling, use 1.3 (Instead of 2) in above formula.

DATA FOR TUBING / PIPES

SIZE & TYPE	VOLUME	WEIGHT
3/8" PEX	0.497 gallons/100 ft.	4.1 lbs/100 ft.
1/2" PEX	0.917 gallons/100 ft.	5.3 lbs/100 ft.
5/8" PEX	1.392 gallons/100 ft.	7.1 lbs/100 ft.
3/4" PEX	1.832 gallons/100 ft.	10.2 lbs/100 ft.
1" PEX	3.067 gallons/100 ft.	16.5 lbs/100 ft.
1/2" Copper (Class M)	1.32 gallons/100 ft.	20.4 lbs/100 ft.
3/4" Copper (Class M)	2.690 gallons/100 ft.	32.8 lbs/100 ft.
1" Copper (Class M):	4.540 gallons/100 ft.	46.5 lbs/100 ft.
1.25" Copper (Class M):	6.810 gallons/100 ft.	66.2 lbs/100 ft.
1.5" Copper (Class M):	9.510 gallons/100 ft.	94.0 lbs/100 ft.

ASTM F876 PEX TUBING DIMENSION CHART

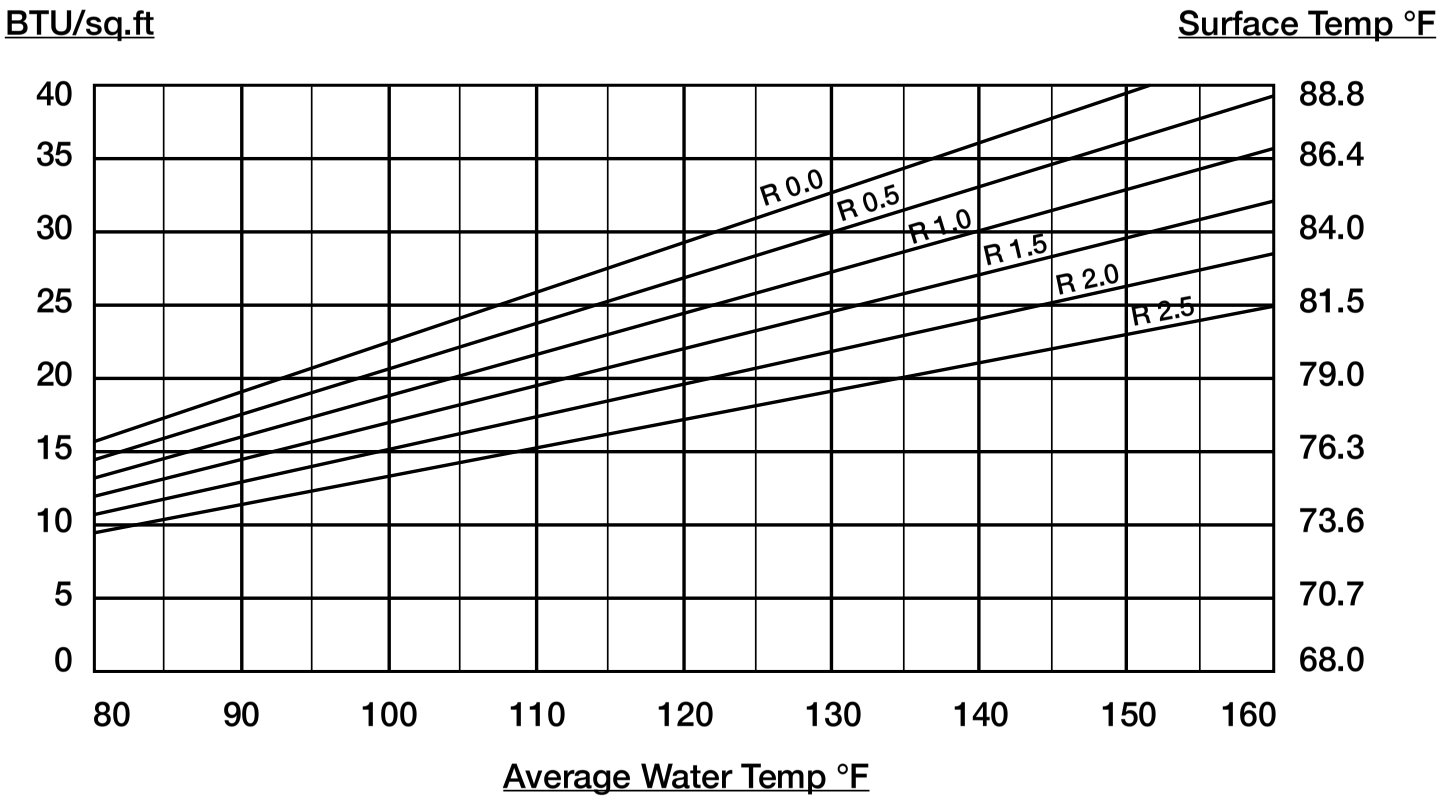
	OD	WALL	ID
3/8	0.500	0.070	0.360
1/2	0.625	0.070	0.485
5/8	0.750	0.083	0.584
3/4	0.875	0.097	0.681
1	1.125	0.125	0.875
1 1/4	1.375	0.153	1.069
1 1/2	1.625	0.181	1.263

ASTM F1281 PEX-AL-PEX TUBING DIMENSION CHART

	OD	WALL	ID
1/2	0.630	0.065	0.500
5/8	0.787	0.075	0.637
3/4	0.984	0.089	0.806
1	1.260	0.118	1.024

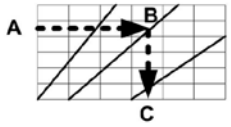
GENERAL GUIDELINES	
GPM	MAIN SIZE
0–4	3/4"
4–8	1"
8–14	1.25"
14–25	1.5"
25–45	2"

HEAT OUTPUT FOR RETROPANEL ON SUBFLOOR OR CONCRETE 8" O.C.



Using the Chart:

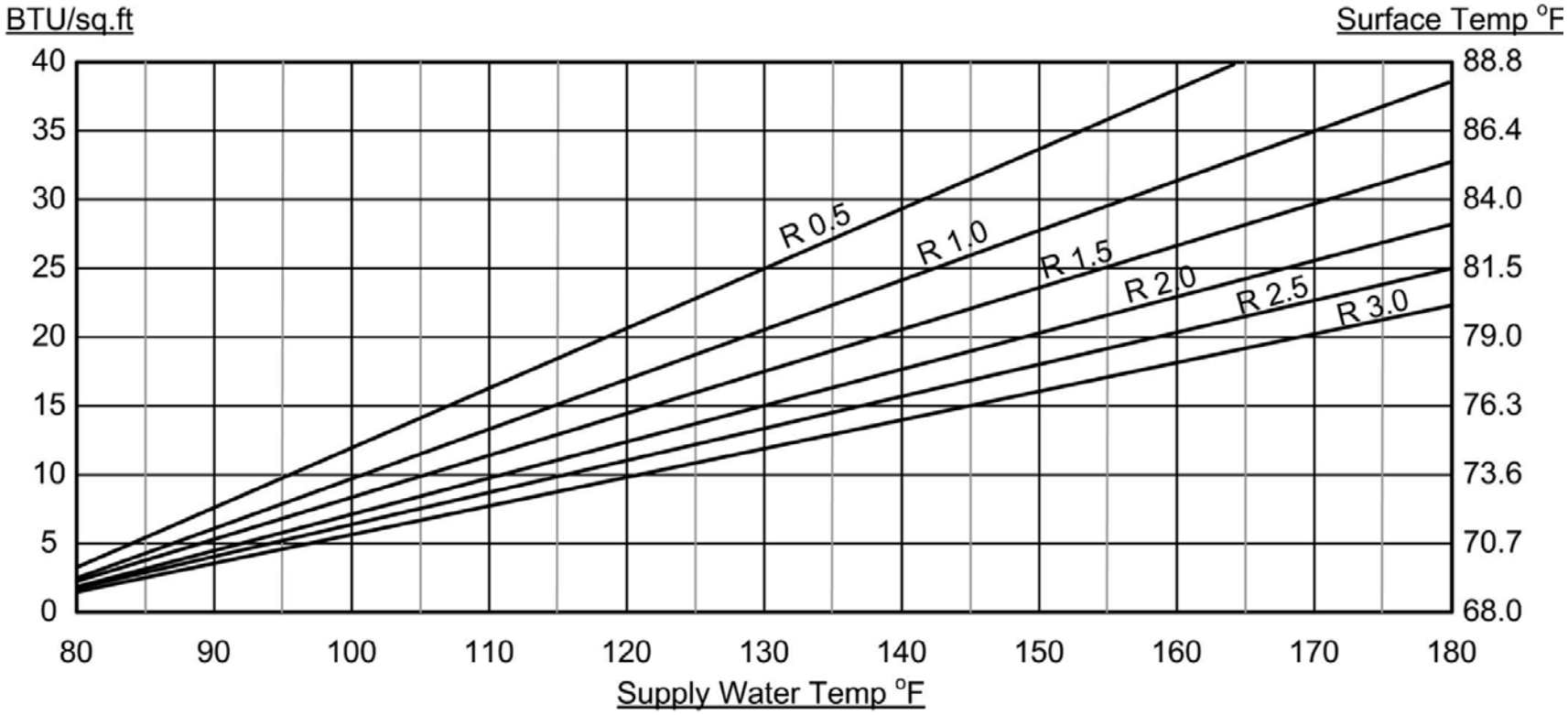
- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with floor covering r-value
- Go down vertically and read the supply water temperature



NOTE: Chart output requirements based on 68°F room setpoint

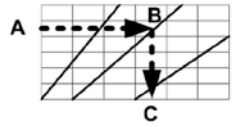
CONSTRUCTION NOTE: R-value represents all layers installed on top of RetroPanel. Verify heat loss and construction prior to installation. Performance may be greatly reduced for; subfloor installations with inadequate insulation below, and slab installations without insulation below, with highly conductive soil or high water table. This chart is to be used as a guide. Mr PEX does not take responsibility for inaccurate design calculations.

HEAT OUTPUT FOR DUOTRACK PLATES BELOW SUBFLOOR 8" O.C.



Using the Chart:

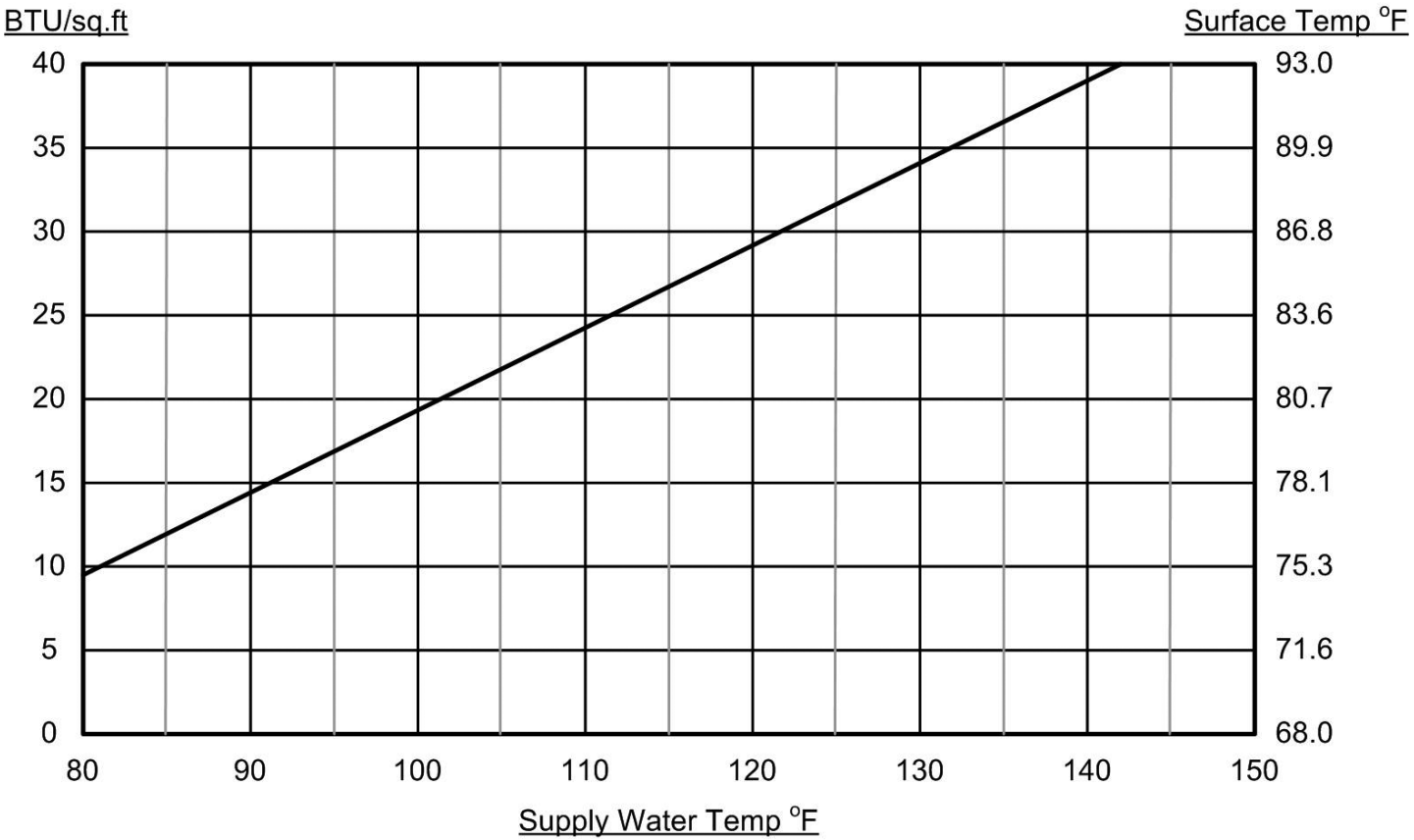
- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with floor covering r-value
- Go down vertically and read the supply water temperature



NOTE: Chart output requirements based on 68ºF room setpoint

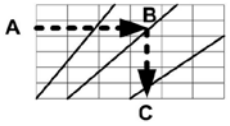
CONSTRUCTION NOTE: This chart assumes a 3/4" subfloor and the R-values represents all layers installed on the top subfloor. Verify heat-loss and construction prior to installation. Performance may be greatly reduced for; subfloor installations with inadequate insulation below. This chart is to be used as a guide. Mr PEX does not take responsibility for inaccurate design calculations.

HEAT OUTPUT FOR RADIANT CEILING USING OMEGA PLATES 8" O.C.



Using the Chart:

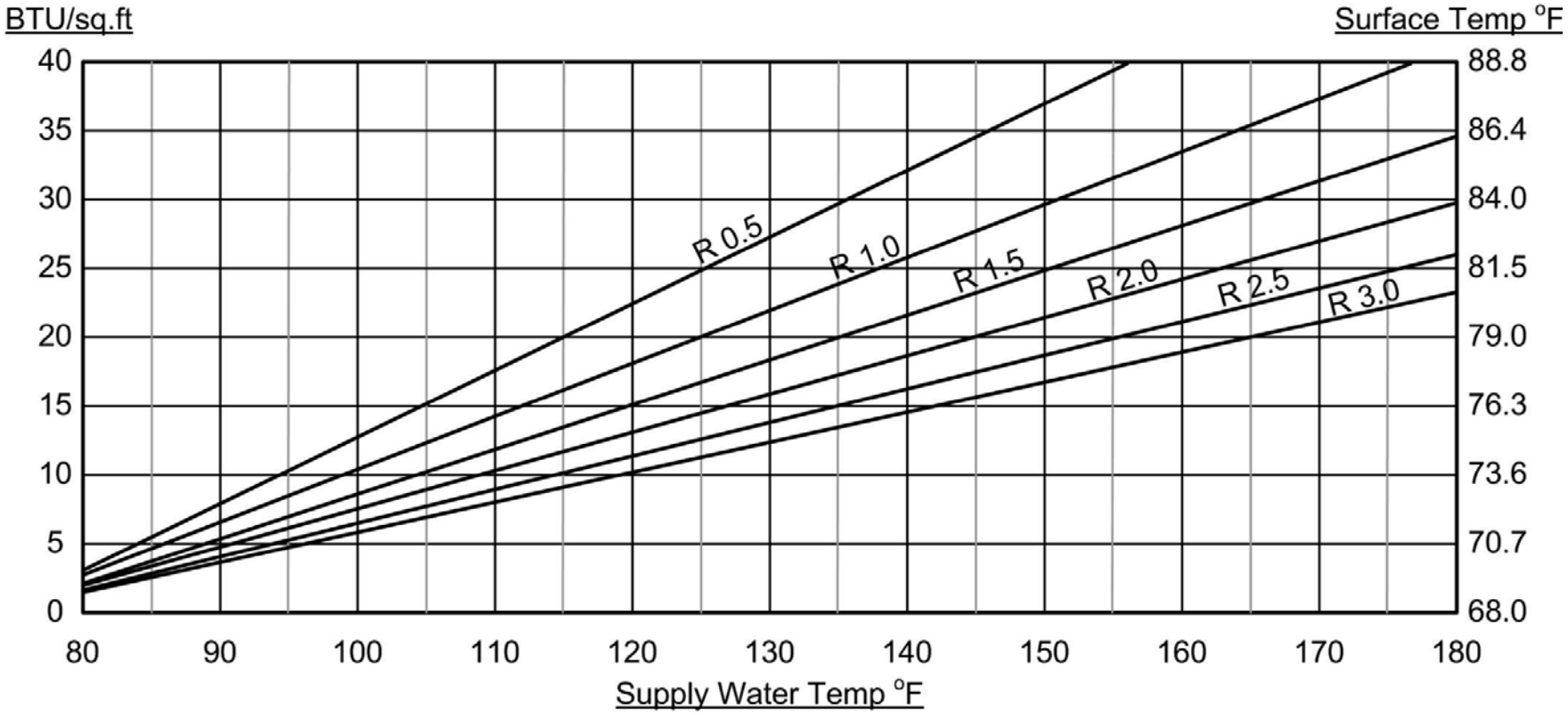
- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with floor covering r-value
- Go down vertically and read the supply water temperature



NOTE: Chart output requirements based on 68ºF room setpoint

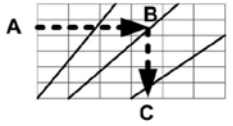
CONSTRUCTION NOTE: This chart assumes 5/8" sheetrock. Verify heat-loss and construction prior to installation. Performance may be greatly reduced with inadequate insulation above. This chart is to be used as a guide. Mr PEX does not take responsibility for inaccurate design calculations.

HEAT OUTPUT FOR OMEGA PLATES ON SUBFLOOR 8" O.C.



Using the Chart:

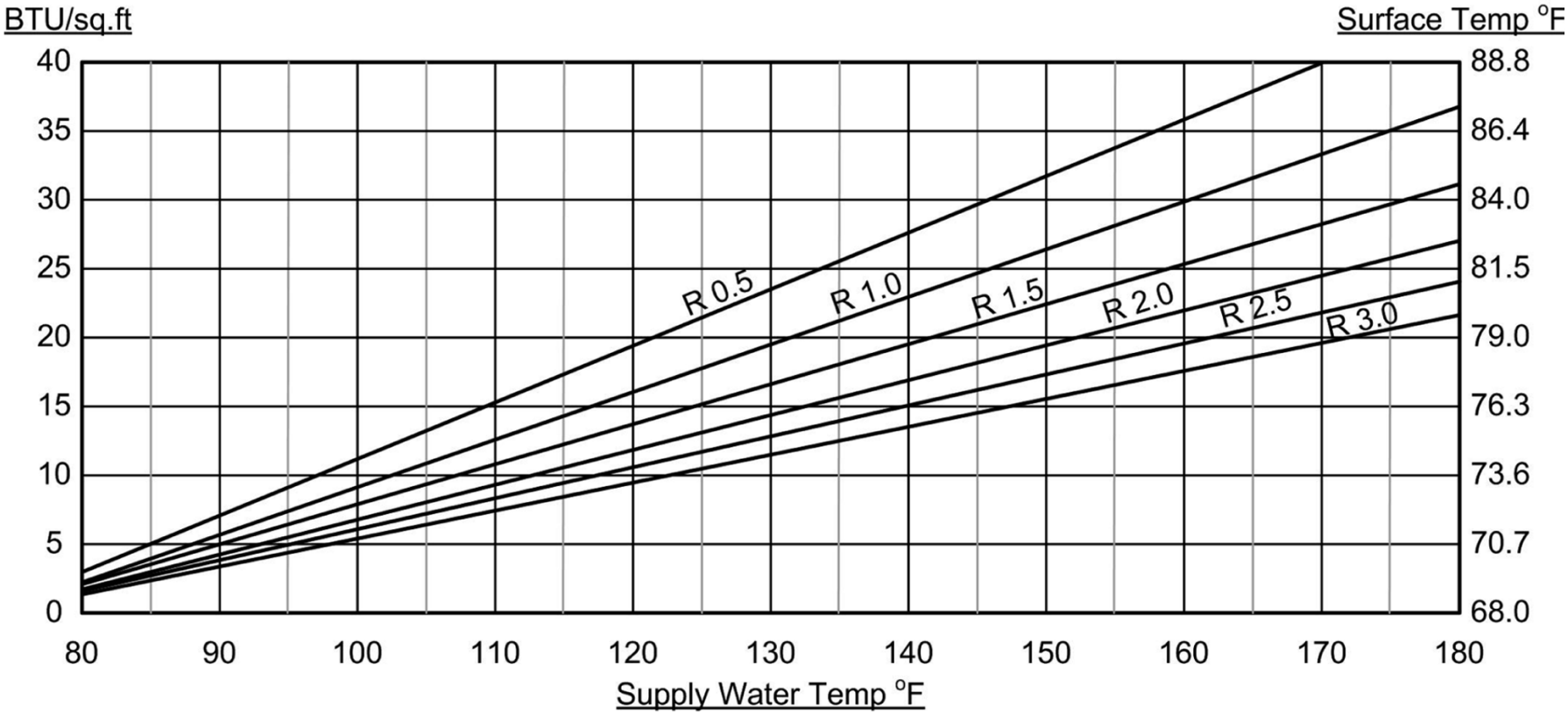
- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with floor covering r-value
- Go down vertically and read the supply water temperature



NOTE: Chart output requirements based on 68ºF room setpoint

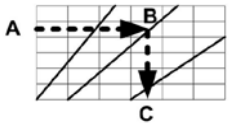
CONSTRUCTION NOTE: R-value represents all layers installed on top of the aluminum heat transfer plates. Verify heat-loss and construction prior to installation. Performance may be greatly reduced for; subfloor installations with inadequate insulation below. This chart is to be used as a guide. Mr PEX does not take responsibility for inaccurate design calculations.

HEAT OUTPUT FOR OMEGA PLATES BELOW SUBFLOOR 8" O.C.



Using the Chart:

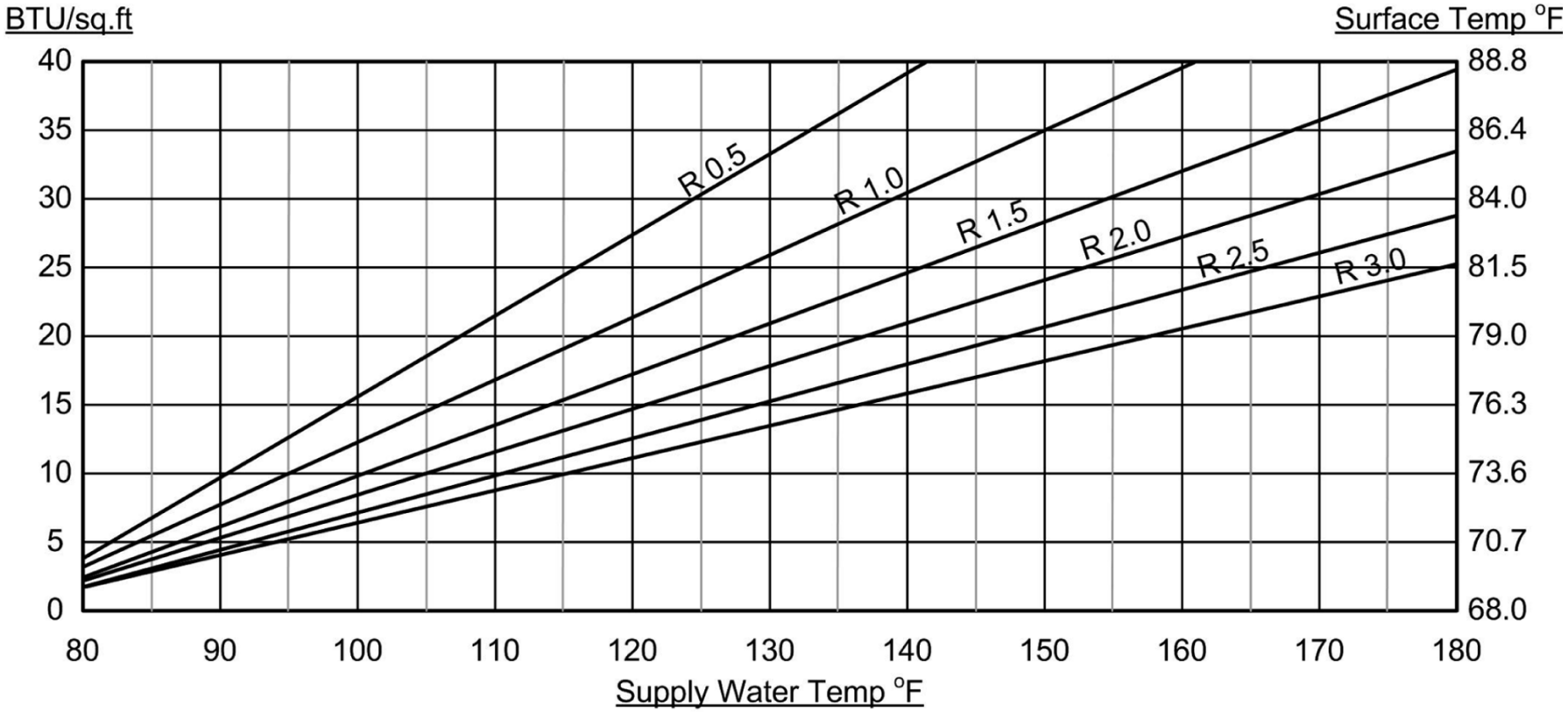
- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with floor covering r-value
- Go down vertically and read the supply water temperature



NOTE: Chart output requirements based on 68ºF room setpoint

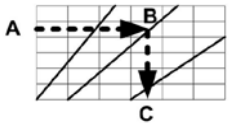
CONSTRUCTION NOTE: This chart assumes a 3/4" subfloor and the R-values represents all layers installed on top of subfloor. Verify heat-loss and construction prior to installation. Performance may be greatly reduced for; subfloor installations with inadequate insulation below. This chart is to be used as a guide. Mr PEX does not take responsibility for inaccurate design calculations.

HEAT OUTPUT FOR SUSPENDED POURED UNDERLAYMENT 6" O.C.



Using the Chart:

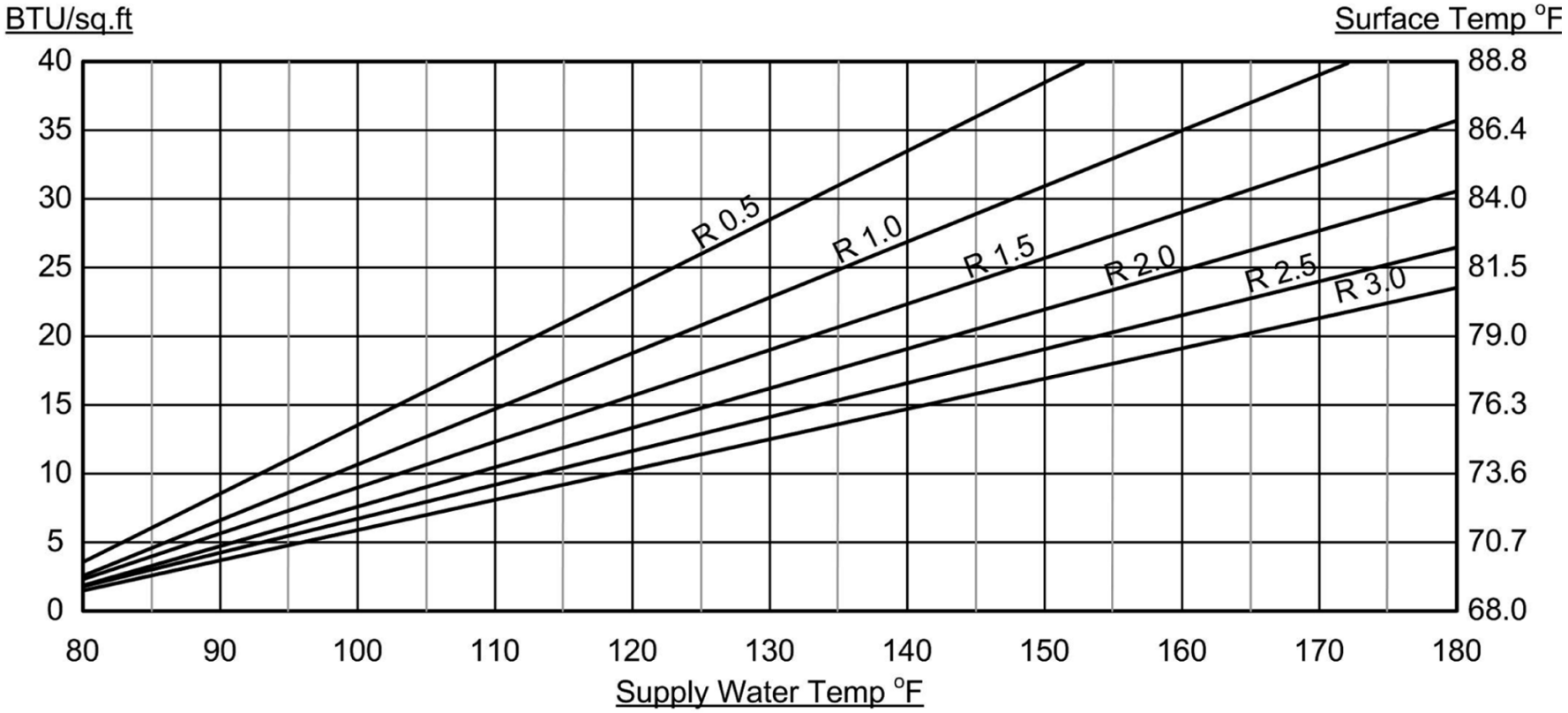
- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with floor covering r-value
- Go down vertically and read the supply water temperature



NOTE: Chart output requirements based on 68ºF room setpoint

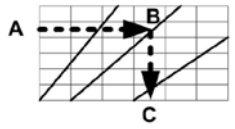
CONSTRUCTION NOTE: This chart assumes a 3/4" subfloor and the R-values represents all layers installed on top of the poured underlayment. Verify heat-loss and construction prior to installation. Performance may be greatly reduced for; subfloor installations with inadequate insulation below. This chart is to be used as a guide. Mr PEX does not take responsibility for inaccurate design calculations.

HEAT OUTPUT FOR SUSPENDED POURED UNDERLAYMENT 9" O.C.



Using the Chart:

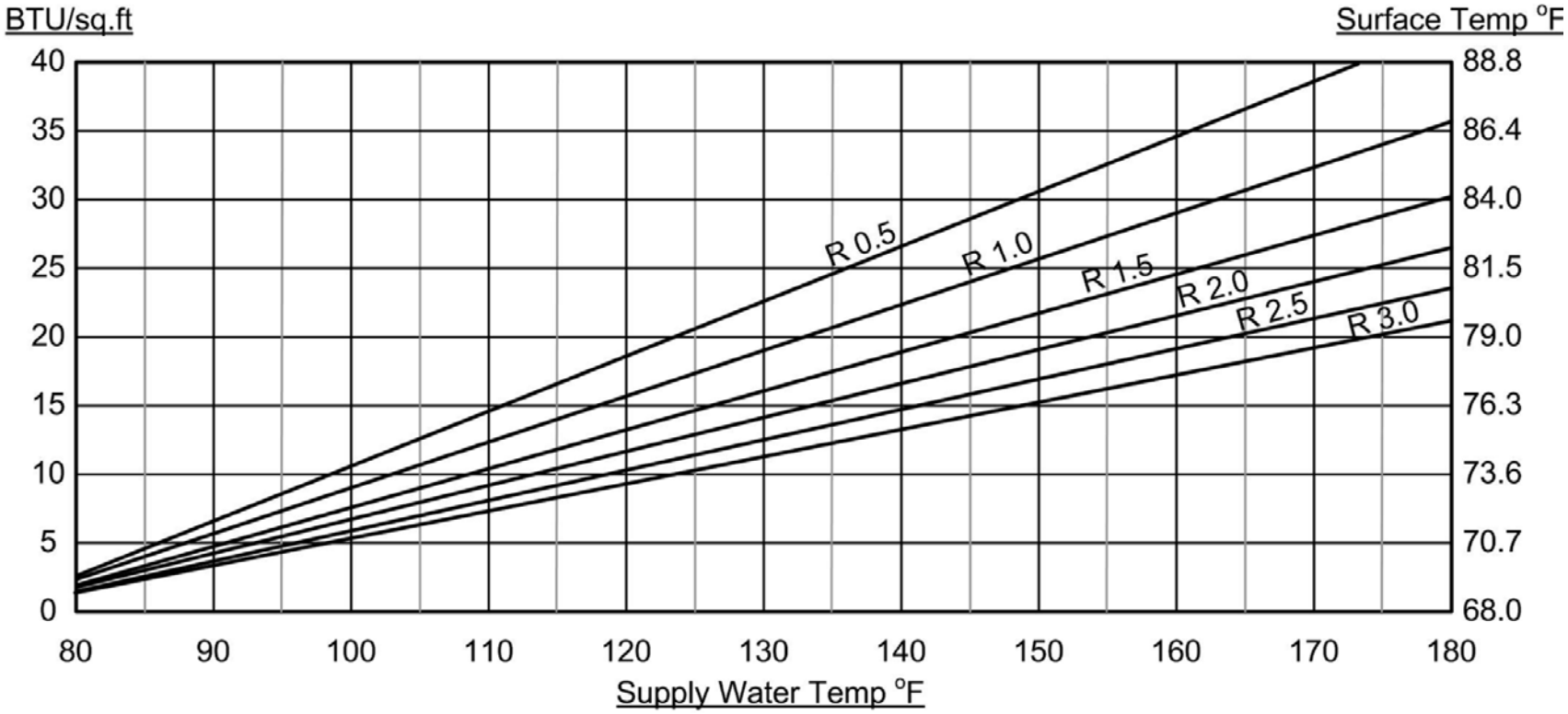
- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with floor covering r-value
- Go down vertically and read the supply water temperature



NOTE: Chart output requirements based on 68ºF room setpoint

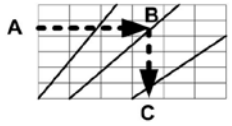
CONSTRUCTION NOTE: This chart assumes a 3/4" subfloor and the R-values represents all layers installed on top of the poured underlayment. Verify heat-loss and construction prior to installation. Performance may be greatly reduced for; subfloor installations with inadequate insulation below. This chart is to be used as a guide. Mr PEX does not take responsibility for inaccurate design calculations.

HEAT OUTPUT FOR SUSPENDED POURED UNDERLAYMENT 12" O.C.



Using the Chart:

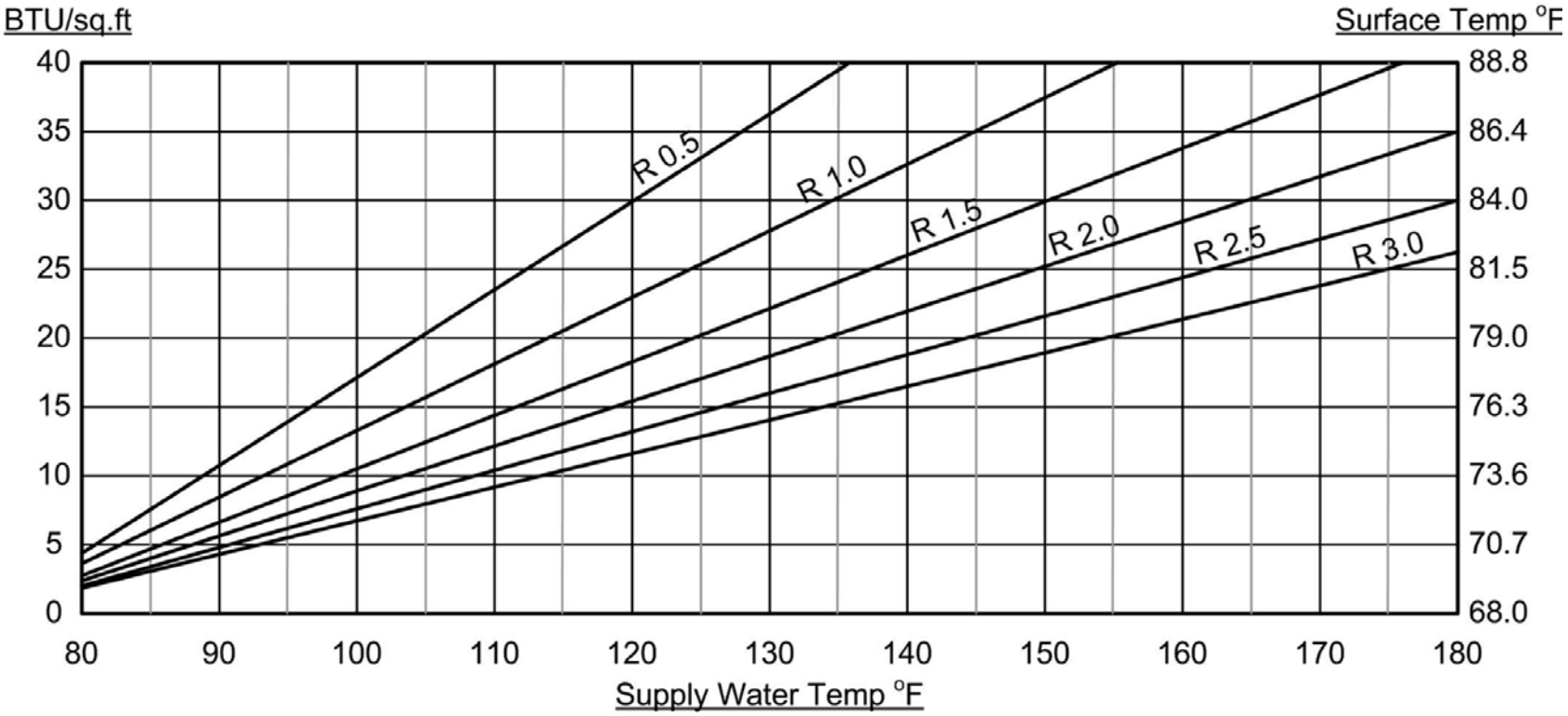
- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with floor covering r-value
- Go down vertically and read the supply water temperature



NOTE: Chart output requirements based on 68ºF room setpoint

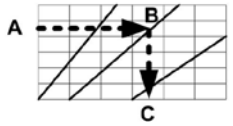
CONSTRUCTION NOTE: This chart assumes a 3/4" subfloor and the R-values represents all layers installed on top of the poured underlayment. Verify heat-loss and construction prior to installation. Performance may be greatly reduced for; subfloor installations with inadequate insulation below. This chart is to be used as a guide. Mr PEX does not take responsibility for inaccurate design calculations.

HEAT OUTPUT FOR SLAB ON OR BELOW GRADE 6" O.C.



Using the Chart:

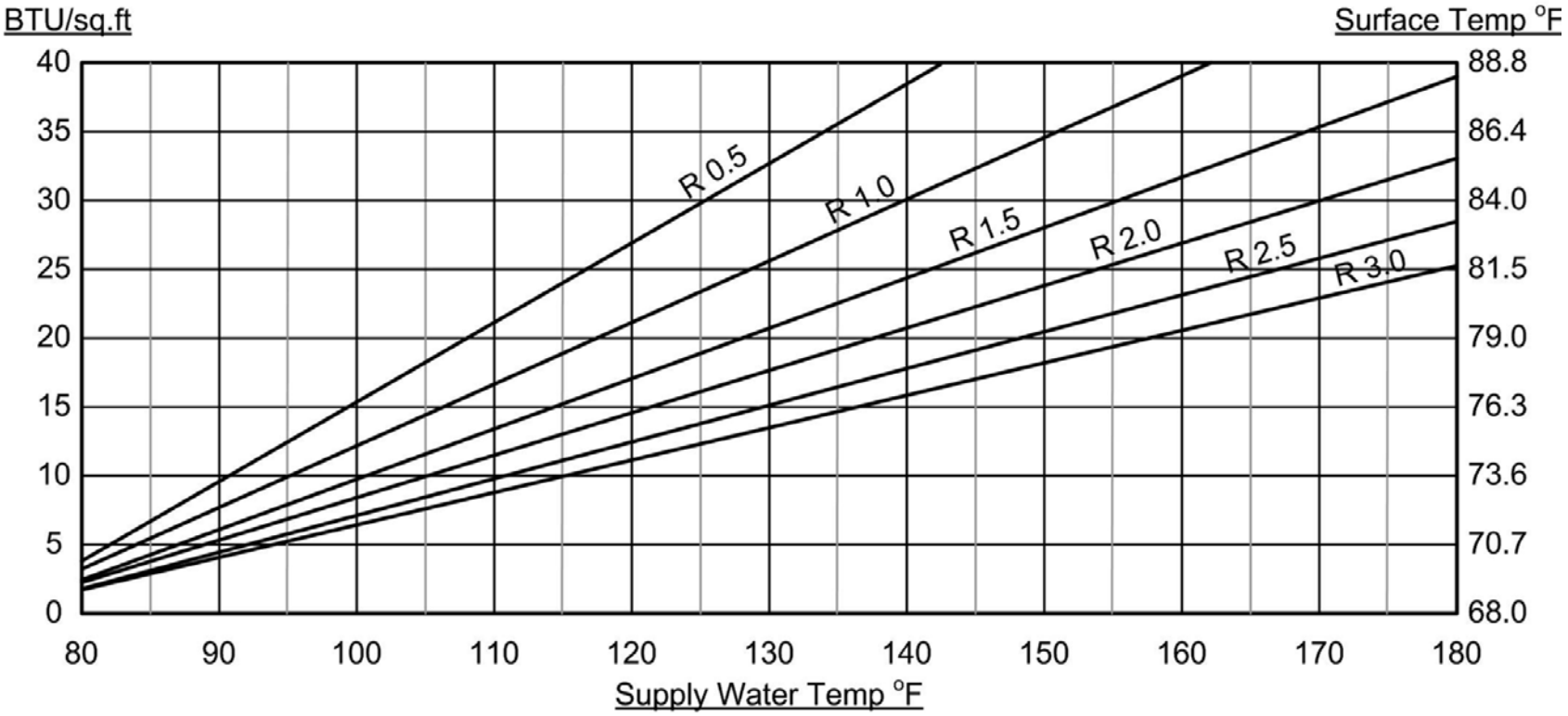
- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with floor covering r-value
- Go down vertically and read the supply water temperature



NOTE: Chart output requirements based on 68ºF room setpoint

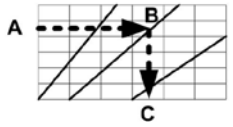
CONSTRUCTION NOTE: This chart assumes tubing installed in a 4"-6" slab. R-values represent all layers installed on top of the slab. Verify heat-loss and construction prior to installation. Performance may be greatly reduced for; slab installations without insulation below, with highly conductive soil or high water table. This chart is to be used as a guide. Mr PEX does not take responsibility for inaccurate design calculations.

HEAT OUTPUT FOR SLAB ON OR BELOW GRADE 9" O.C.



Using the Chart:

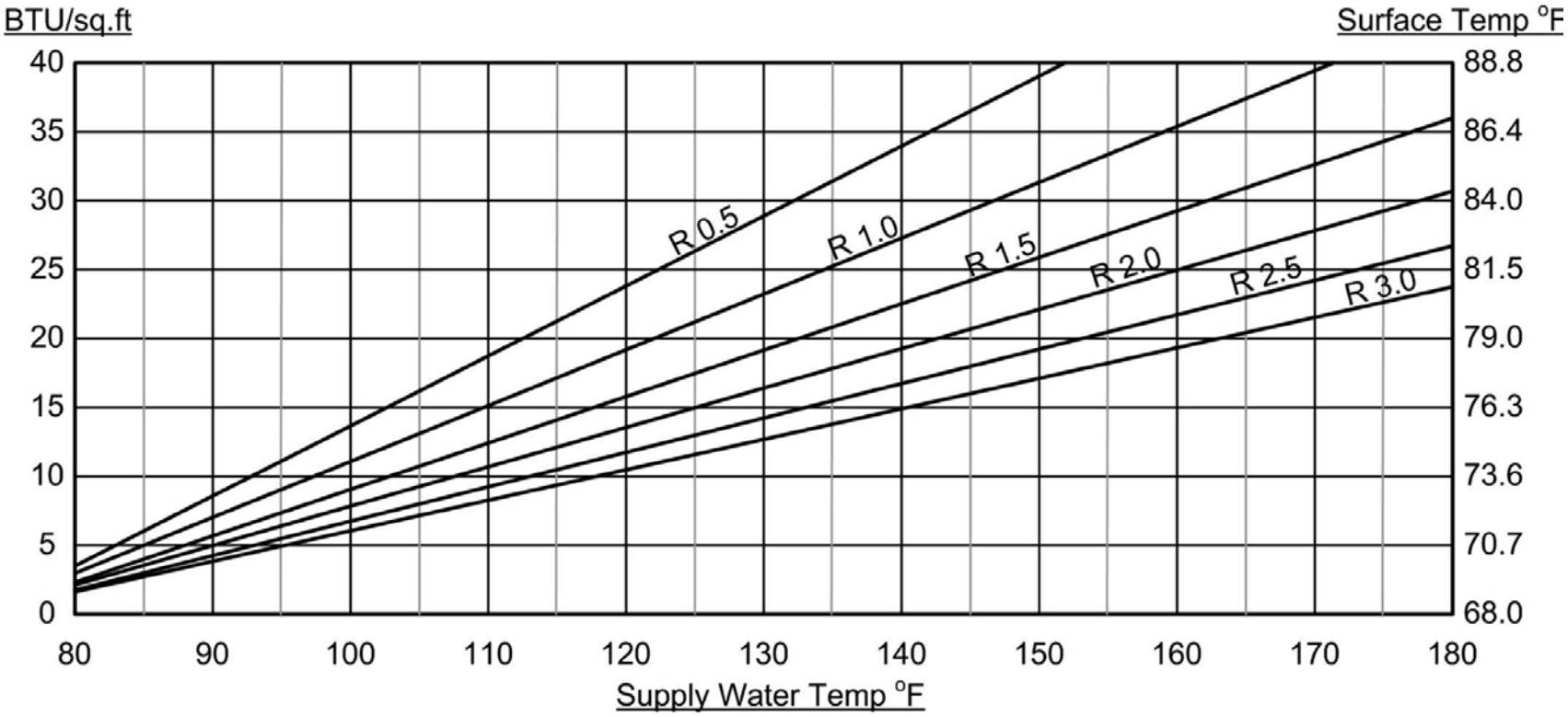
- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with floor covering r-value
- Go down vertically and read the supply water temperature



NOTE: Chart output requirements based on 68ºF room setpoint

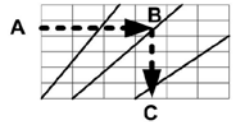
CONSTRUCTION NOTE: This chart assumes tubing installed in a 4"-6" slab. R-values represent all layers installed on top of the slab. Verify heat-loss and construction prior to installation. Performance may be greatly reduced for; slab installations without insulation below, with highly conductive soil or high water table. This chart is to be used as a guide. Mr PEX does not take responsibility for inaccurate design calculations.

HEAT OUTPUT FOR SLAB ON OR BELOW GRADE 12" O.C.



Using the Chart:

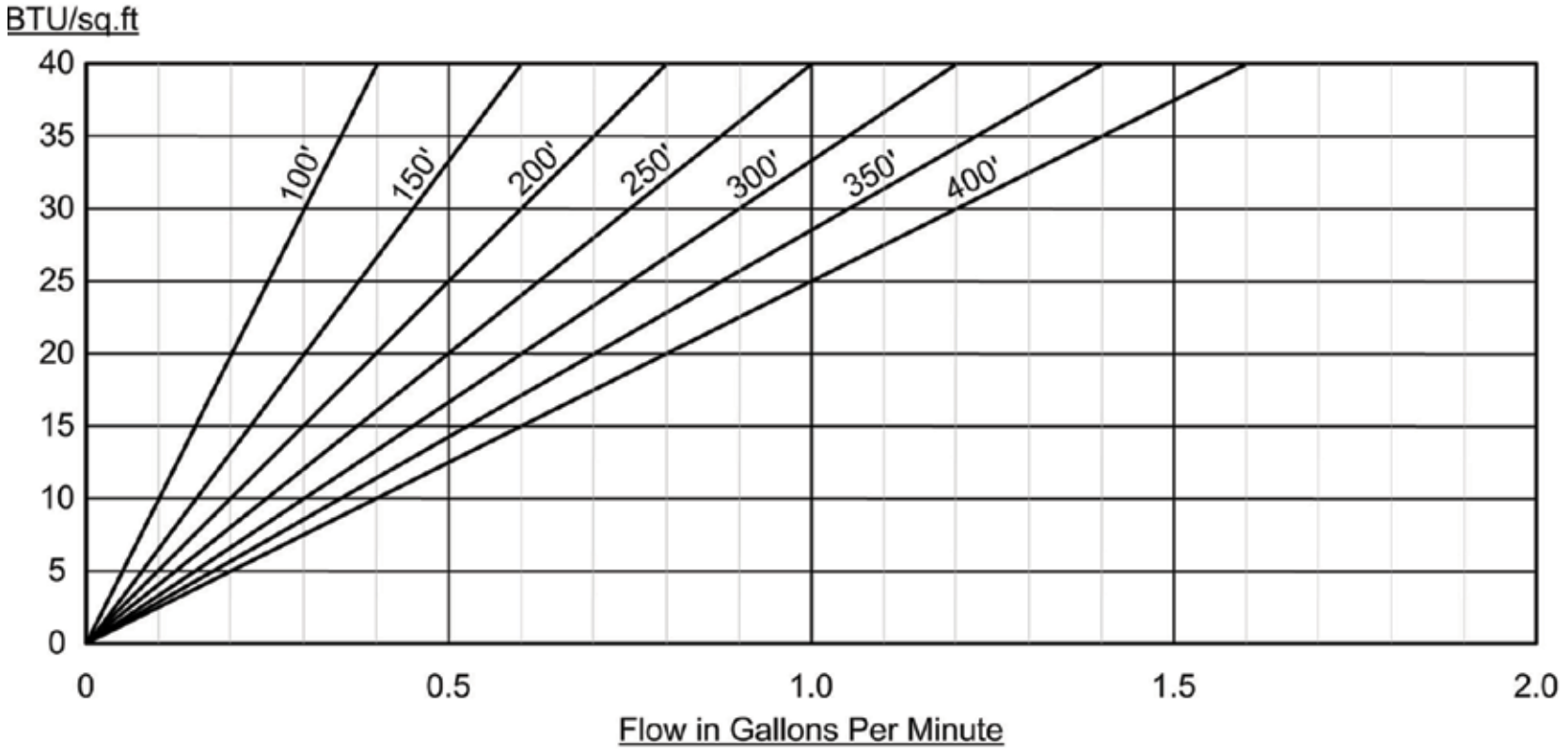
- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with floor covering r-value
- Go down vertically and read the supply water temperature



NOTE: Chart output requirements based on 68ºF room setpoint

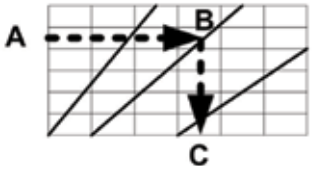
CONSTRUCTION NOTE: This chart assumes tubing installed in a 4"-6" slab. R-values represent all layers installed on top of the slab. Verify heat-loss and construction prior to installation. Performance may be greatly reduced for; slab installations without insulation below, with highly conductive soil or high water table. This chart is to be used as a guide. Mr PEX does not take responsibility for inaccurate design calculations.

FLOW CHART FOR 6" O.C. @ 10°F DELTA-T

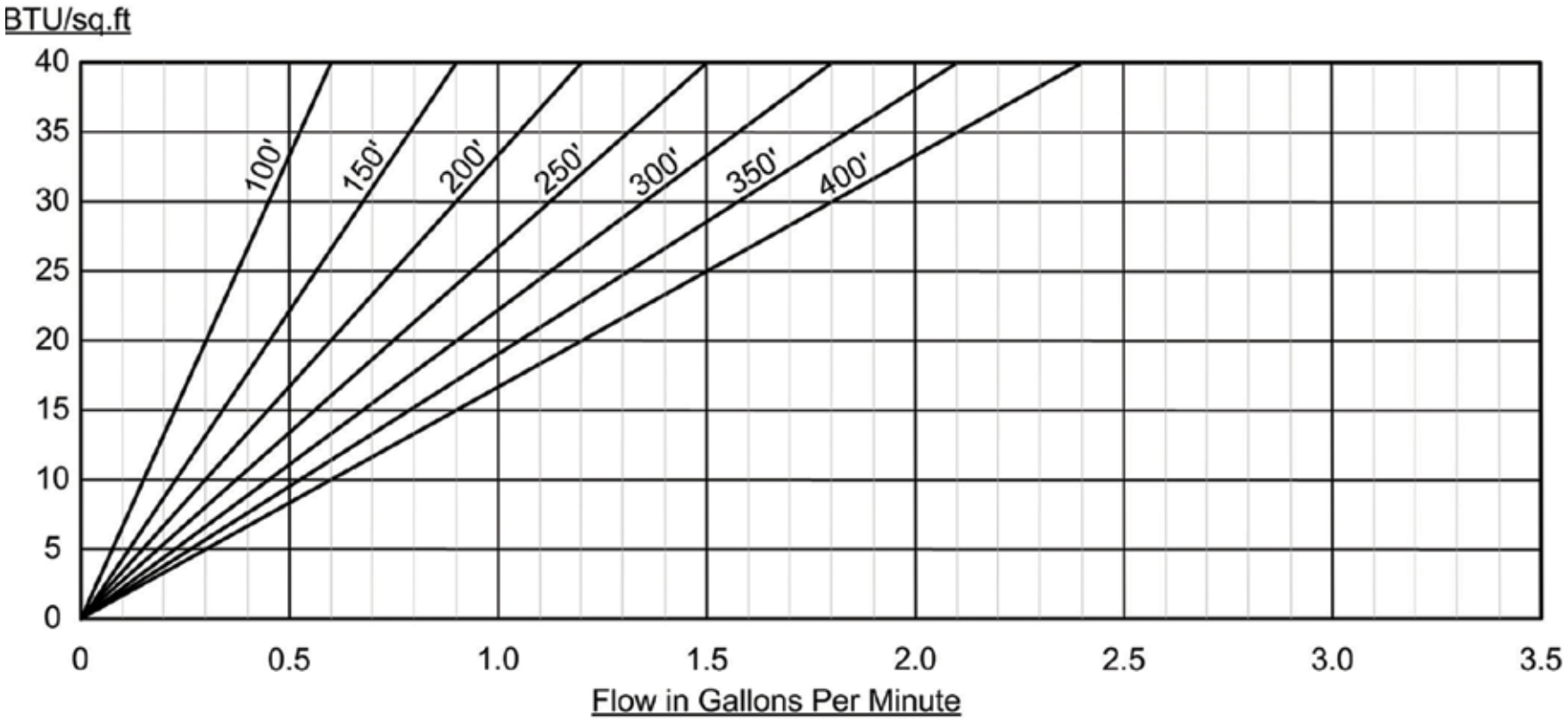


Using the Chart:

- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with correct loop length
- Go down vertically and read the flow for the loop

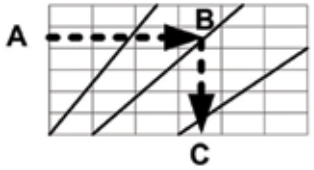


FLOW CHART FOR 9" O.C. @ 10°F DELTA-T

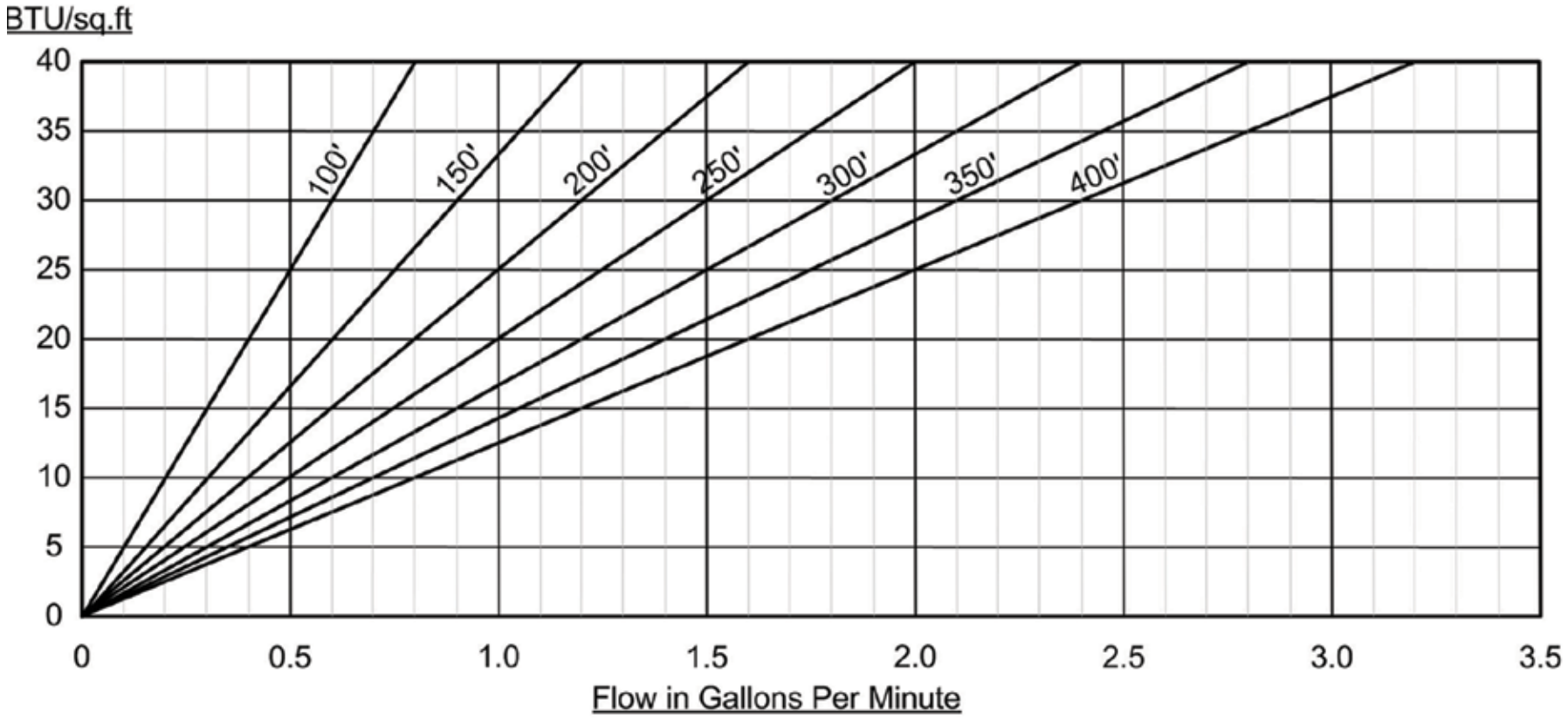


Using the Chart:

- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with correct loop length
- Go down vertically and read the flow for the loop

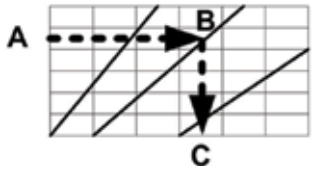


FLOW CHART FOR 12" O.C. @ 10°F DELTA-T



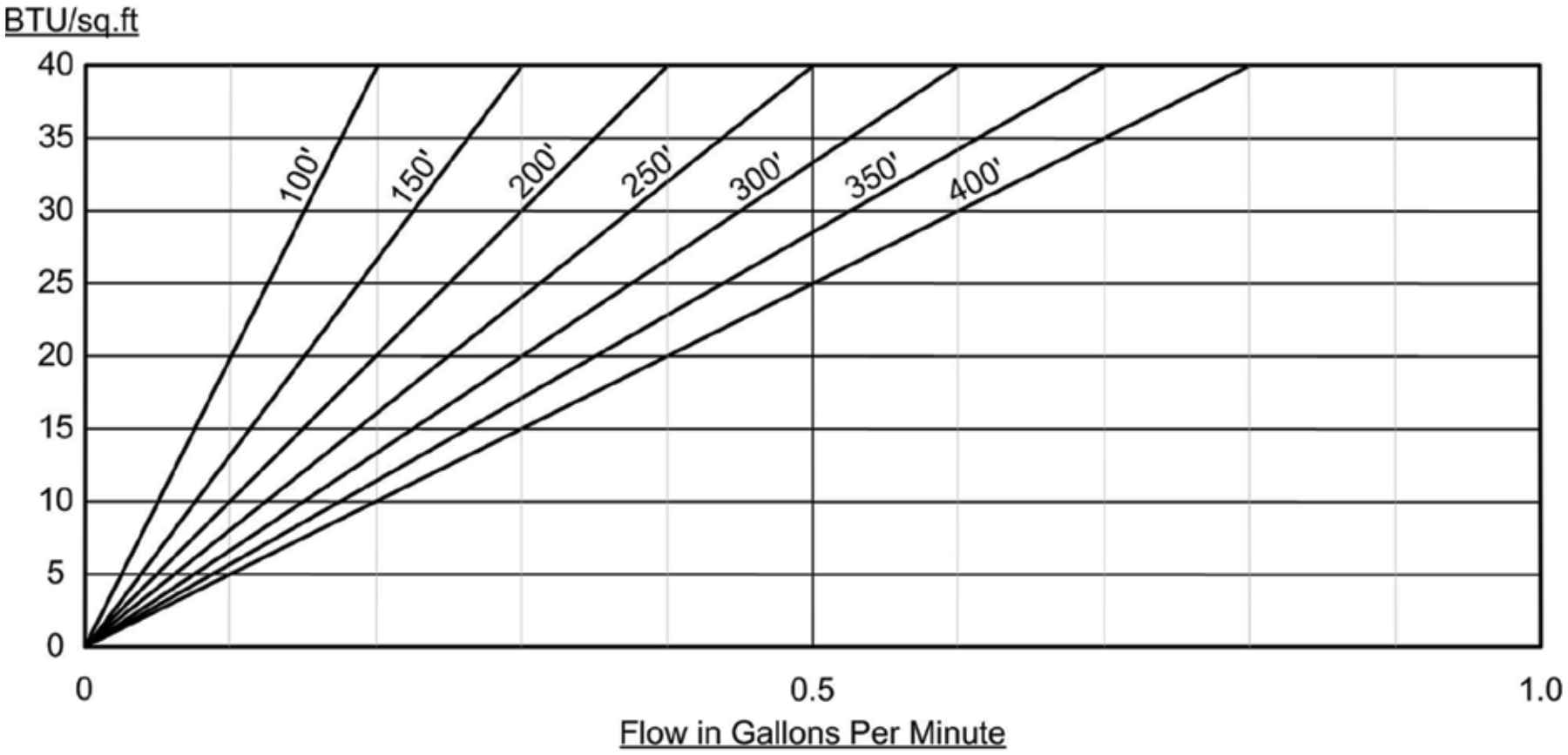
Using the Chart:

- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with correct loop length
- Go down vertically and read the flow for the loop



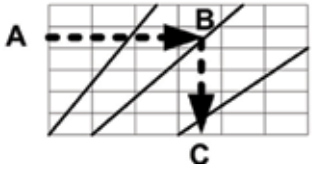
1-800-716-3406

FLOW CHART FOR 6" O.C. @ 20°F DELTA-T

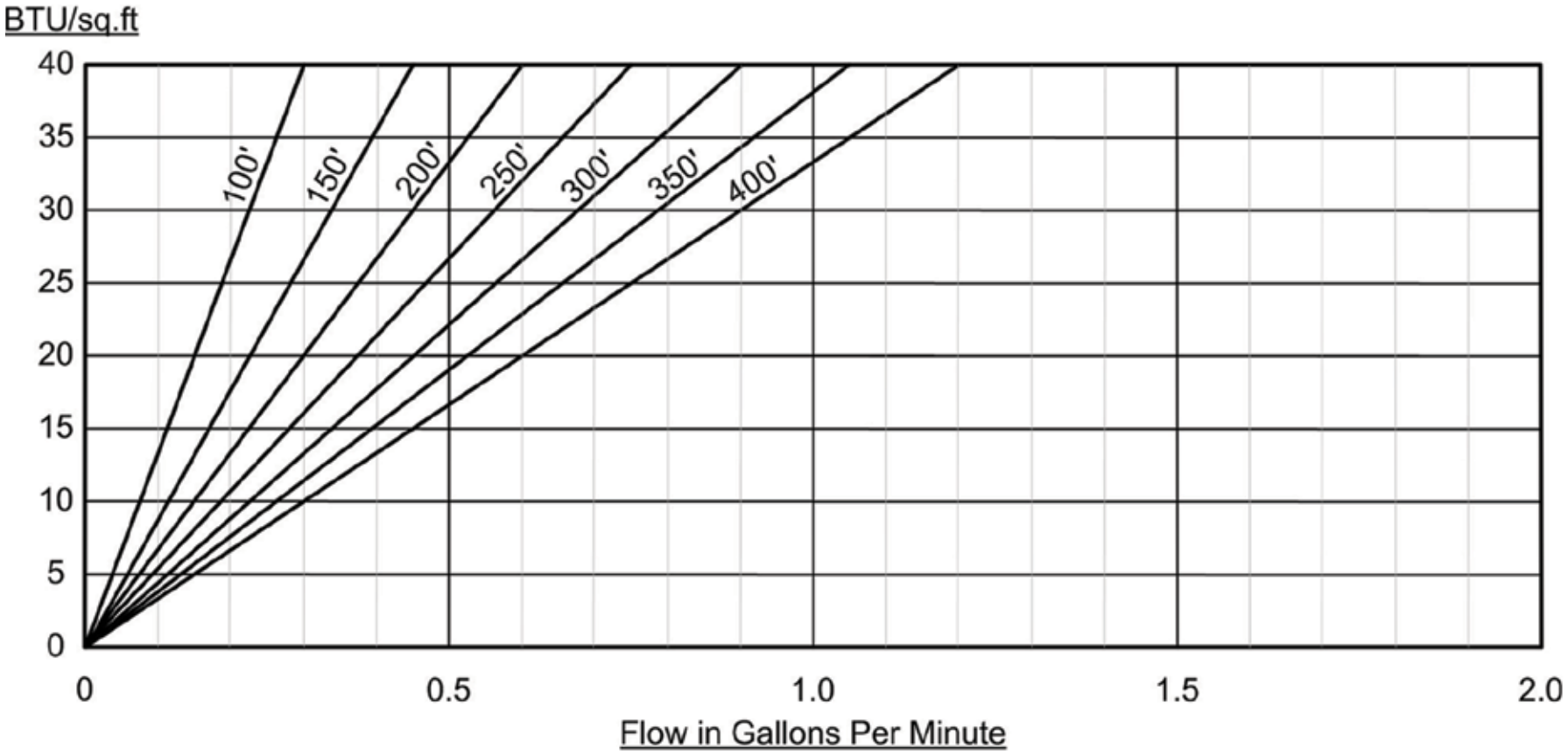


Using the Chart:

- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with correct loop length
- Go down vertically and read the flow for the loop

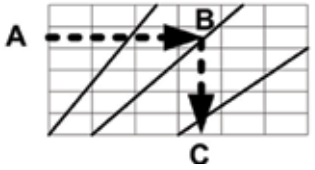


FLOW CHART FOR 9" O.C. @ 20°F DELTA-T



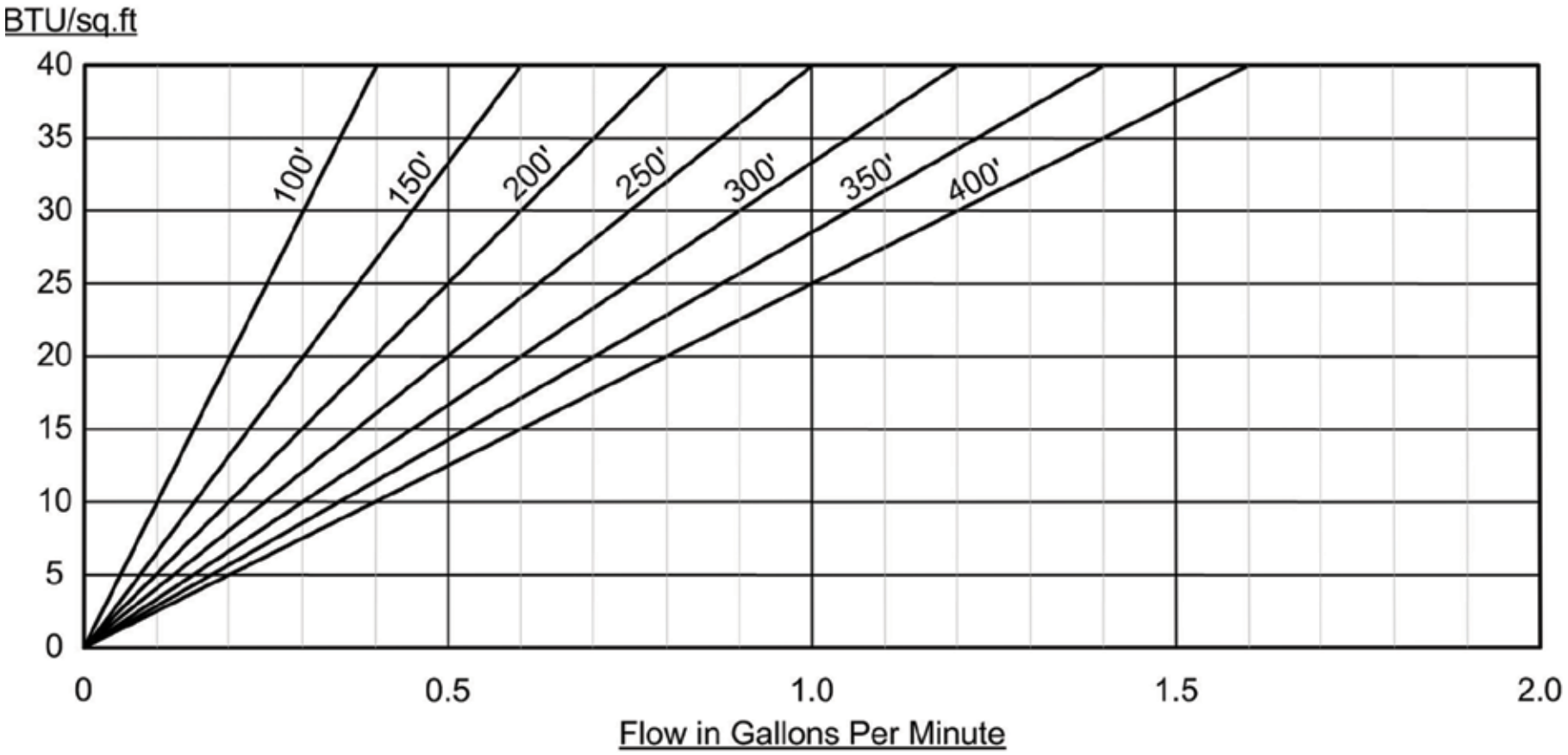
Using the Chart:

- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with correct loop length
- Go down vertically and read the flow for the loop



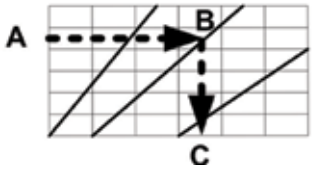
1-800-716-3406

FLOW CHART FOR 12" O.C. @ 20°F DELTA-T

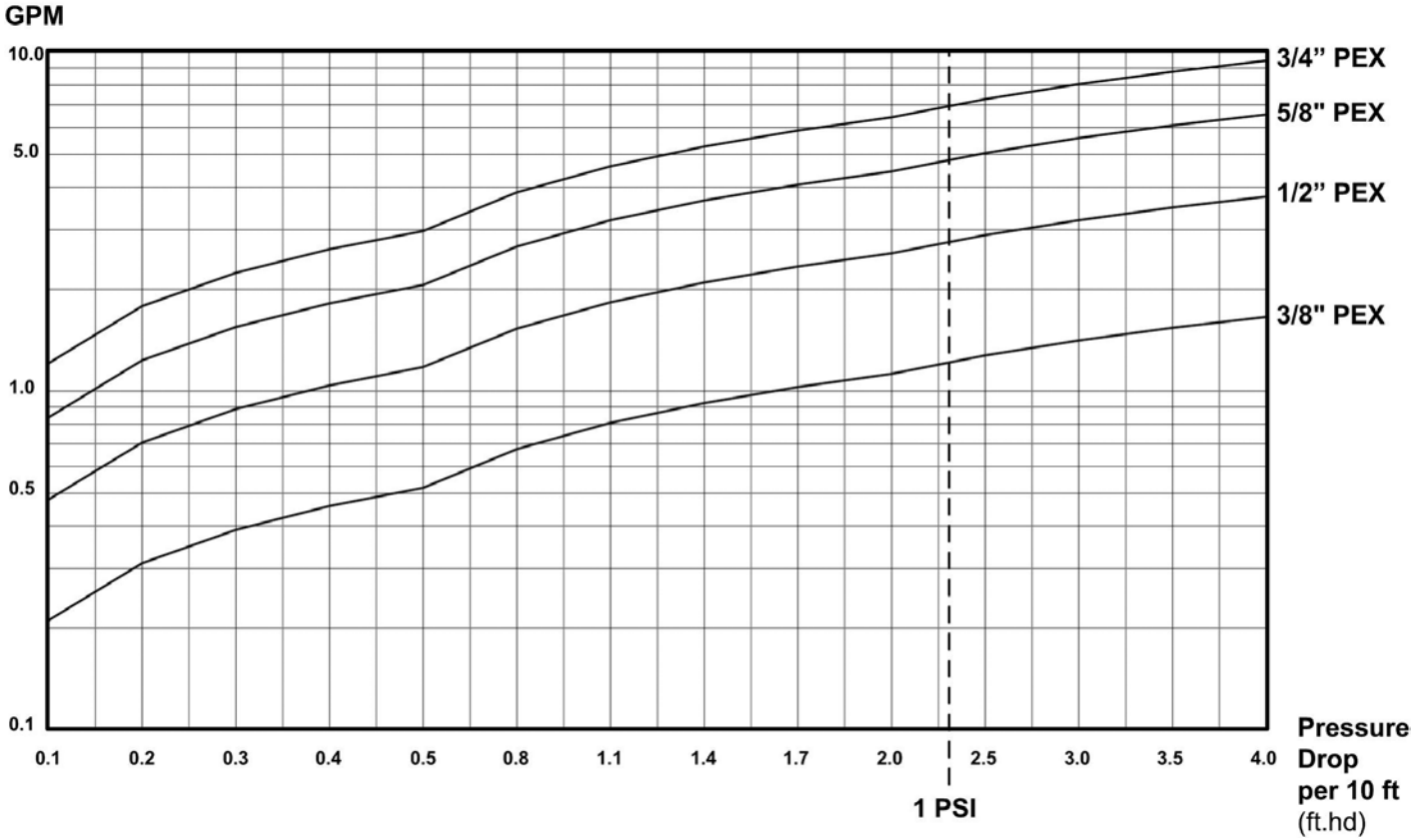


Using the Chart:

- Find the btu/sq ft to the left
- Move horizontally to the right until the intersection with correct loop length
- Go down vertically and read the flow for the loop



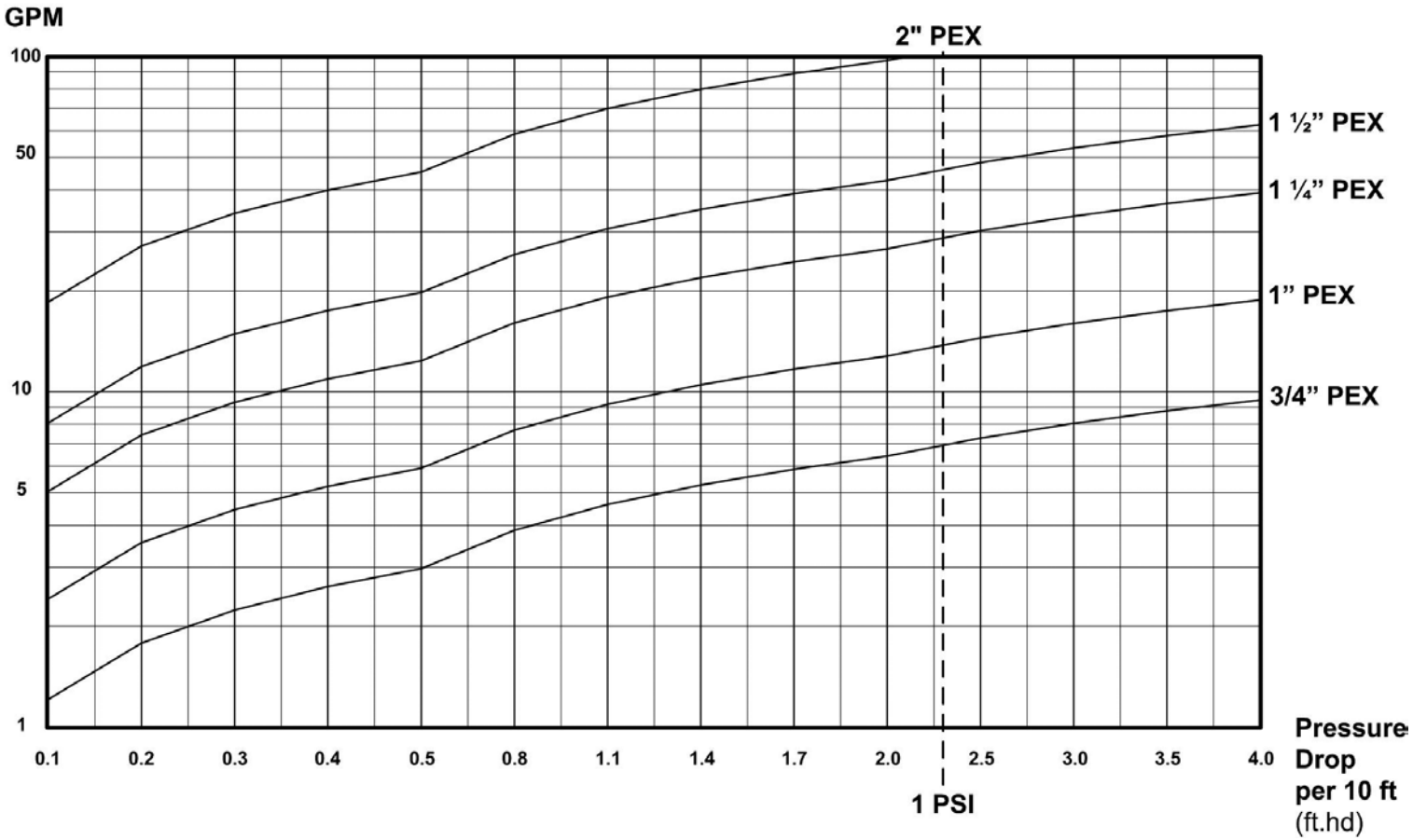
PRESSURE DROP FOR SMALL PEX TUBING AT 100 F



- Take the total heat load (BTUH) for the area that the loop is covering and divide it by 501.
- Divide the result with the Delta-T to find GPM for the loop.
- Find the closest flow for the loop in the left GPM column of the chart.
- Move to the right to the correct pipe size intersecting line.
- Move down to read to read the pressure drop per 10 feet of pipe.
- Divide the loop length by 10, then multiply the result with the given pressure drop for 10 feet to get the total pressure drop for the loop.

NOTE: This chart is for 100% water, and only includes the pressure drop for the PEX pipe itself. You need to add the drop for other equipment. For the manifold, add about 2 ft/hd. If glycol is used, use the correction charts on pages 92–93.

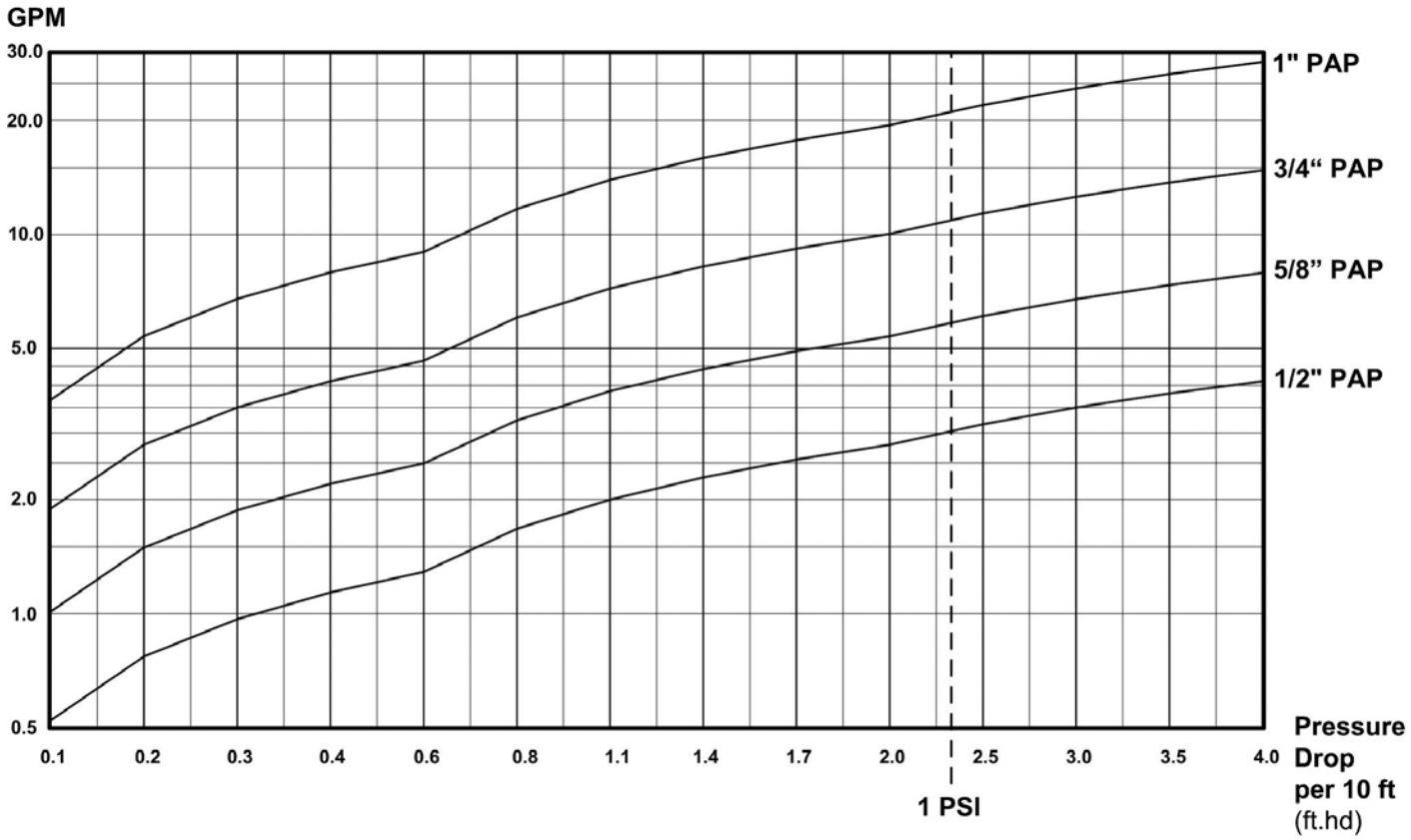
PRESSURE DROP FOR LARGE PEX TUBING AT 100 F



- Find the closest flow for the loop in the left GPM column of the chart.
- Step 2, Move to the right to the correct pipe size intersecting line.
- Step 3, Move down to read to read the pressure drop per 10 feet of pipe.
- Step 4, Divide the pipe length by 10, then multiply the result with the given pressure drop for 10 feet to get the total pressure drop for the pipe length.

NOTE: This chart is for 100% water, and only includes the pressure drop for the PEX pipe itself. You need to add the drop for other equipment. If glycol is used, use the correction charts on pages 92–93.

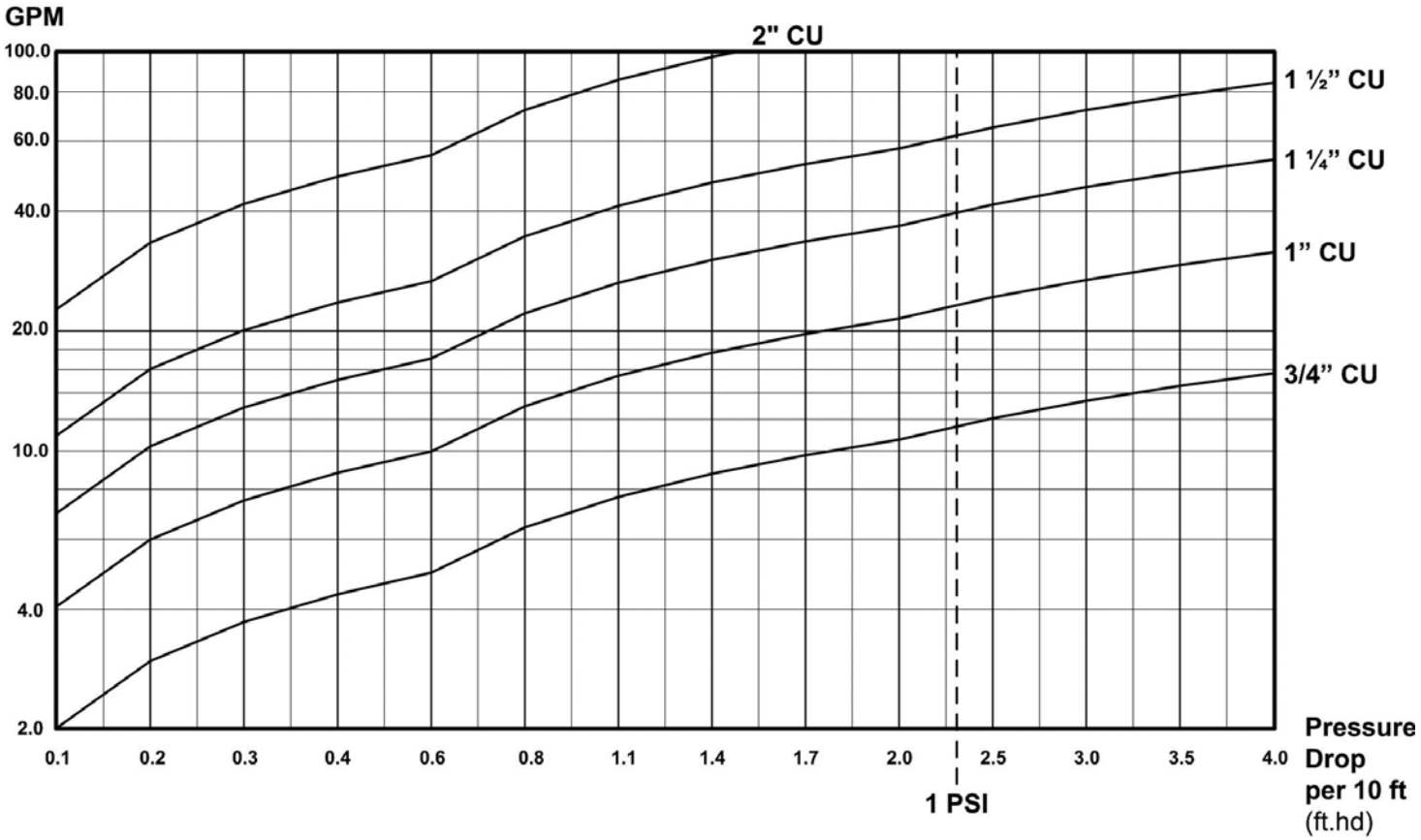
PRESSURE DROP FOR PAP TUBING AT 100 F



- Take the total heat load (BTUH) for the area that the loop is covering and divide it by 501.
- Step 2, Divide the result with the Delta-T to find GPM for the loop.
- Step 3, Find the closest flow for the loop in the left GPM column of the chart.
- Step 4, Move to the right to the correct pipe size intersecting line.
- Step 5, Move down to read to read the pressure drop per 10 feet of pipe.
- Step 5, Divide the loop length by 10, then multiply the result with the given pressure drop for 10 feet to get the total pressure drop for the loop.

NOTE: This chart is for 100% water, and only includes the pressure drop for the PAP pipe itself. You need to add the drop for other equipment. For the manifold, add about 2 ft/hd. If glycol is used, use the correction charts on pages 92–93.

PRESSURE DROP FOR COPPER TUBING AT 100 F



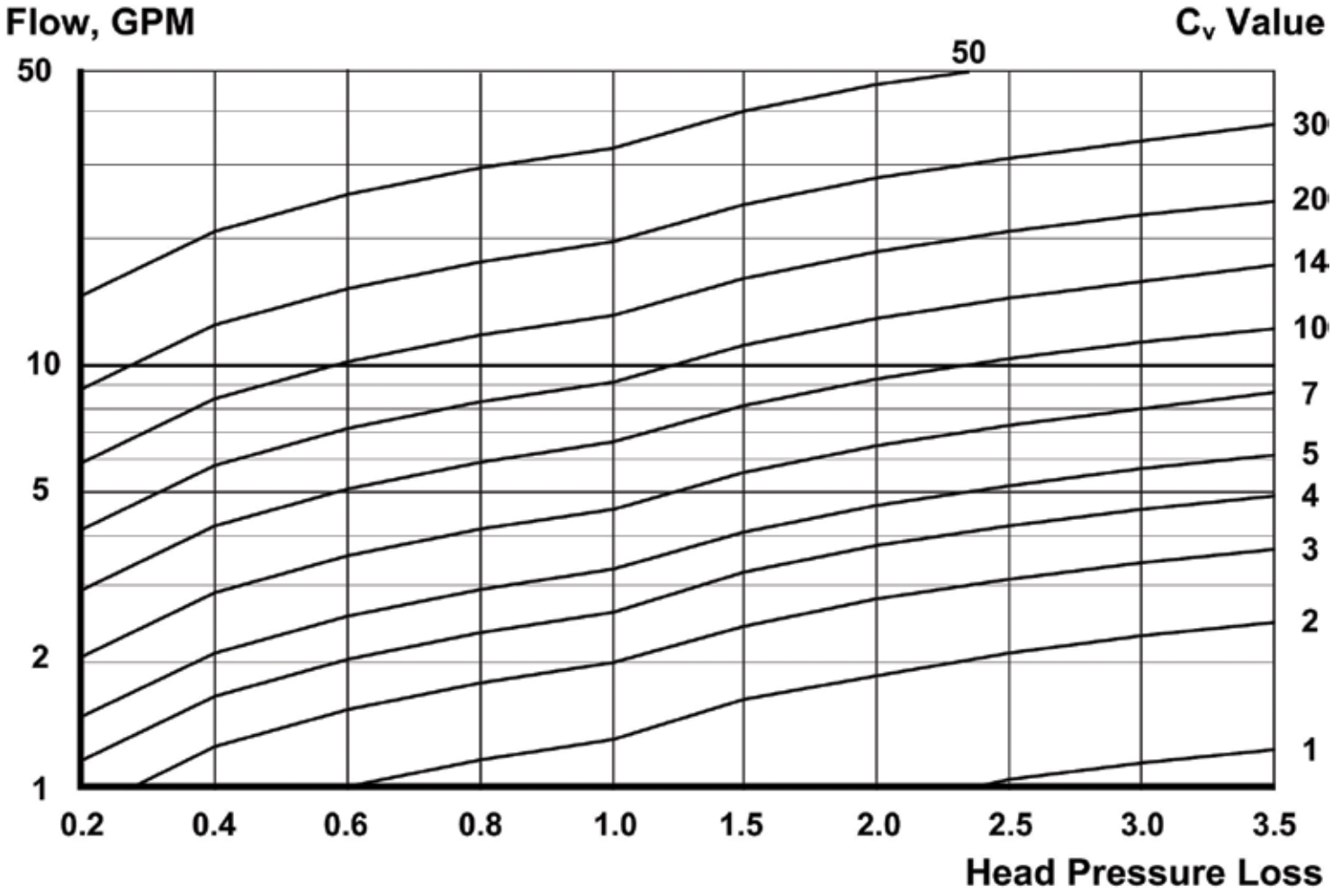
- Find the closest flow for the loop in the left GPM column of the chart.
- Step 2, Move to the right to the correct pipe size intersecting line.
- Step 3, Move down to read to read the pressure drop per 10 feet of pipe.
- Step 4, Divide the pipe length by 10, then multiply the result with the given pressure drop for 10 feet to get the total pressure drop for the pipe length.

NOTE: This chart is for 100% water, and only includes the pressure drop for the copper pipe itself. You need to add the drop for other equipment. If glycol is used, use the correction charts on pages 92–93.

C_V VALUES

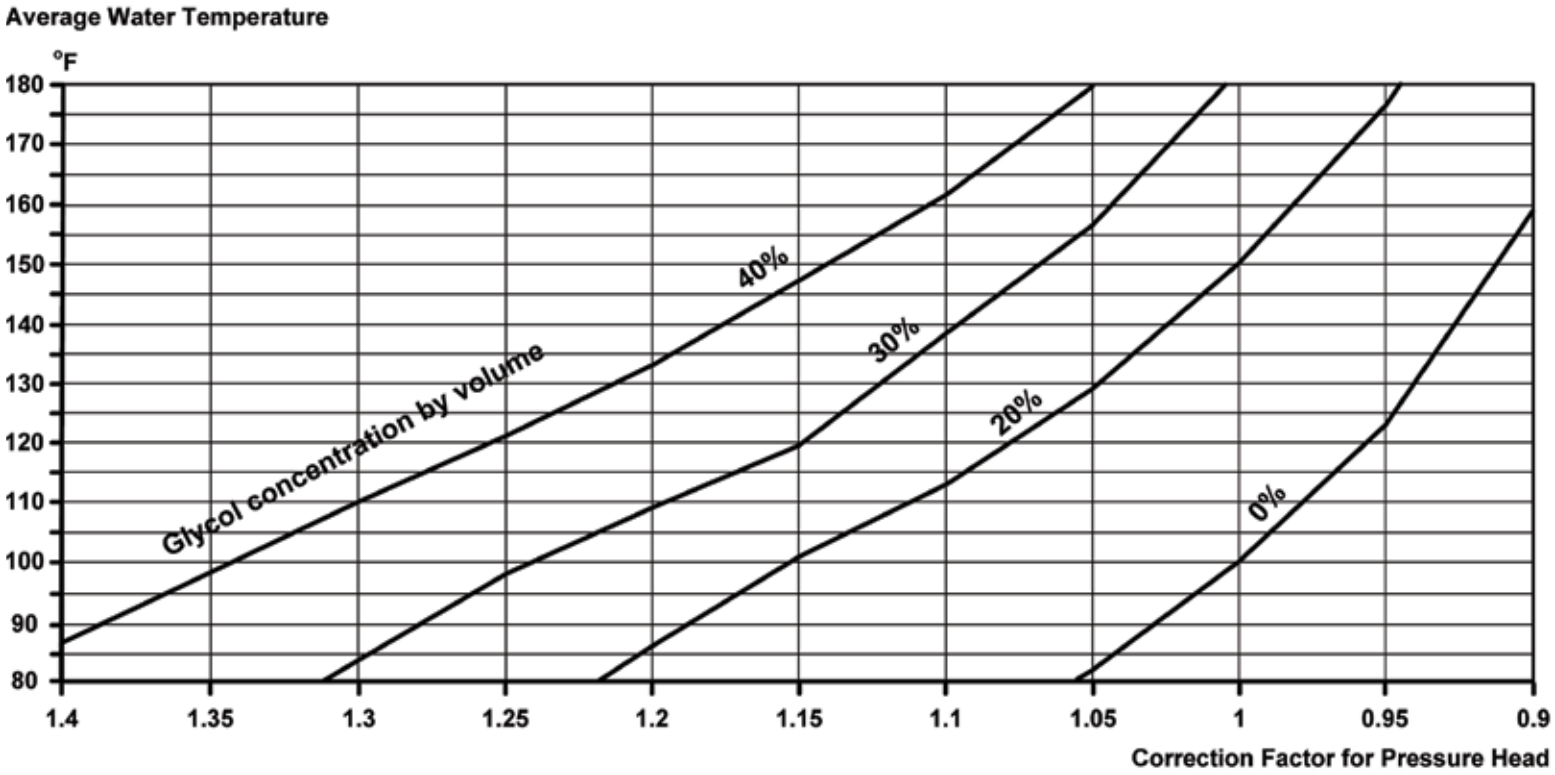
The pressure drop for hydronic heating components are normally described by their C_v value. The C_v value describes at what flow (in gpm) the pressure drop over the component will be 1 psi (equal to 2.31 ft/hd). Check with the manufacturer for the C_v value of the component and then use formula below to establish the head loss (ft/hd).

HEAD LOSS (FT.HD.) OVER VALVES ETC.: (1.52 x GPM / Cv)2 (GPM is the flow, and Cv is the valve parameter)
(Multiply the flow by 1.52 and then divide by the Cv value. Multiply the result by itself)



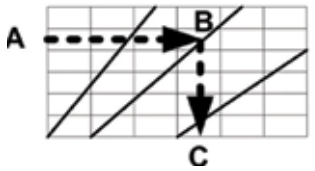
PRESSURE HEAD CORRECTION FACTOR FOR TEMPERATURES AND PROPYLENE GLYCOL

Pressure head correction factor (multiplier) as a function of average fluid temperature (°F) and propylene glycol concentration (Volume %).



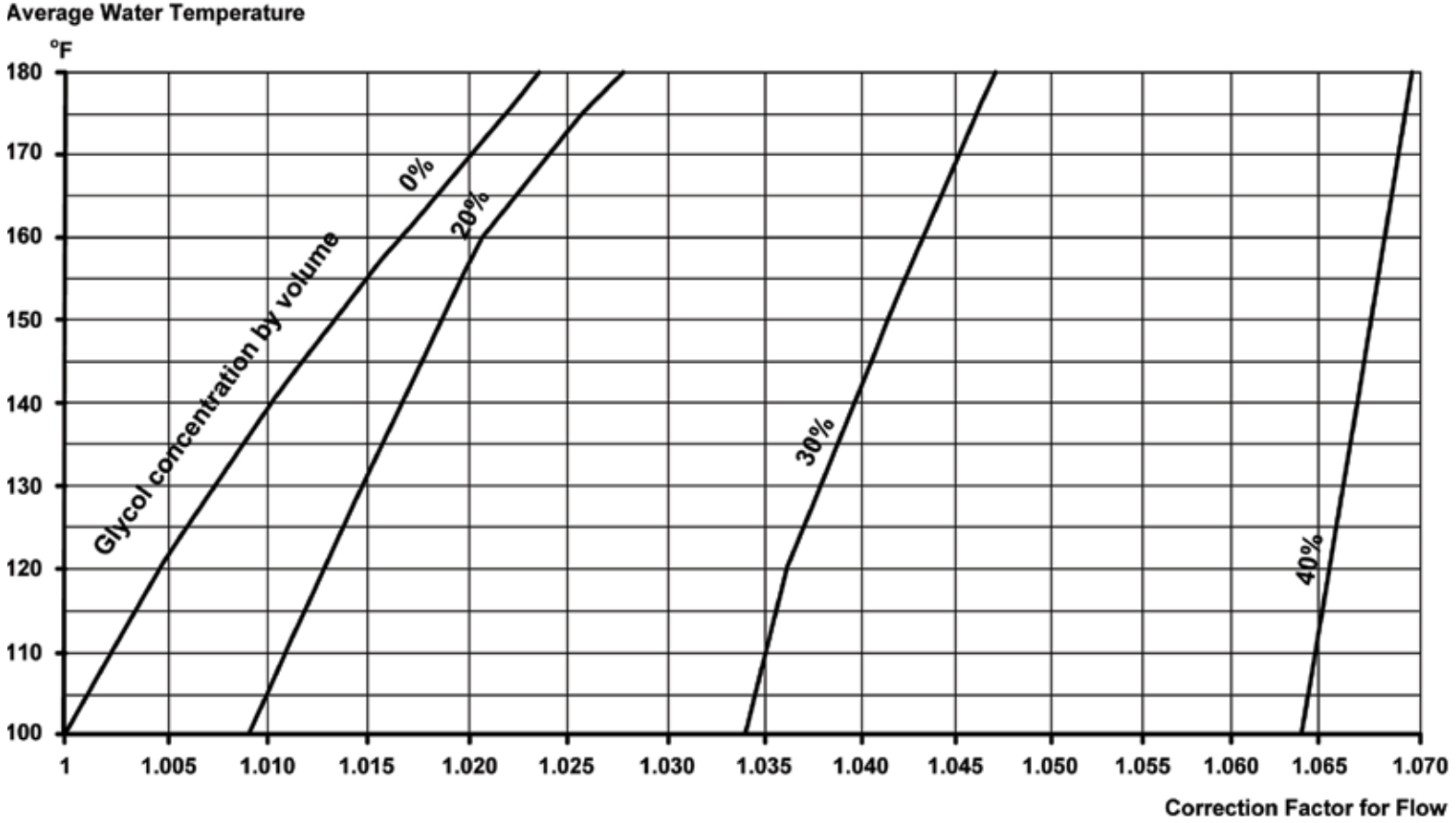
Using the Chart:

- Find the average water temperature to the left
- Move horizontally to the right until the intersection with actual glycol concentration
- Go down vertically and read the flow correction factor
- Multiply the head loss (ft/hd) with the correction factor for correct result



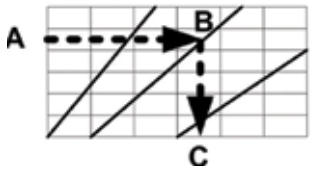
FLOW CORRECTION FACTOR FOR TEMPERATURES AND PROPYLENE GLYCOL

Flow correction factor (multiplier) as a function of average fluid temperature (°F) and propylene glycol concentration (Volume %).



Using the Chart:

- Find the average water temperature to the left
- Move horizontally to the right until the intersection with actual glycol concentration
- Go down vertically and read the flow correction factor
- Multiply the flow (GPM) with the correction factor for correct result



1-800-916-3406

THERMOSTAT INSTALLATION

INSTALLATION INSTRUCTIONS FOR DIGITAL THERMOSTAT #5110740

PREPARATION: This is a Low Voltage Thermostat. Before installing this thermostat, verify that the system is a low voltage heating system. If necessary, check with your local dealer.

NOTE: Leave these instructions with the homeowner for future reference.

- Find a location about 5 ft above the floor that has a constant temperature, and is not subject to big swings in temperature. Avoid mounting close to; oven, fireplace, outside door, air conditioning register, TV, or full sun.
- WARNING!!! Turn off the main power switch before installing the thermostat.
- Release the front cover by pressing the tab on the top of the front cover with a screwdriver (see figure 1).
- Remove the front cover with your hand holding both sides of the cover (see figure 2).
- Remove the terminal cover to get access to the terminals by pushing a small flat screwdriver into the gap from the front and push the tab toward the center to open the cover.
  Pull the cover straight up (see figure 3).
- Route the wires through the cutout in the base and mount the thermostat to the wall with two screws (see figure 4).
- Install the thermostat wire as necessary following the guide in Fig. 5. And tighten the screws.
  - For heating applications, use terminals #1 & #5
- Install the two AAA batteries as shown in Fig. 5.
- Replace the terminal cover. Replace the front cover onto the base.
- Turn on power to the system for operation.


Fig. 1


Fig. 2


Fig. 3


Fig. 4

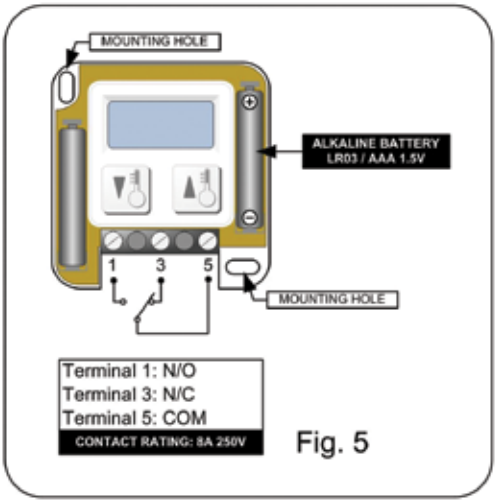
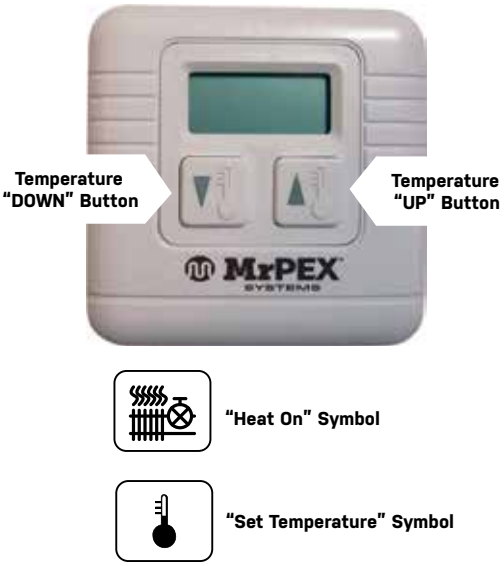


Fig. 5

NOTE: See pages 104–105 for electrical sample schematics..

TESTING THE OPERATION

- Start by briefly pressing either the "UP" or "DOWN" button. The set point temperature will start flashing with "Heat On" and "temperature set" symbols.
- While still flashing, push the "UP" or "DOWN" buttons to set the temperature at least 2 degrees above current ambient temperature. Each push of the button moves the set-point 1 degree F. Wait 15 seconds until the display stops flashing. The "Heat On" symbol should now stay on and a faint click should be heard indicating that the heat demand relay has engaged. If this does not occur, wait for another 3 minutes. It is possible that the thermostat is in "Short cycle elimination mode". This means that if the set point is changed more than once within a 3 minute period, the thermostat will wait another 3 minutes to make sure that any appliance that is connected will not short cycle. If the thermostat still does not engage "Heat On" mode. Check wiring to make sure both the thermostat and associated wiring is connected correctly.



NOTE: If the LCD changes from displaying the ambient temperature to "Lo", install new AAA size alkaline batteries.

INSTALLATION INSTRUCTIONS FOR DIGITAL THERMOSTAT #5110519

BEFORE YOU START

CAUTION:

Improper installation and operation of this control could result in damage to the equipment and possibly even personal injury or death. It is your responsibility to ensure that this control is safely installed according to all applicable codes and standards. This electronic control is not intended for use as a primary limit control. Other controls that are intended and certified as safety limits must be placed into the control circuit.

ABOUT YOUR THERMOSTAT

The Radiant Thermostat 519 accurately controls the room and/or floor temperature for a hydronic heating zone using Pulse Width Modulation (PWM) technology. Simple up and down buttons and a display with large type make this thermostat easy to read and use. A Slab Sensor 5110079 is included to measure floor temperature to protect the floor from overheating and enhance comfort. This easy to install thermostat is a direct replacement for the tekmar Thermostat 509.

Tools Required

- Jeweller screwdriver
- Phillips head screwdriver
- Wire Stripper

Materials Required

- 18 AWG LVT Solid Wire (Low Voltage Connections)

INSTALLATION LOCATION

Choose the placement of the thermostats early in the construction process to enable proper wiring during rough-in.

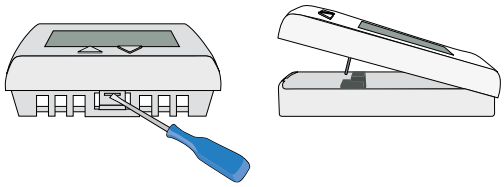
Consider the following:

- Interior Wall.
- Keep dry. Avoid potential leakage onto the control.
- Relative Humidity less than 90%. Non-condensing environment.
- No exposure to extreme temperatures beyond 32-122°F (0-50°C).
- No draft, direct sun, or other cause for inaccurate temperature readings.
- Away from equipment, appliances, or other sources of electrical interference.
- Easy access for wiring, viewing, and adjusting the display screen.
- Approximately 5 feet (1.5 m) off the finished floor.
- The maximum length of wire is 500 feet (150 m).
- Strip wire to 3/8" (10 mm) for all terminal connections.
- Use standard 4 conductor, 18 AWG wire.

REMOVING THE THERMOSTAT BASE

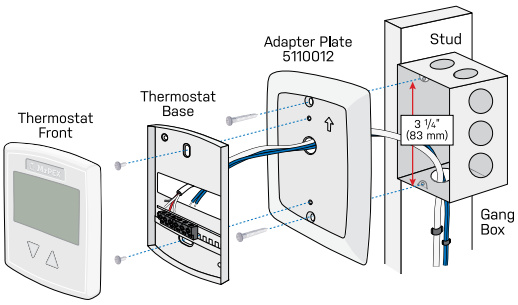
To remove the thermostat base:

- Locate the tab on the bottom of the thermostat.
- Push the tab with either your thumb or with a screwdriver.
- Lift the thermostat front away from the thermostat's base.



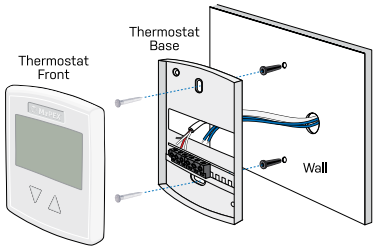
If a single gang box is used:

- Adapter Plate 5110012 is required (sold separately).
- Feed the wiring through the hole in the adaptor plate and the thermostat base.
- Fasten the adaptor plate to the gang box.
- Fasten the base of the thermostat to the adaptor plate.
- Terminate wiring to the wiring strip.
- Push the thermostat front onto the thermostat base.



If mounting directly to the wall:

- Drill holes and install the wall anchors.
- Feed the wiring through the large hole in the thermostat base.
- Fasten the thermostat base to the wall using the wood screws to the wall anchors.
- Terminate wiring to the wiring strip.
- Push the thermostat front onto the thermostat base.



NEW SLAB SENSOR 5110079 INSTALLATION

Thin-Set or Thin-Pour Applications

If the floor covering is to be installed over either a thin-set or thin-pour material of sufficient depth, the 5110079 slab sensor can be placed directly into either the thin-set material or the thin-pour material and covered over. Ensure that the sensor is located in such a position that the attached wire is able to reach to a suitable junction location. Splices within the thin-set or thinpour should be avoided to ensure trouble free operation. The sensor should be located mid way between the heating elements to ensure a proper temperature reading.

Thin Floor Coverings (less than 3/8" (10 mm))

If a thin floor covering is to be installed directly to the subfloor, a groove 1/8" (4 mm) wide by 1/16" (2 mm) deep can be cut into the surface of the subfloor to accommodate the wire for the sensor. Ensure that the sensor is located in such a position that the attached wire is able to reach to a suitable junction location. Splices under the floor covering should be avoided to ensure trouble free operation. A groove 3/16" (5 mm) wide by 3/16" (5 mm) deep by 1-3/4" (45 mm) long should be cut to accommodate the sensor. The sensor should be located mid way between the heating elements to ensure a proper temperature reading

Thick Floor Coverings (greater than 3/8" (10 mm))

If a thick floor covering is to be installed directly to the subfloor, a groove 1/8" (4 mm) wide by 1/16" (2 mm) deep can be cut into the back of the flooring material to accommodate the wire for the sensor. Ensure that the sensor is located in such a position that the attached wire is able to reach to a suitable junction location. Splices under the floor covering should be avoided to ensure trouble free operation. A groove 3/16" (5 mm) wide by 3/16" (5 mm) deep by 1-3/4" (45 mm) long should be cut to accommodate the sensor. The sensor should be located mid way between the heating elements to ensure a proper temperature reading.

NOTE: If it isn't practical to cut a groove in the surface covering, follow the method used for thin floor coverings.

RETROFIT SLAB SENSOR 5110079 INSTALLATION

Tile Floor Coverings

If a Slab Sensor 5110079 is to be installed into an existing tile floor with sufficiently large grout lines, the sensor and wire can be installed in one of the grout lines between the tiles. Select a low traffic area of the floor that is mid way between the heating elements for the sensor location. Ensure that the sensor is located in such a position that the attached wire is able to reach to a suitable junction location. Splices within the grout should be avoided to ensure trouble free operation. Remove the appropriate grout line and place the sensor and wire in the floor. Re-grout the area.

Installing the Sensor to the Bottom of a Subfloor

If the sensor is to be installed to the bottom of a subfloor, cut a piece of 1" (25 mm) thick rigid insulation into a 6" (150 mm) by 6" (150 mm) square. A groove 3/16" (5 mm) wide by 3/16" (5 mm) deep by 1-3/4" (45 mm) long should be cut into the insulation to accommodate the sensor. Place the sensor in the groove and sandwich the sensor between the insulation and the subfloor. Use a suitable fastening method to affix the insulation to the subfloor.

SLAB SENSOR 5110079 WIRING

Caution: Do not run sensor wires parallel to telephone or power cables. If the sensor wires are located in an area with strong sources of electromagnetic interference, shielded cable or twisted pair should be used or the wires can be run in a grounded metal conduit.

The Slab Sensor 5110079 is supplied with 10' (3 m) of cable. If a longer length is required, 24 AWG or larger wire can be spliced onto the two wires from the sensor. The splices should be properly soldered and protected in an accessible junction box. Follow the sensor testing instructions given in this brochure and then connect the wires to the control.

SLAB SENSOR 5110079 TESTING

A good quality test meter capable of measuring up to 5,000 kΩ (1 kΩ = 1000Ω) is required to measure the sensor resistance. In addition to this, the actual temperature must be measured with either a good quality digital thermometer, or if a thermometer is not available, a second sensor can be placed alongside the one to be tested and the readings compared.

First measure the room temperature using the thermometer. Disconnect the Sen and Com wires from the thermostat. Using an electrical meter, measure the resistance of the Sen and Com wires at the thermostat location. Using the temperature versus resistance table, estimate the temperature measured by the sensor. The sensor measurement and thermometer readings should be close. If the test meter reads a very high resistance, there may be a broken wire, a poor wiring connection or a defective sensor. If the resistance is very low, the wiring may be shorted, there may be moisture in the sensor or the sensor may be defective. To test for a defective sensor, measure the resistance directly at the sensor location. Once the test has been completed, reconnect the Sen and Com wires to the thermostat. Do not apply voltage to the temperature sensor terminals at any time as damage to the sensor may result.

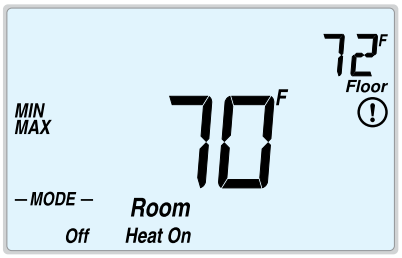
Temperature vs. Resistance Table

TEMPERATURE		RESISTANCE
°F	°C	Ω
-50	-46	490,813
-45	-43	405,710
-40	-40	336,606
-35	-37	280,279
-30	-34	234,196
-25	-32	196,358
-20	-29	165,180
-15	-26	139,402
-10	-23	118,018
-5	-21	100,221
0	-18	85,362
5	-15	72,918
10	-12	62,465
15	-9	53,658
20	-7	46,218
25	-4	39,913
30	-1	34,558
35	2	29,996
40	4	26,099
45	7	22,763
50	10	19,900
55	13	17,436
60	16	15,311
65	18	13,474
70	21	11,883
75	24	10,501
80	27	9,299
85	29	8,250

TEMPERATURE		RESISTANCE
°F	°C	Ω
90	32	7,334
95	35	6,532
100	38	5,828
105	41	5,210
110	43	4,665
115	46	4,184
120	49	3,760
125	52	3,383
130	54	3,050
135	57	2,754
140	60	2,490
145	63	2,255
150	66	2,045
155	68	1,857
160	71	1,689
165	74	1,538
170	77	1,403
175	79	1,281
180	82	1,172
185	85	1,073
190	88	983
195	91	903
200	93	829
205	96	763
210	99	703
215	102	648
220	104	598
225	107	553

USER INTERFACE

Home Screen



Heat On	Heat is turned on.
— MODE — Off	The heating system is off.
!	Indicates an error is present.
MIN	The floor is at or below the floor minimum temperature.
MAX	The floor has reached the floor maximum temperature.

SEQUENCE OF OPERATION

Heating Operation

To change the heat temperature setting, push the △ or ▽ button to select a preferred temperature setting. The Heat On symbol is shown on the display when the thermostat is heating. The heat can cycle on and off within +/- 1.5°F (1°C) of the temperature setting.

The floor and air heating can be shut off by holding ▽ the button until Set Room is Off.

To resume heating when the Mode is Off, press the △ button to navigate to the Mode setting, then press the △ button to select Mode Heat. The thermostat will resume heating at the last previously set temperature.

Air Temperature Only

If there is only an air temperature sensor (no floor sensor), the thermostat operates to control your desired air temperature.

Floor Temperature Only

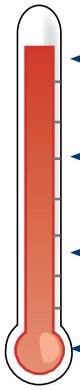
If the air sensor has been disabled, the thermostat will only maintain floor temperature and ignore air temperature. This operation is recommended for areas such as bathrooms to ensure that tile floors are warm to the touch.

Floor and Air Temperature

If the air sensor is turned on and a floor sensor is connected, the thermostat will maintain the desired air temperature as well as a minimum floor temperature.

This operation is recommended for areas with large windows that allow the sun to shine into a room and keep it warm without the need for heat. This can allow the floors to cool off during the afternoon. When the sun goes down, it can take a long time for the floors to get warm again. This may cause the room to cool off too much in the early evening. A floor minimum setting can help with this condition by maintaining a floor minimum temperature. Keep in mind the floor minimum temperature will override the air temperature, and if set too high, may overheat the room.

This operation is also recommended for rooms with hardwood floors. Setting floor minimum and maximum temperatures is a way of enhancing the comfort of the living space while protecting floor coverings.



90°F (32°C)
Feels hot to the touch
« Suggested maximum for all floor types other than wood.

80 to 85°F (26 to 30°C)
Feels warm to the touch
« Bathrooms and kitchens. Suggested maximum for wood floors.

70°F (21°C)
Feels cool to the touch
« Rooms with large windows preventing under heating in the evening.

40 to 45°F (5 to 7°C)
Feels cold to the touch
« Freeze protection for garages.

PROGRAMMABLE SETTINGS

SETTING	DISPLAY
User settings. Press the △ and ▽ buttons together for 3 seconds to enter and advance to the next setting.	
MODE Select heat or off.	MODE HEAT
Range: HEAT, OFF	Default: HEAT
UNITS Select the temperature units.	UNITS F
Range: °F or °C	Default: °F
LIGHT Select when the display back light should operate. Auto operates the backlight for 30 seconds after a keystroke.	LIGHT AUTO
Range: OFF, AUTO, ON	Default: AUTO
SET FLOOR Set the floor minimum temperature. Available when an auxiliary floor sensor is connected and the built-in room sensor is on.	SET FLOOR 72°
Range: OFF, 40 to 122°F (4.5 to 50.0°C)	Default: 72°F (22.0°C)
TYPE Device Type number. Hold the △ button to view the software version.	TYPE 519
ESCAPE Release the △ and ▽ buttons to return to the home screen.	ESCAPE
Installer settings. Press the △ and ▽ buttons together for 5 more seconds.	
AUXILIARY SENSOR Select the type of auxiliary sensor. Available when an auxiliary sensor is automatically detected.	AUXILLARY SENSOR NONE
Range: NONE = no auxiliary sensor, ROOM = Indoor Sensor, FLOR = Slab Sensor, OUT = Outdoor Sensor	Default: OFF
ROOM SENSOR Select if the built-in room temperature sensor is on or off. The built-in room sensor can only be disabled when an auxiliary room or slab sensor is connected.	SENSOR ON ROOM
Range: ON or OFF	Default: ON

SETTING	DISPLAY
SET FLOOR MAXIMUM Set the floor maximum temperature in order to protect the floor covering. Suggested settings: Tile = 90°F (32°C), Wood Floor = 85°F (29°C) F	SET FLOOR MAX 85°
Range: 40 to 122°F (4.5 to 50.0°C), OFF	Default: 85°F (29.5°C)
ESCAPE Release the △ and ▽ buttons to return to the home screen.	ESCAPE

TROUBLESHOOTING

Error Messages

ERROR MESSAGE	DESCRIPTION
SETUP ERR ROOM	**SETUP MENU SAVE ERROR** The thermostat failed to read the Programmable Settings from memory and has reloaded the factory default settings. The thermostat stops normal operation until all Programmable Settings are checked except to provide freeze protection.
SENSOR OPEN ROOM	**ROOM SENSOR OPEN CIRCUIT ERROR** The built-in air temperature sensor has an open circuit fault. Do not confuse this error with the auxiliary room sensor short circuit error. This error cannot be field repaired. Contact your wholesaler or MrPEX Systems sales representative for details on repair procedures.
SENSOR SHRT ROOM	**ROOM SENSOR SHORT CIRCUIT ERROR** The built-in air temperature sensor has a short circuit fault. Do not confuse this error with the auxiliary room sensor short circuit error. This error cannot be field repaired. Contact your wholesaler or MrPEX Systems sales representative for details on repair procedures.
AUX SENSOR OPEN	**AUXILIARY SENSOR OPEN CIRCUIT ERROR** The auxiliary sensor has an open circuit. Check for loose or damaged wires. Locate and repair the problem as described in the Sensor Testing section of this brochure. The error clears after the auxiliary sensor fault is corrected. If the auxiliary sensor was intentionally removed, power the thermostat down and up to clear the error.
AUX SENSOR SHRT	**AUXILIARY SENSOR SHORT CIRCUIT ERROR** The auxiliary sensor has a short circuit. Check for damaged wires. Locate and repair the problem as described in the Sensor Testing section of this brochure. The error clears after the auxiliary sensor fault is corrected.

Frequently Asked Questions

SYMPTOM	LOOK FOR...	CORRECTIVE ACTION
Display powering on and off.	Measure voltage at wiring terminals R and C.	The power supply transformer may have limited VA capacity. A transformer with a larger VA rating is recommended.
Thermostat does not heat.	Mode Off	Thermostat must be in Mode Heat in order to provide heating.

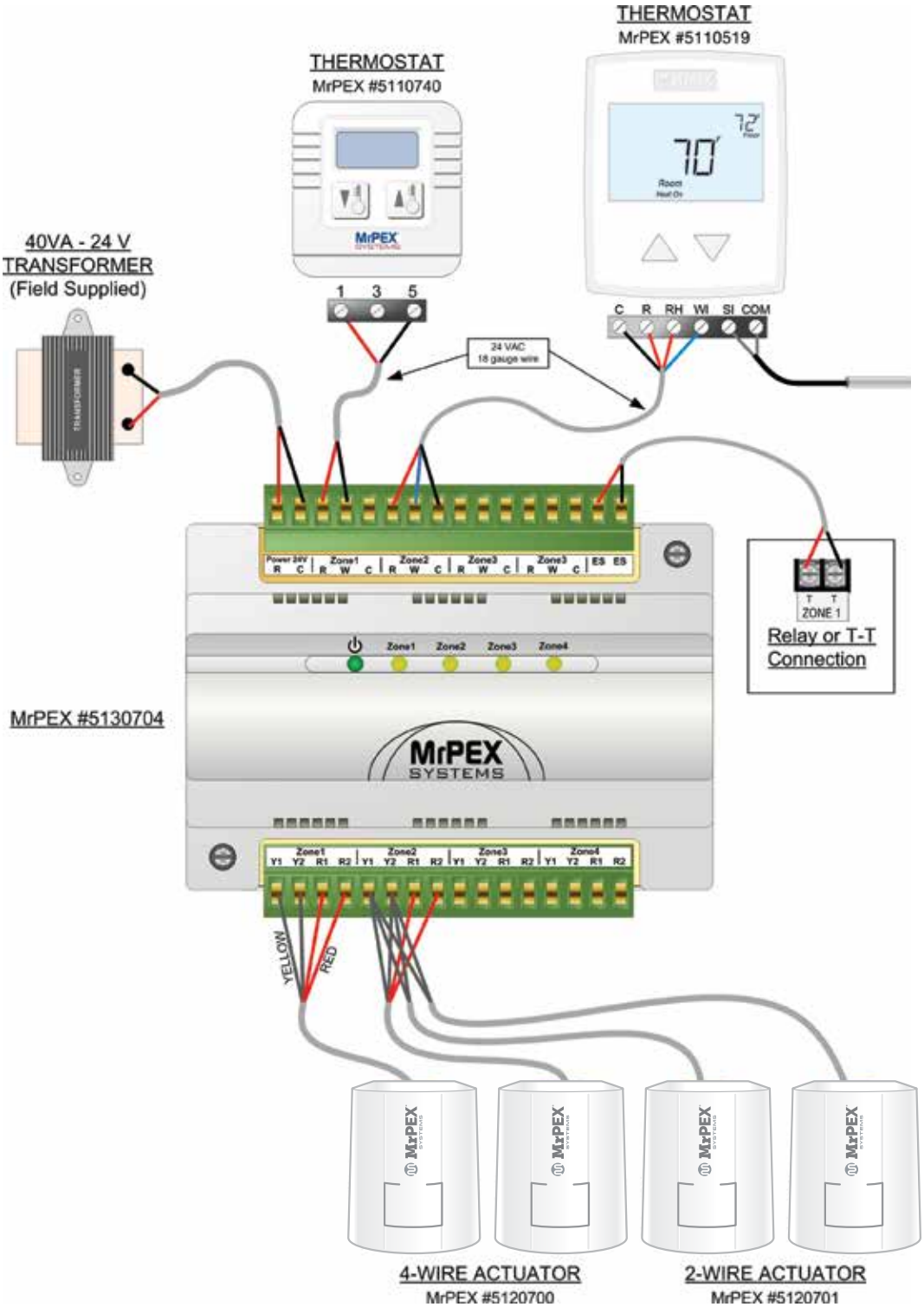
Technical Data

Radiant Thermostat 5110519 ***One Stage Heat***	
Literature	5110519_C, 5110519_D, 5110519_Q, 5110519_U
Control	Microprocessor control. This is not a safety (limit) control
Packaged weight	0.6 lb. (290 g)
Dimensions	3-11/16" H x 3" W x 15/16" D (94 x 76 x 24 mm)
Enclosure	White PVC plastic, NEMA Type 1
Approvals	Meets Class B: ICES & FCC Part 15
Ambient conditions	Indoor use only, 32 to 122°F (0 to 50°C), RH ≤90% non-condensing
Power supply	10 to 30 V (ac/dc), 50/60 Hz, 1.8 VA standby, 56 VA max fully loaded, Class 2
Relay	30 V (ac/dc) 2 A, Class 2 circuits
Sensor	NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) ß=3892
– Included	Slab Sensor 5110079
– Optional	tekmar type # 070, 072, 073, 076, 077, 079, 084

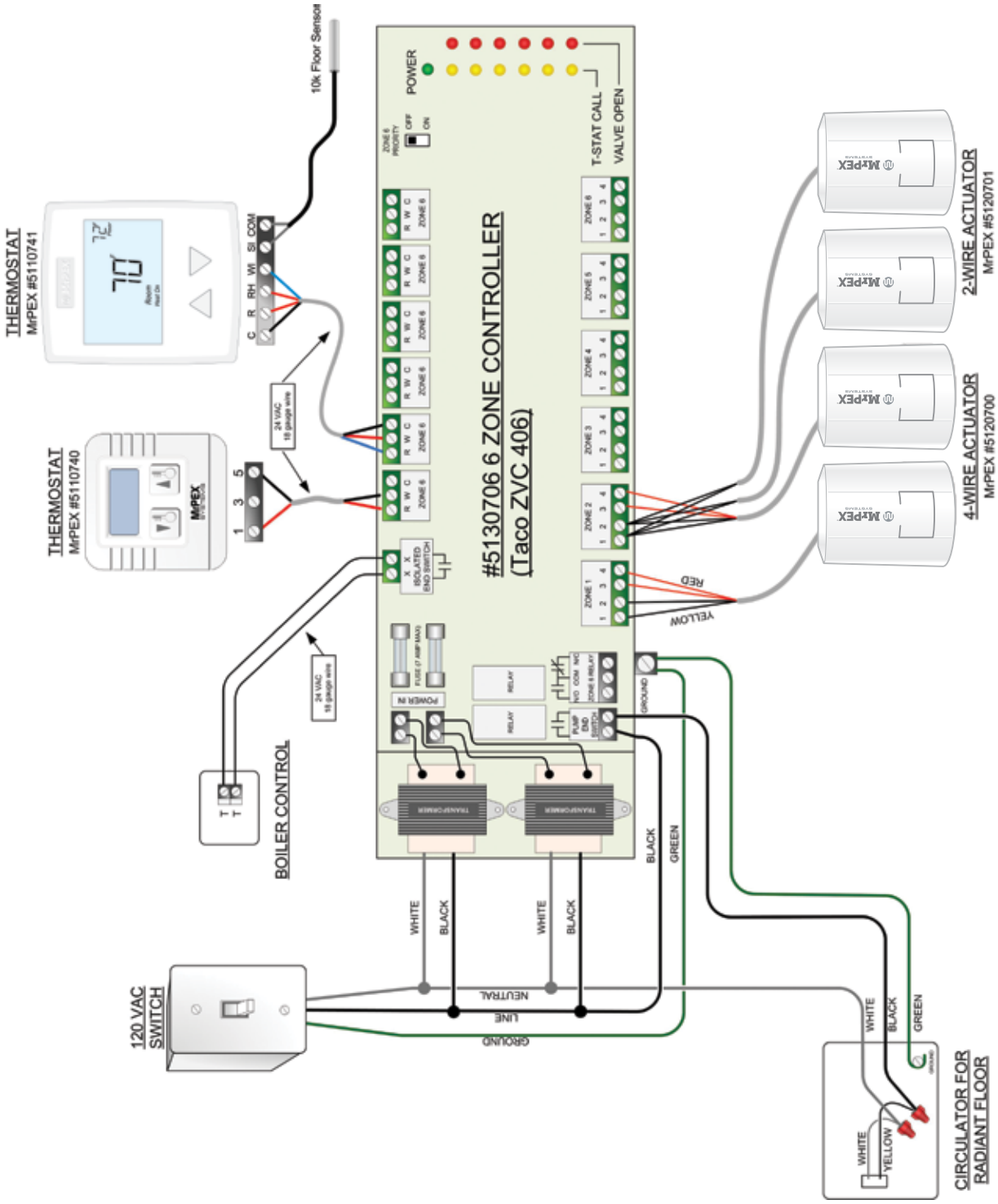
Slab Sensor 5110079 ***10' (3 m) wire***	
Dimensions	3/16" OD x 1-1/2" (5 OD x 38 mm)
Enclosure	316 stainless steel, 10' (3 m) 24 AWG, 300 volt PVC insulated Zipcord
Approvals	CSA C US
Operating range	-58 to 140°F (-50 to 60°C)
Sensor	NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) ß=3892

ELECTRICAL SCHEMATICS

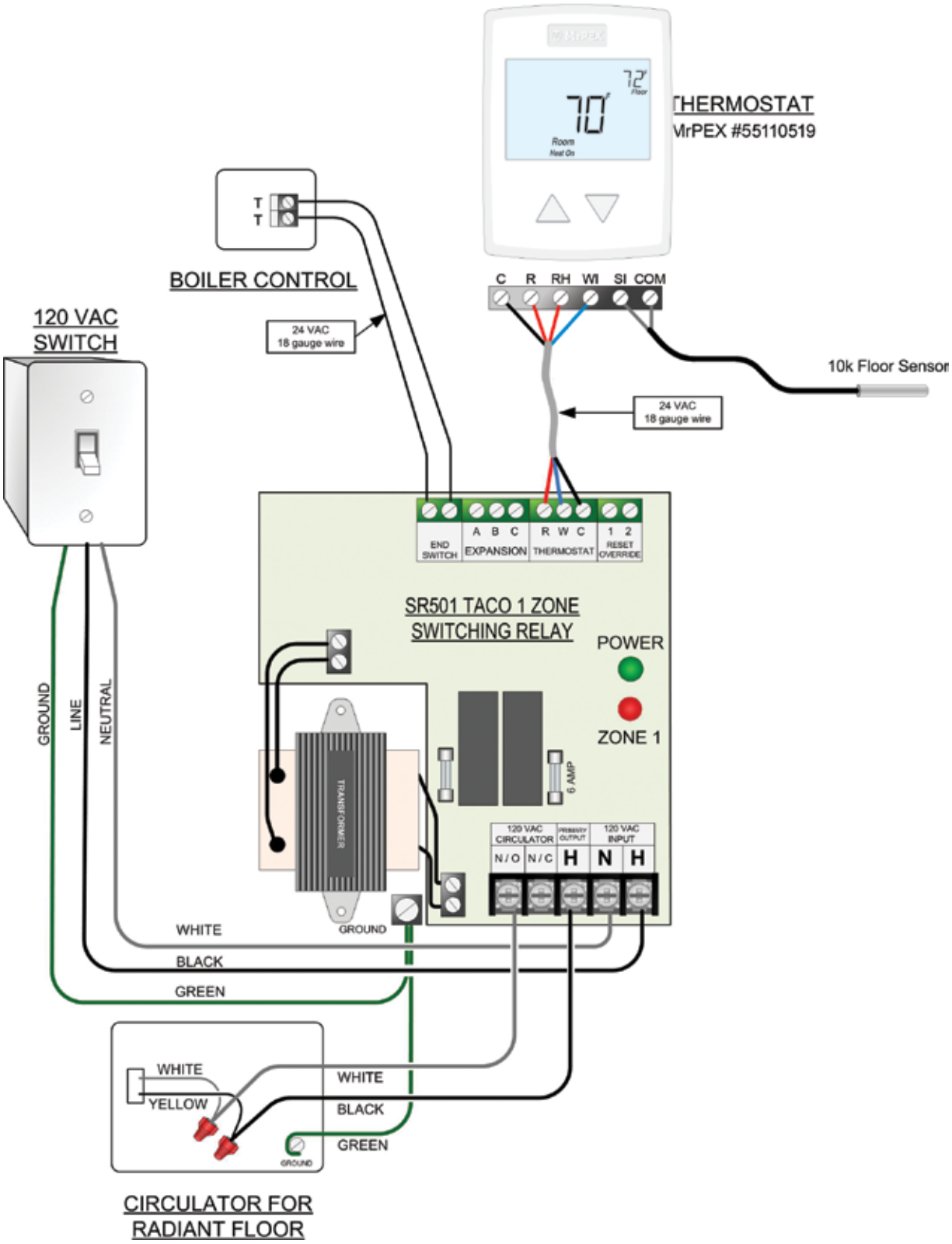
SIMPLE 4 ZONE CONTROLLER MRPEX® #5130704



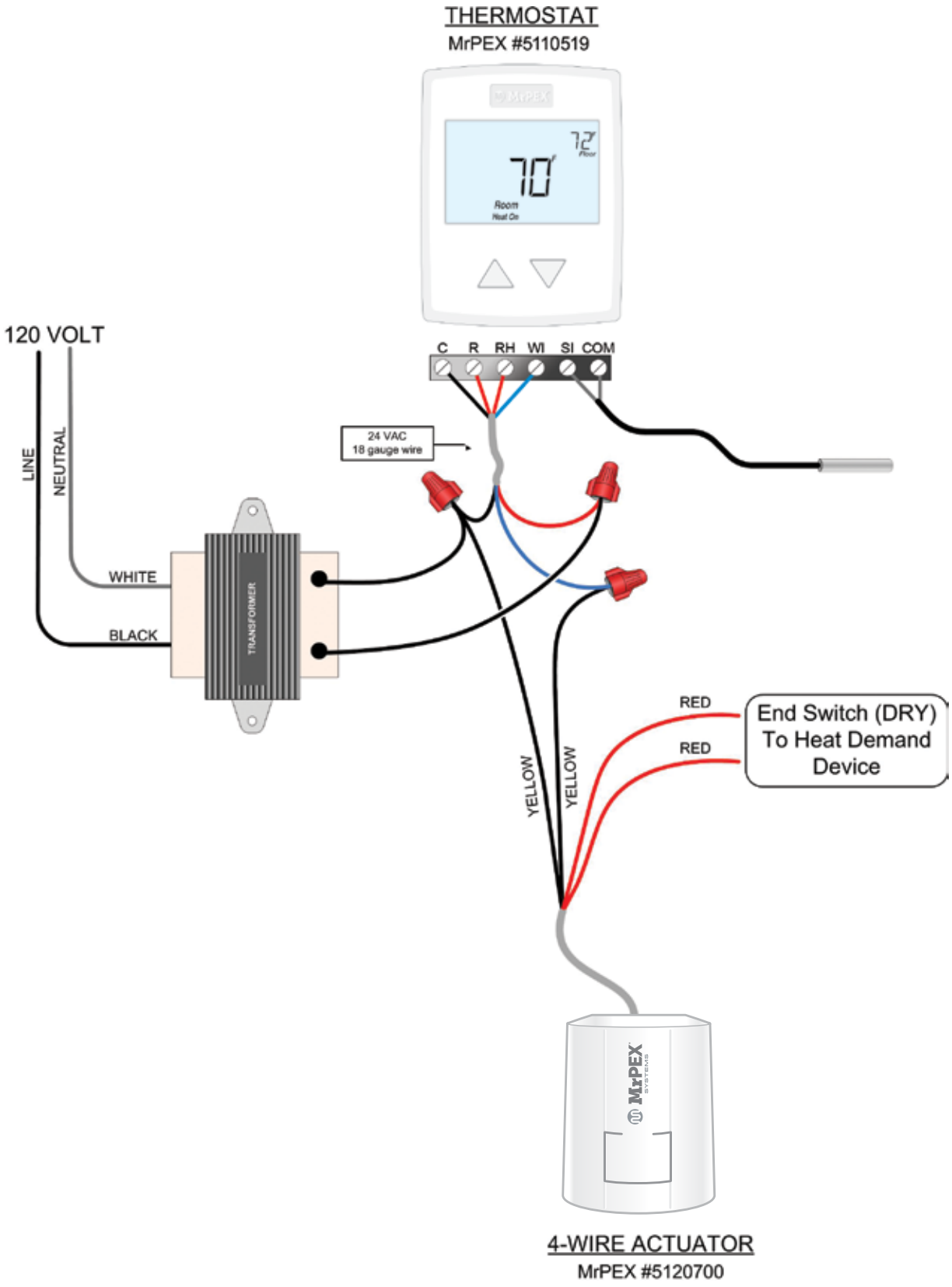
6 ZONE CONTROLLER MRPEX® #5130706



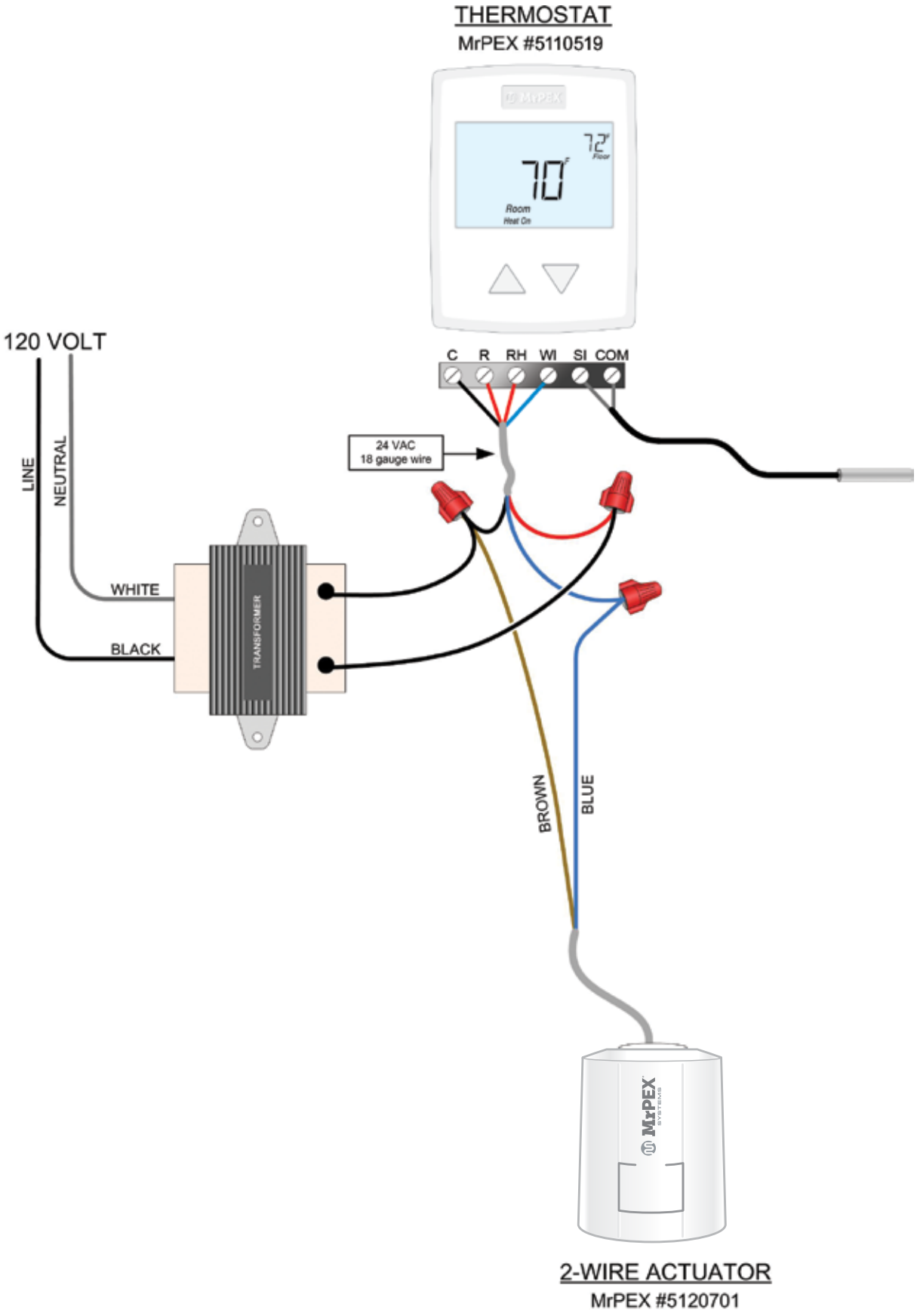
SINGLE ZONE CONTROLLER USING SINGLE ZONE PUMP RELAY WITH FLOOR SENSING THERMOSTAT #5110519



SINGLE ZONE SIMPLE WIRING USING MRPEX® #5110519 AND #5120700



SINGLE ZONE SIMPLE WIRING USING MRPEX® #5110519 AND #5120701



MECHANICAL SCHEMATICS

CONDENSING BOILER OR WATER HEATER – NO MIXING

Component Overview

1. Condensing Boiler / Water Heater
2. 30# Pressure Relief Valve
3. Ball Valve
4. Thermometer / Pressure Gauge
5. Expansion Tank
6. City Water Supply
   w/ **Back Flow Prevention by code**
7. Air Eliminator
9. Boiler Drain
14. Isolation Valve Flanges
15. System Circulator
16. Manifold Isolation Ball Valves
17. Radiant Manifold

DISCLAIMER:
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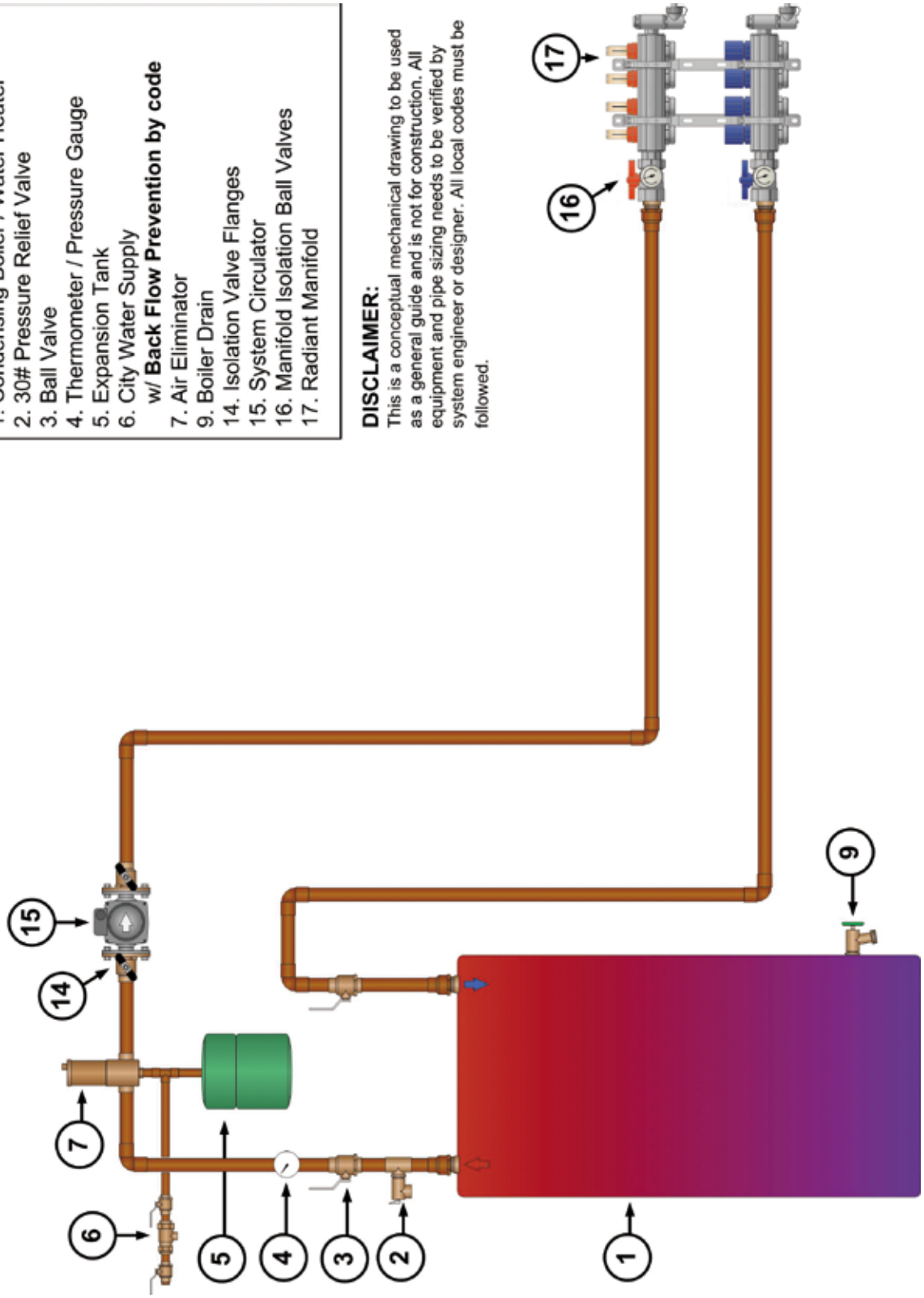
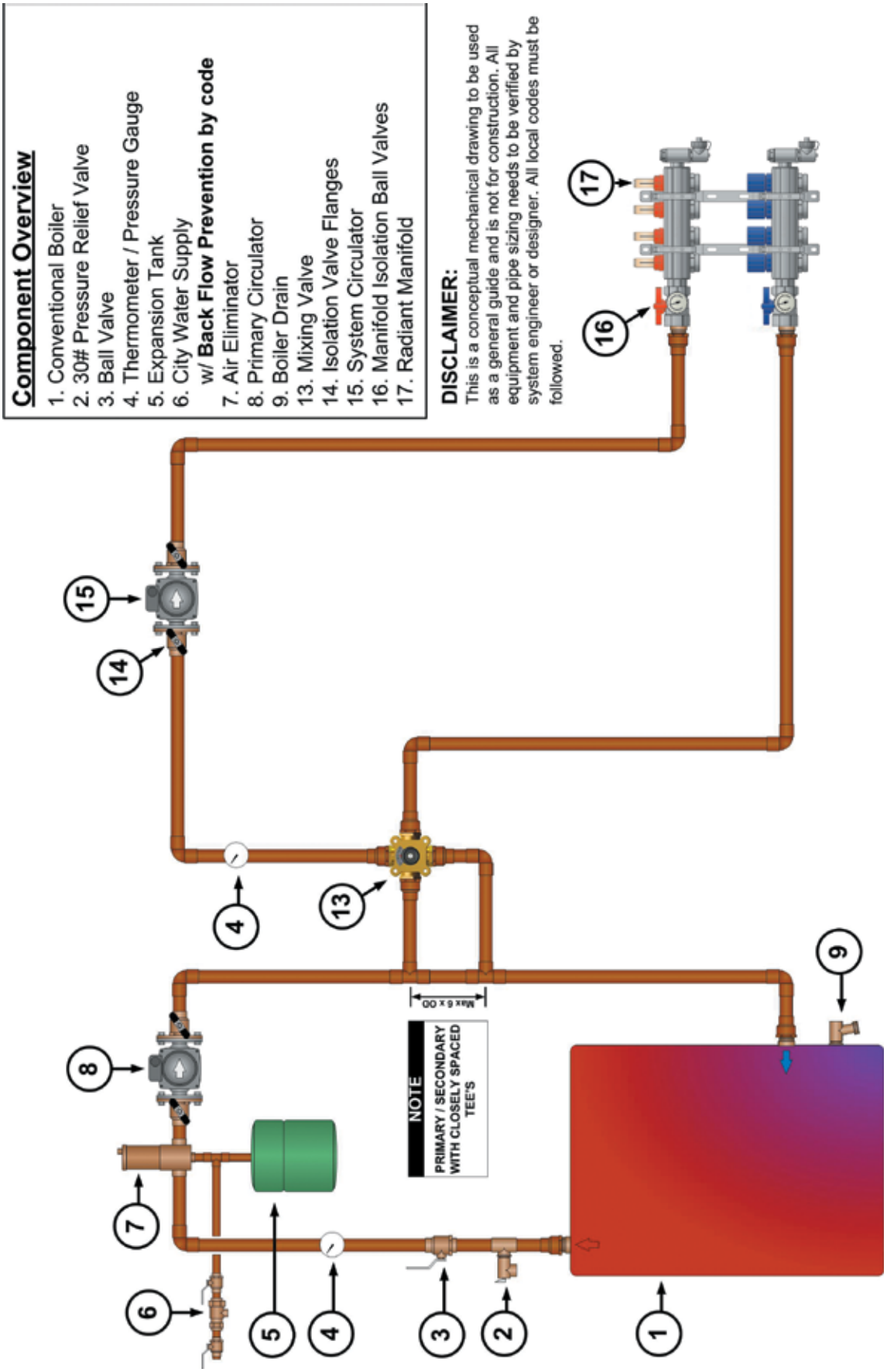
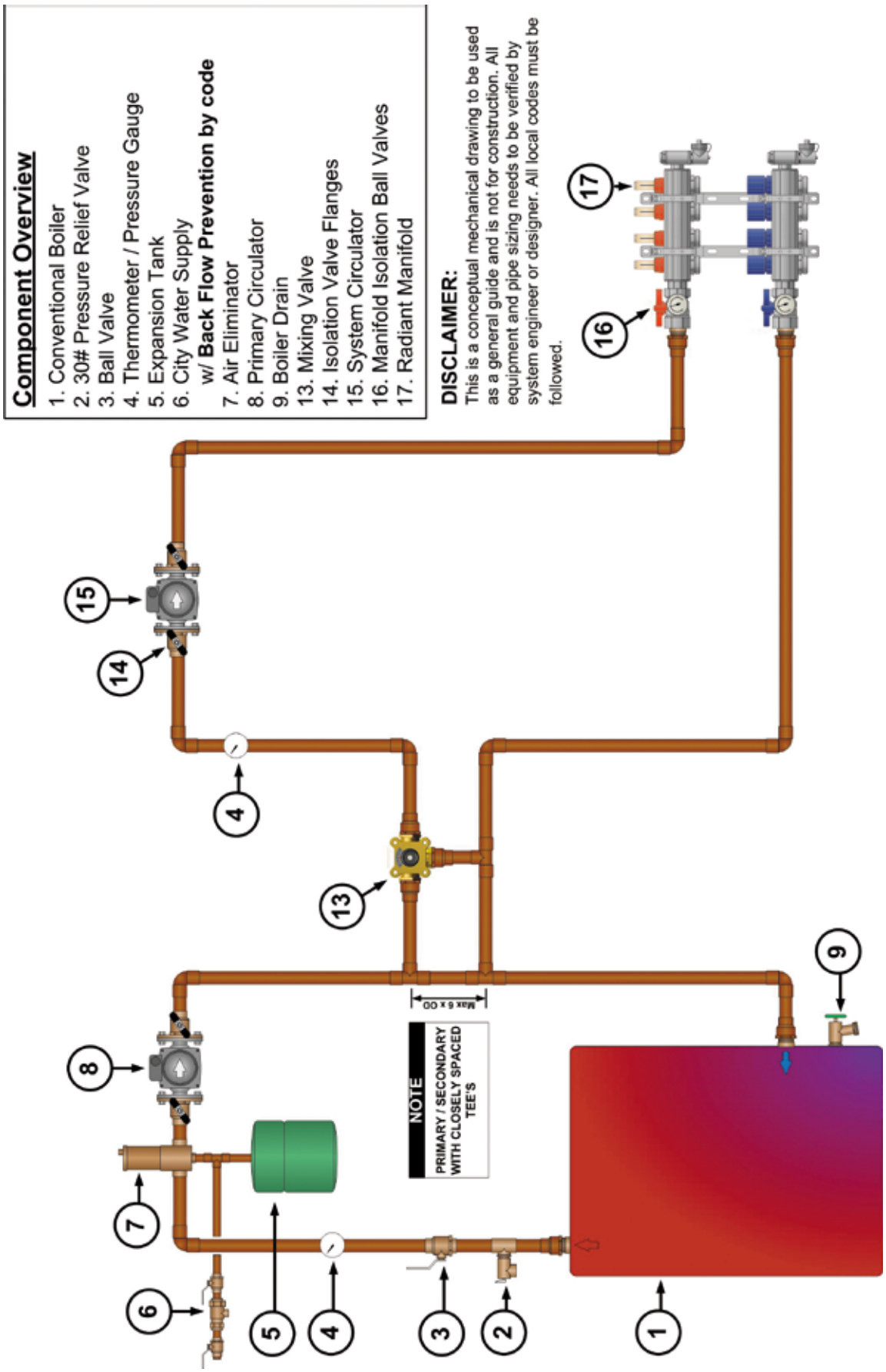


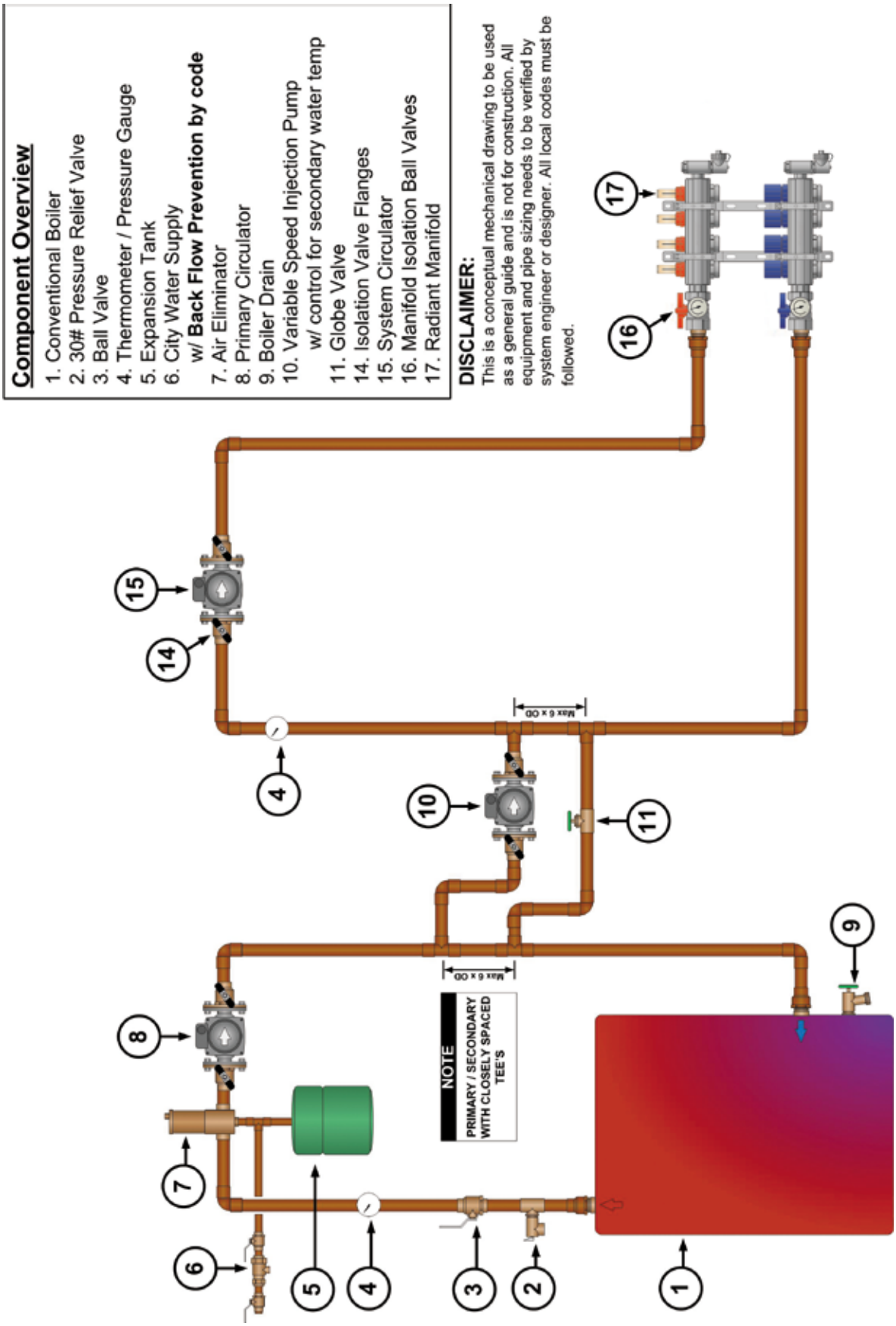
CONVENTIONAL BOILER WITH 4-WAY MIXING VALVE



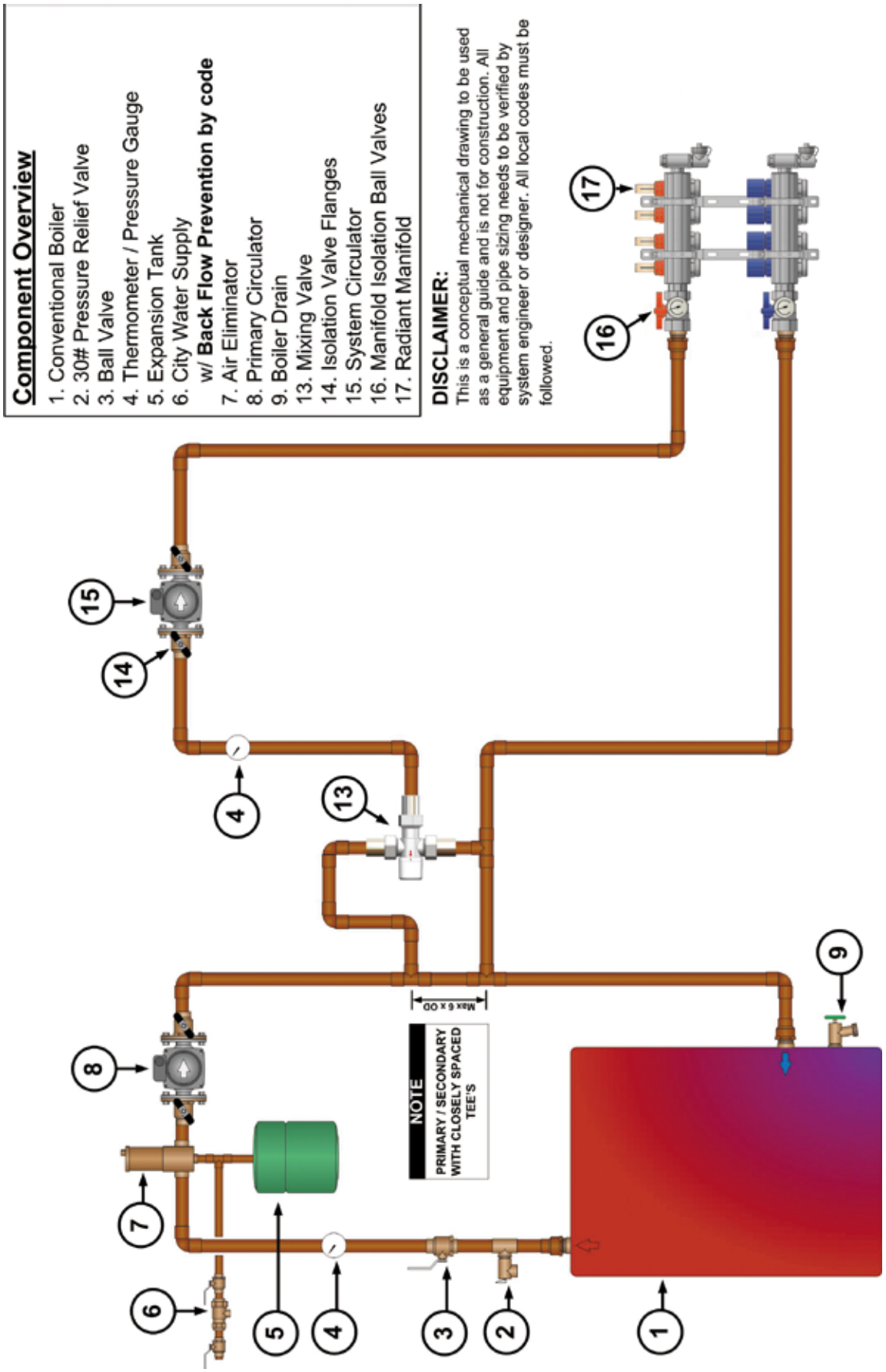
CONVENTIONAL BOILER WITH 3-WAY MIXING VALVE



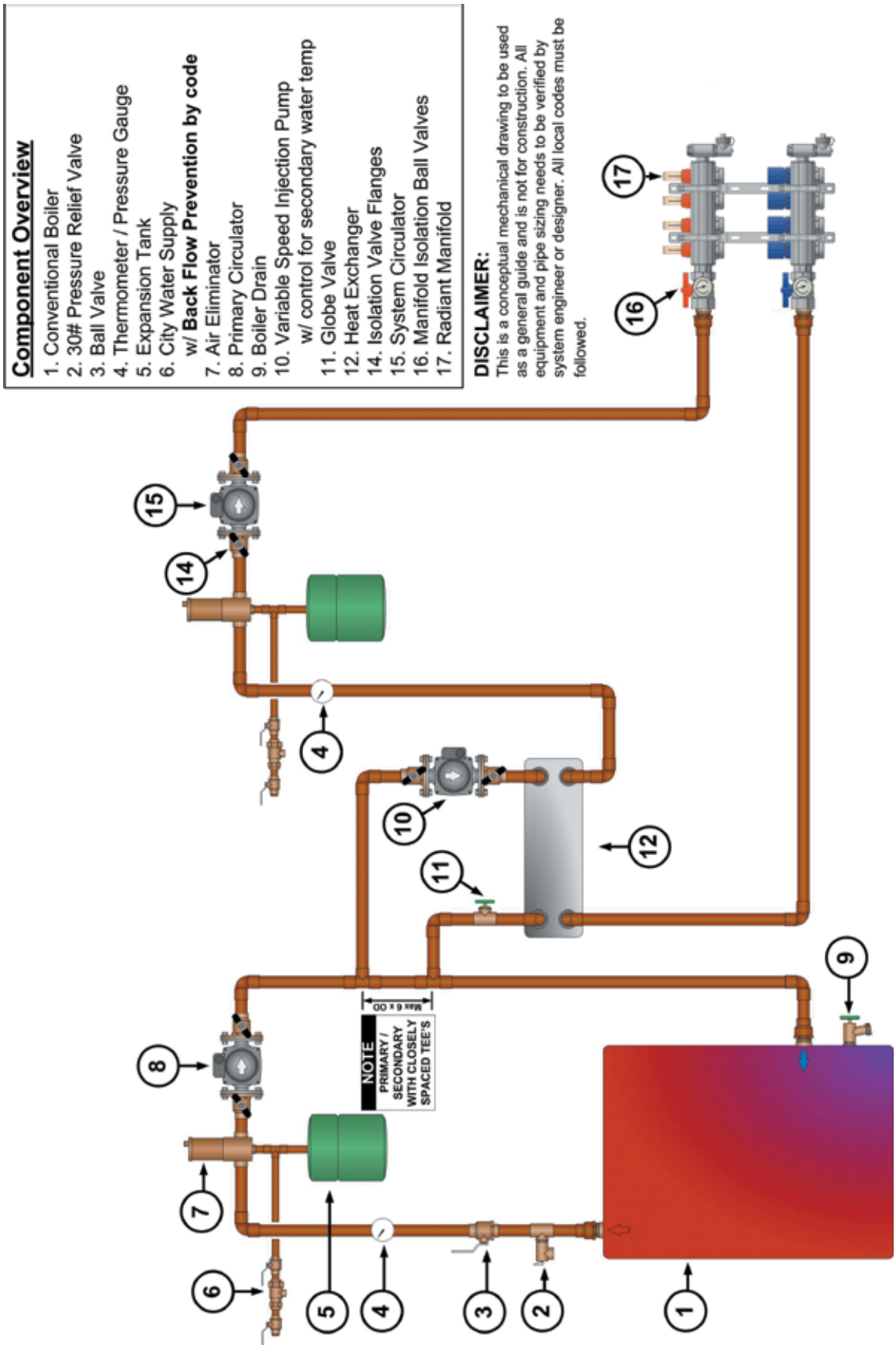
CONVENTIONAL BOILER WITH VARIABLE SPEED INJECTION PUMP



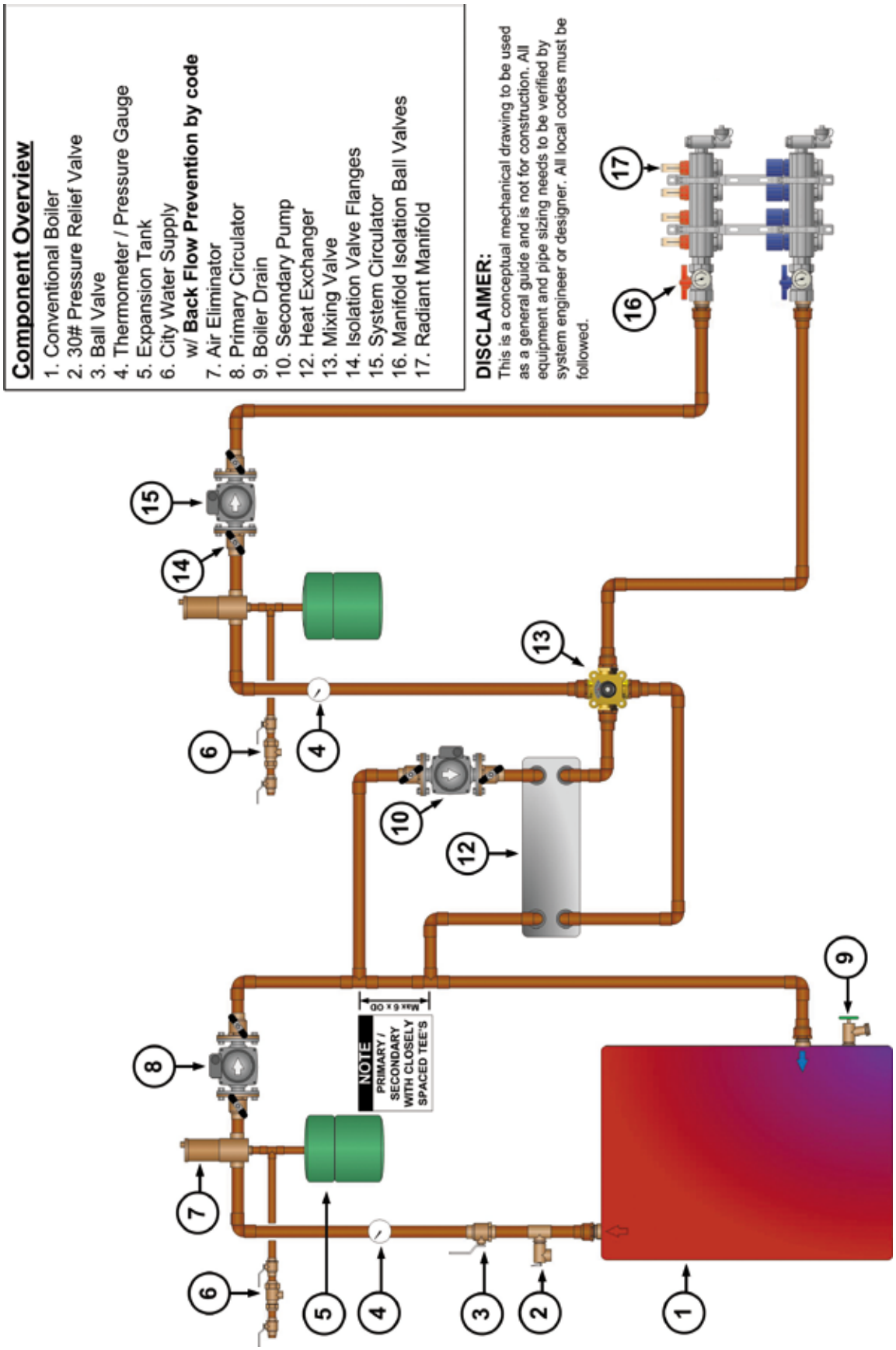
CONVENTIONAL BOILER WITH 3-WAY TEMPERING VALVE



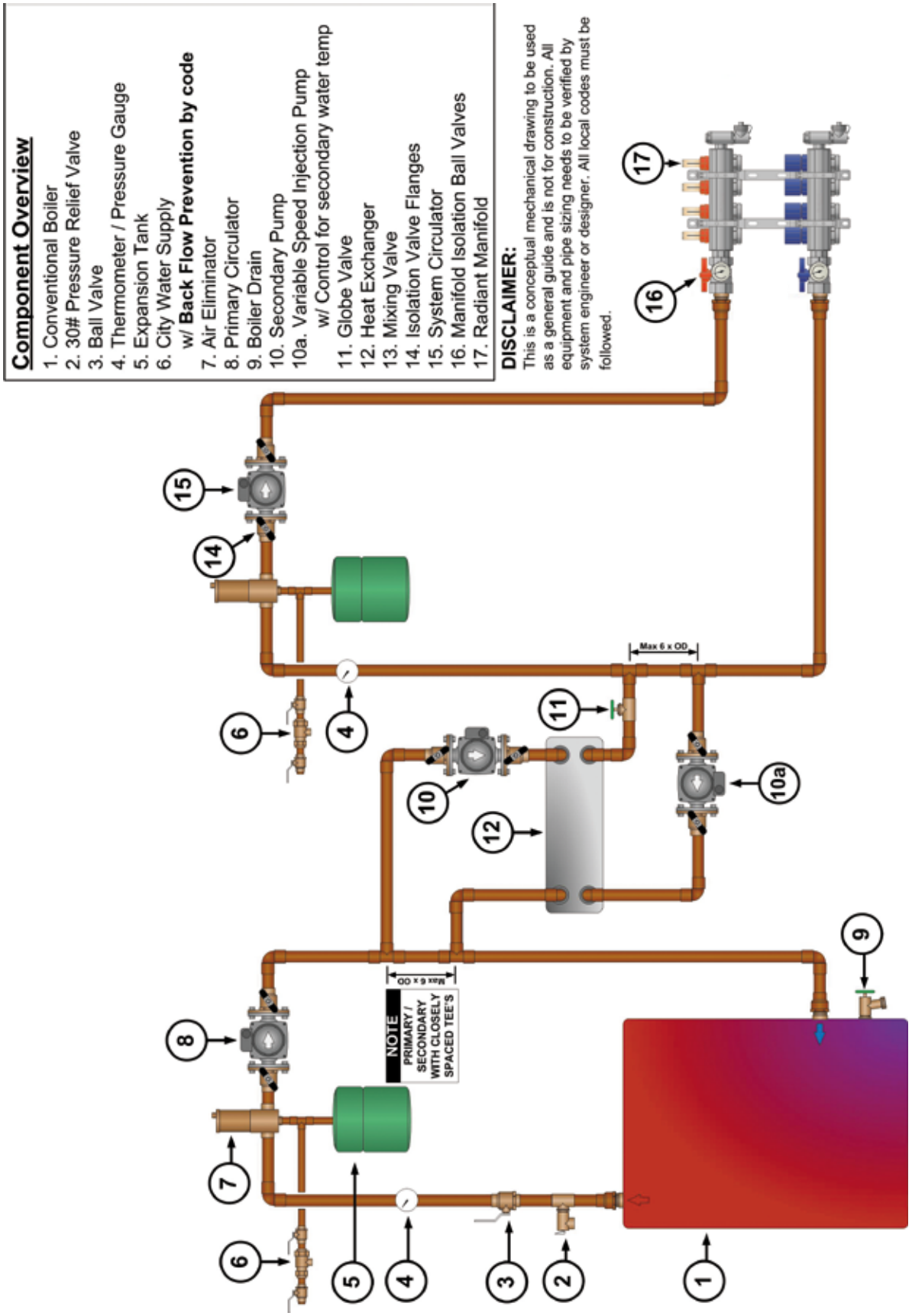
CONVENTIONAL BOILER WITH HEAT EXCHANGER 1



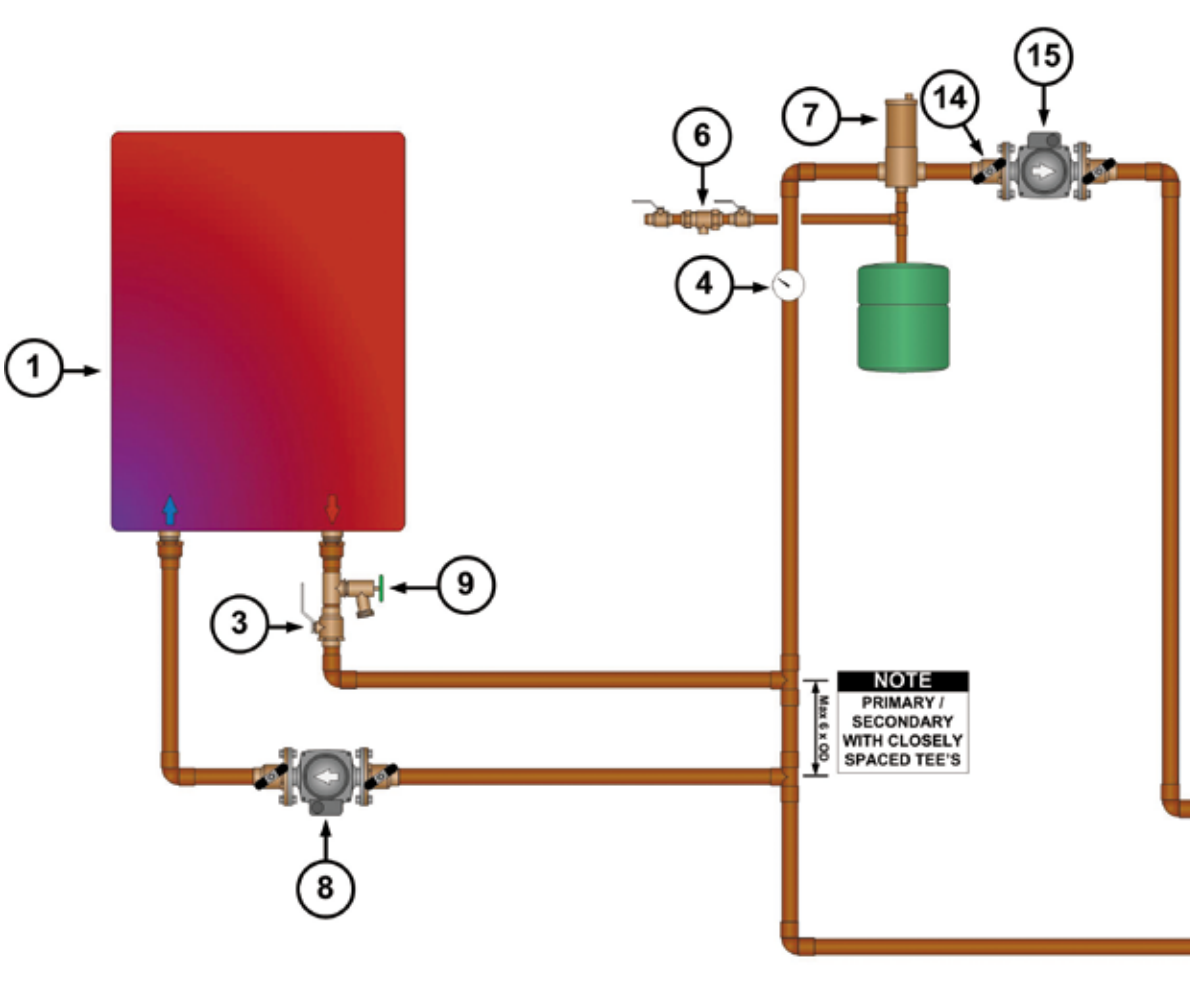
CONVENTIONAL BOILER WITH HEAT EXCHANGER 2

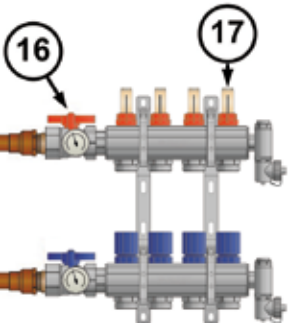


CONVENTIONAL BOILER WITH HEAT EXCHANGER 3



WALL HUNG BOILER – NO MIXING





Component Overview

1. Wall Hung Boiler
3. Ball Valve
4. Thermometer / Pressure Gauge
5. Expansion Tank
6. City Water Supply
   w/ **Back Flow Prevention by code**
7. Air Eliminator
8. Primary Circulator
9. Boiler Drain
14. Isolation Valve Flanges
15. System Circulator
16. Manifold Isolation Ball Valves
17. Radiant Manifold

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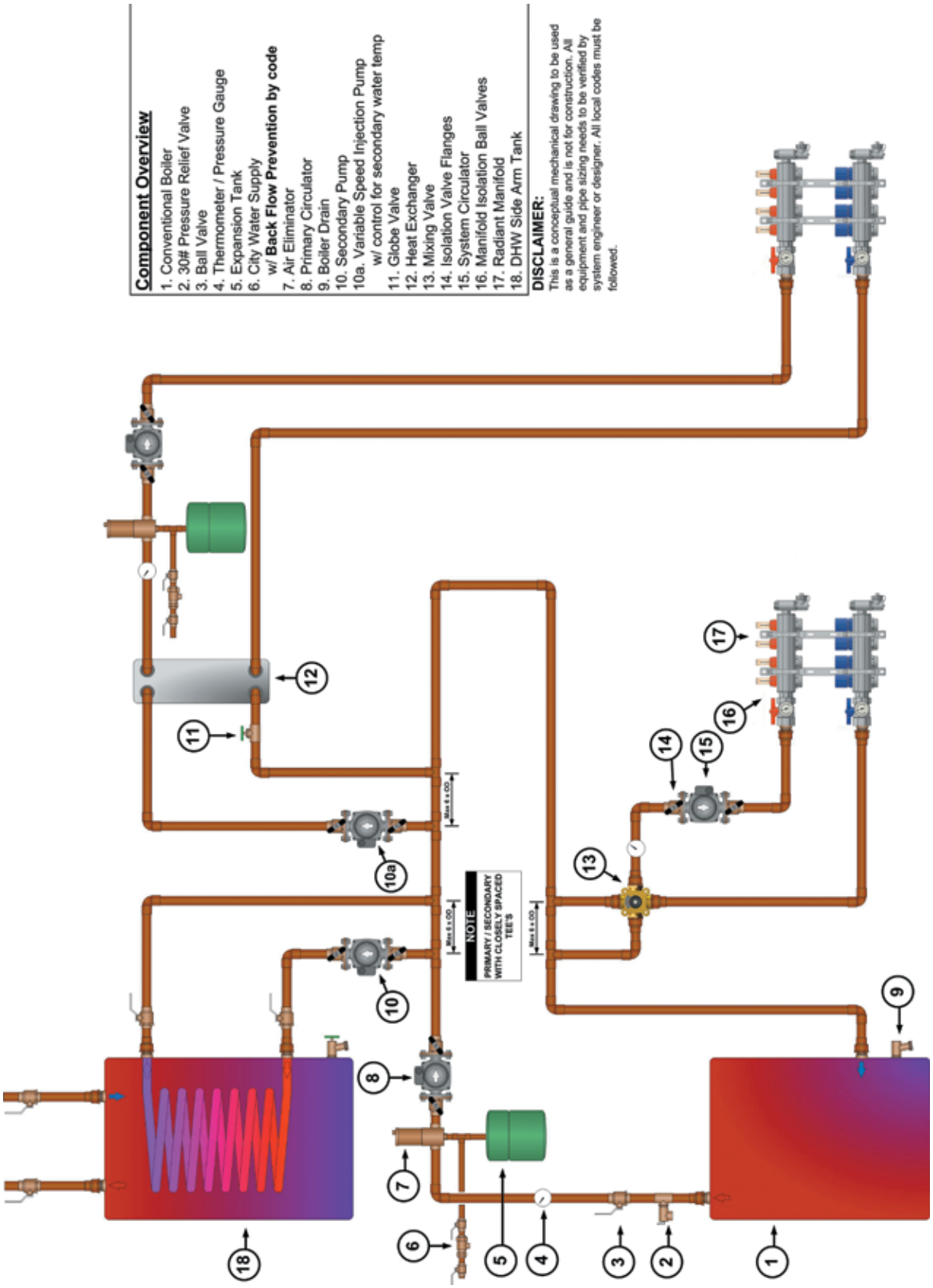
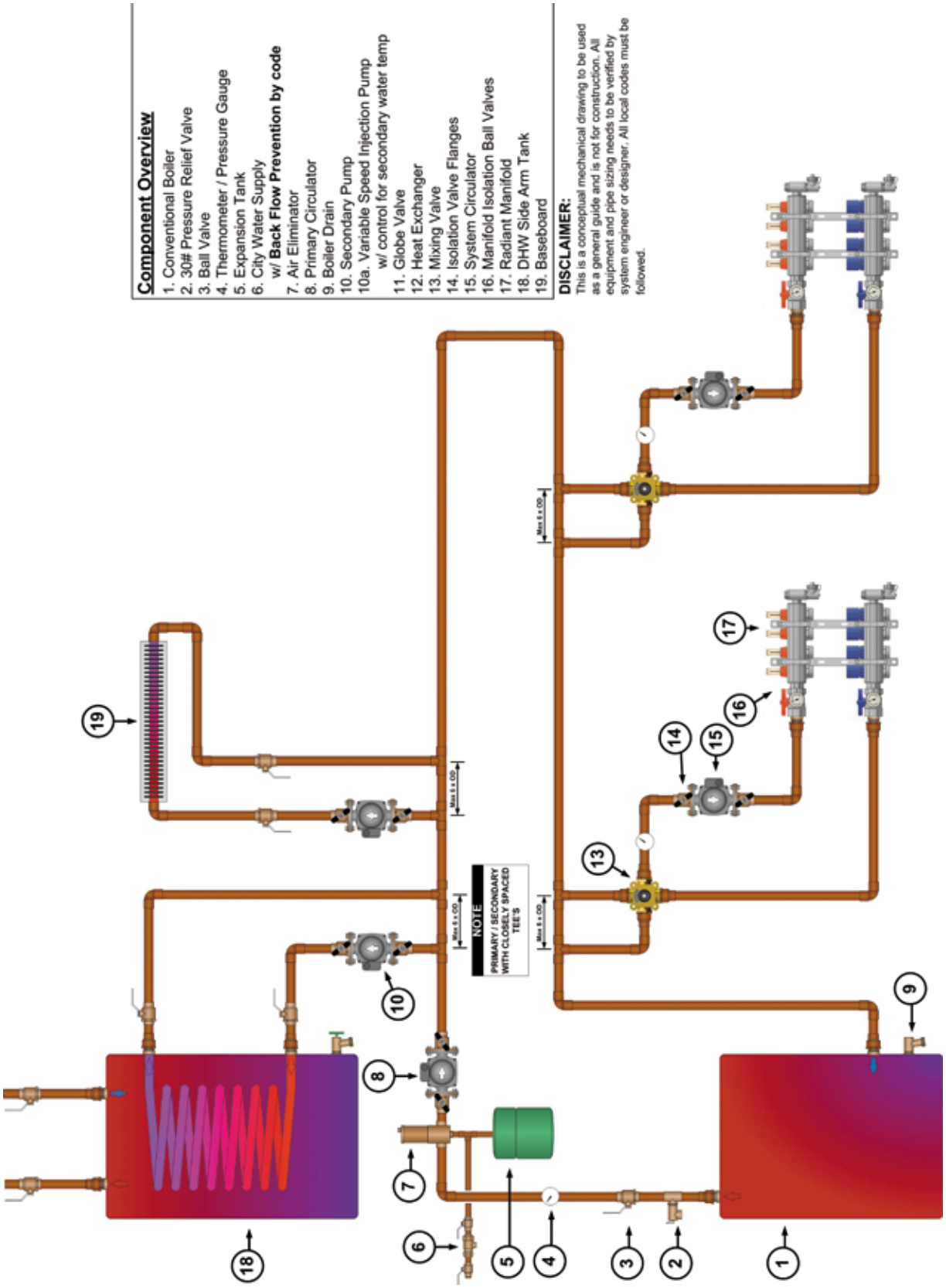
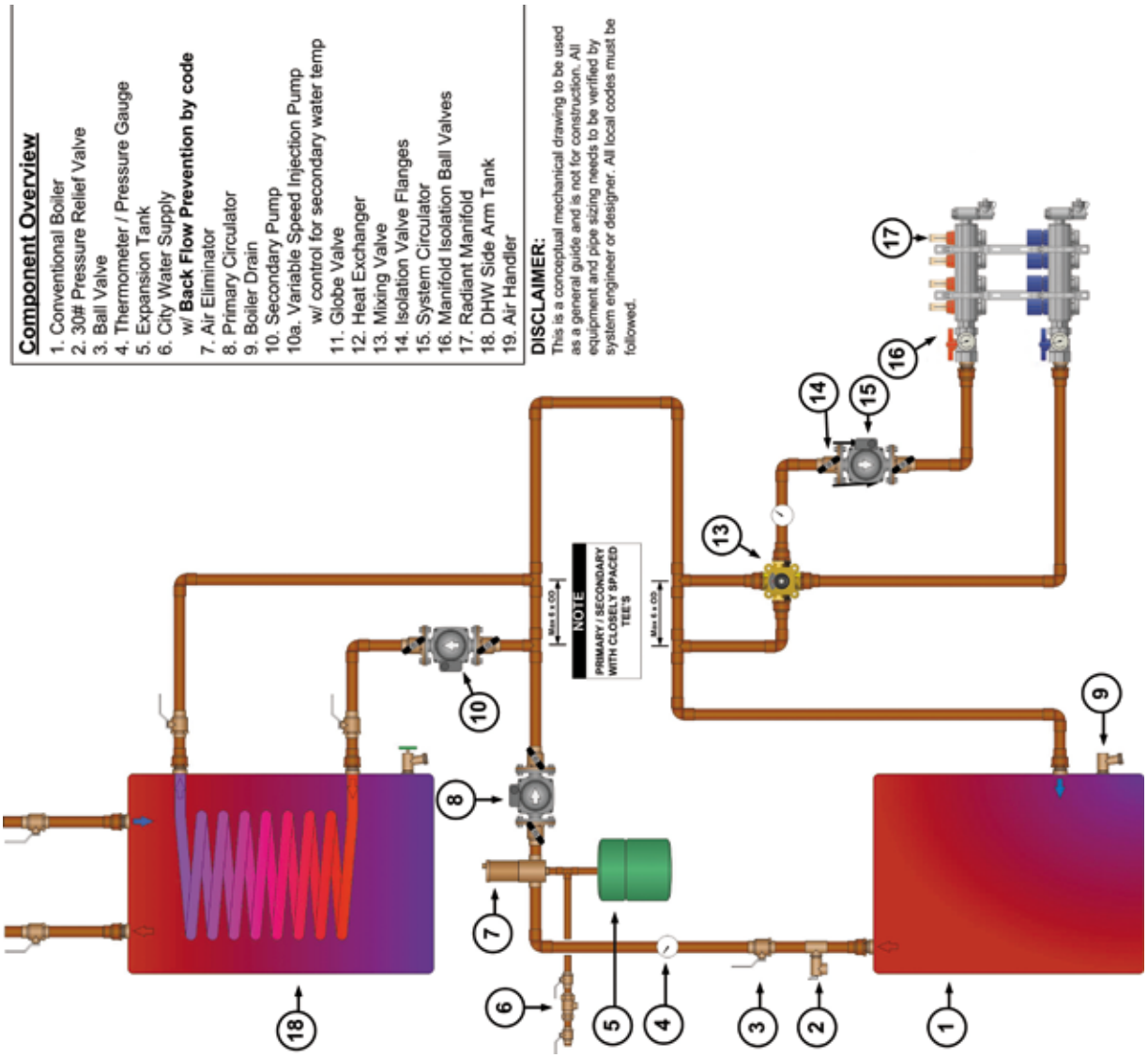
CONVENTIONAL BOILER WITH DHW, HEAT EXCHANGER, 1 TEMP MIXING



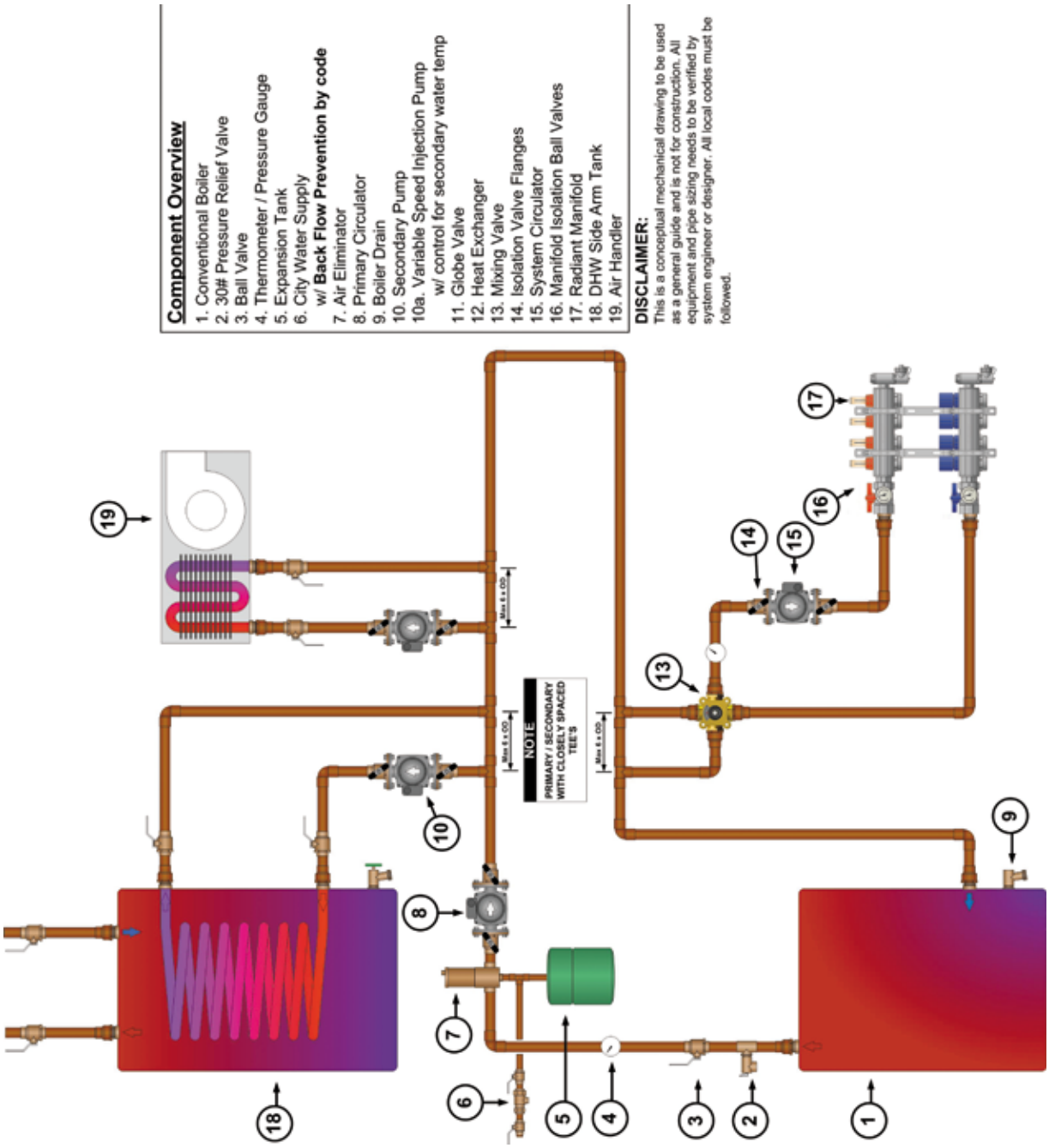
CONVENTIONAL BOILER WITH DHW, BASEBOARD, 2 TEMP MIXING



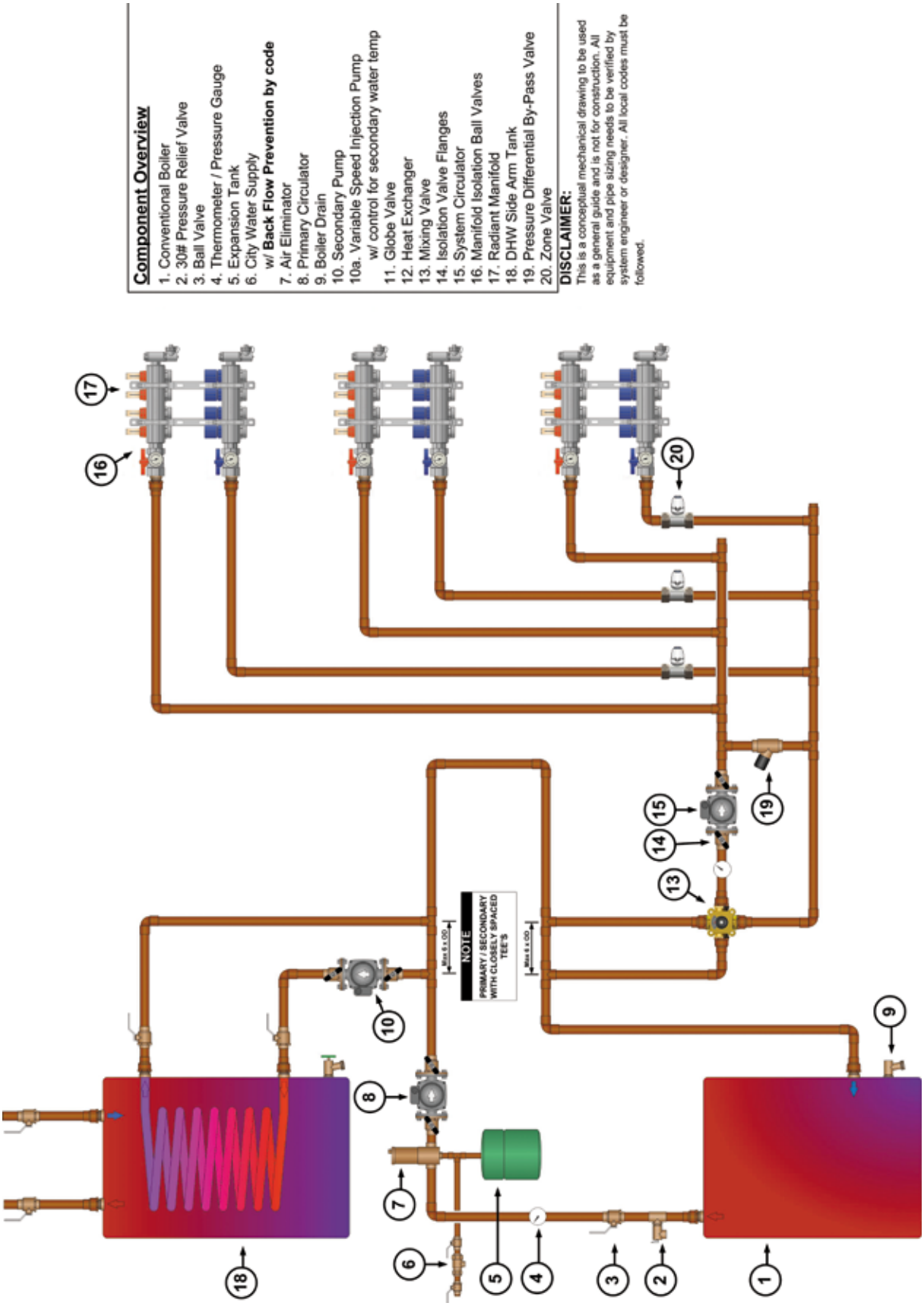
CONVENTIONAL BOILER WITH DHW, 1 TEMP MIXING



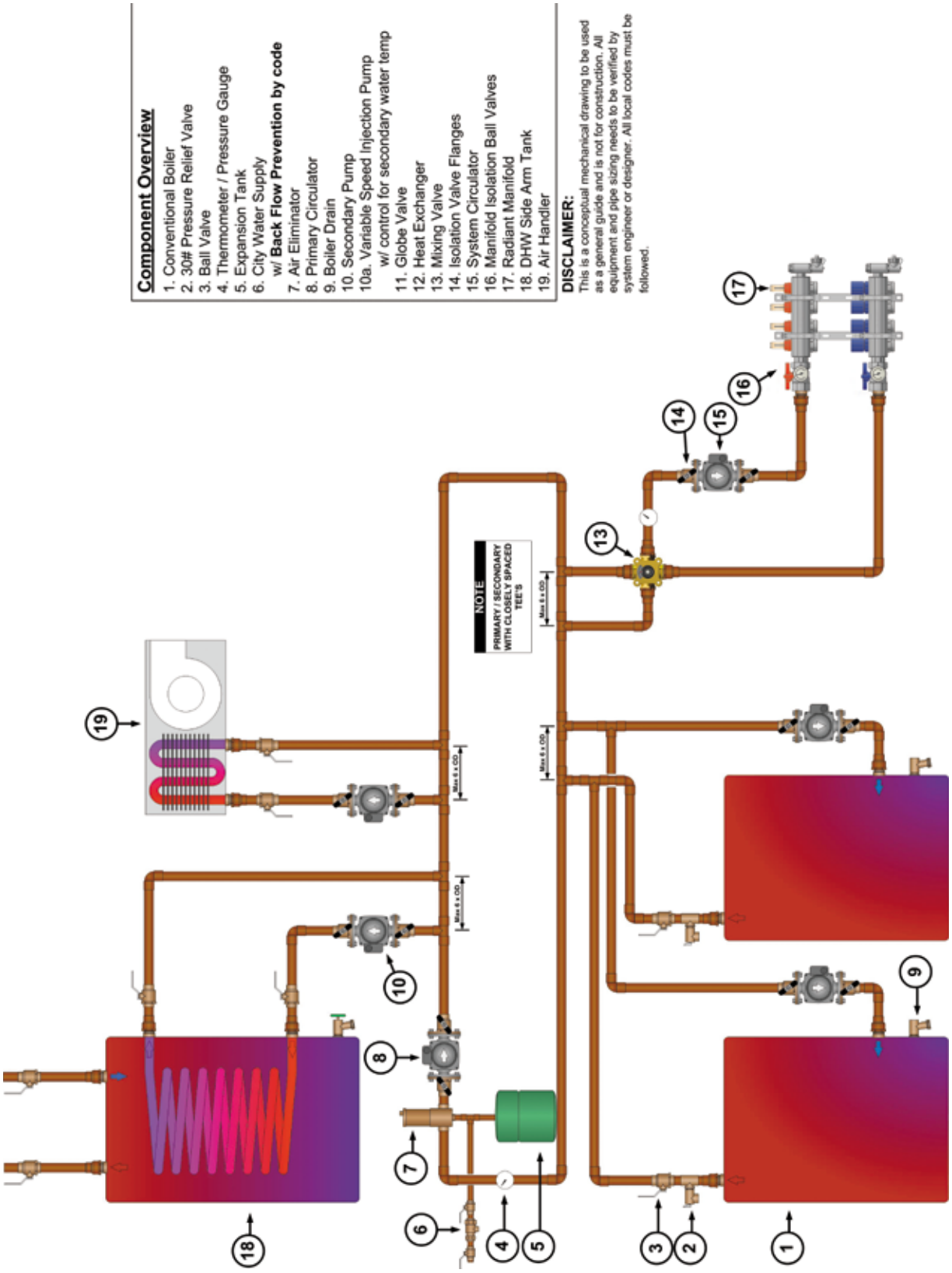
CONVENTIONAL BOILER WITH DHW, AIR HANDLER, 1 TEMP MIXING



CONVENTIONAL BOILER WITH DHW, 1 TEMP MIXING, ZONE VALVES



2 CONVENTIONAL BOILERS WITH DHW, AIR HANDLER, 1 TEMP MIXING



LIMITED WARRANTY

EFFCTIVE DECEMBER 1, 2020

VALID FOR MRPEX® TUBING AND PANEL HEATING COMPONENTS

LIMITED WARRANTY:

MrPEX® Systems warrants to its "clients" that the MrPEX® Tubing and Panel Heating Components, used for Panel Heating applications, sold hereunder shall be free from defects in material and workmanship and that the components will conform to specifications stated in MrPEX® Publications. This Limited Warranty shall expire thirty (30) years for the MrPEX® tubing, five (5) years for DZR Press Fittings and two (2) years for all other components, from date of shipment by MrPEX® Systems unless otherwise specified in writing. MrPEX® Systems further warrants that products listed are compatible with each other, but at the same time we disclaim warranty for claims related to compatibility with non-MrPEX® products. Components sold under this Limited Warranty must (1) be selected, designed, and installed according to the instructions in MrPEX® Publications using appropriate trade workmanship and according to the local building code(s), (2) remain in their originally installed location, (3) are connected to appropriate water and power supplies, (4) show no evidence of tampering, mishandling, neglect, accidental damage, modification or repair without the approval of MrPEX® Systems or damage done to the product by anyone other than MrPEX® Systems authorized personnel. MrPEX® Systems' sole obligation hereunder shall be, at its option, to issue credit, repair or replace any component or part thereof which is proved to be other than as warranted. No allowance shall be made to clients for transportation or labor charges unless such charges are authorized in writing in advance by MrPEX® Systems. Any repairs without the express written consent of MrPEX® Systems, shall render this Limited Warranty invalid. Warranty claims must be received by MrPEX® Systems within the applicable warranty period and within thirty (30) days from the time when the cause for the claim occurred or was discovered. Upon receipt of prompt notice of a warranty claim, MrPEX® Systems shall have ten (10) business days in which to determine whether it acknowledges responsibility for any asserted defects in material or workmanship and the appropriate action to be taken. This Limited Warranty and any claims arising from breach of warranty, or any other claim arising hereunder, shall be governed and construed under the laws of the State of Minnesota. No other persons than MrPEX® employees have any express or implied authority to bind MrPEX® to any agreement or warranty of any kind without the express written consent of MrPEX® Systems.

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