

Piping Material Options

DiaNorm panel radiators are compatible with most piping materials used in modern hydronic systems. These include copper tubing, cross-linked polyethylene (PEX) tubing, and composite PEX-AL-PEX tubing.

Type M copper

The most traditional piping material for residential and light commercial hydronic heating systems in North America is type M rigid copper water tube. It has more than adequate pressure and temperature ratings for use in residential hydronic systems. It also offers good corrosion resistance and relatively low flow resistance. It is easily joined using soft soldering.

DiaNorm panel radiators use compression fittings that allow 1/2-inch copper water tube to connect directly to the radiator inlet and outlet tapings, or to an Oventrop diverter valve if used.

Straight lengths of rigid copper tubing must be joined using fittings. In new construction, access to fittings and installation of tubing in framing areas is generally not a problem. However, in retrofit situations such access can be very difficult, especially when the framing cavities are covered with drywall or other finishes. Such installations are better handled using flexible tubing. Type L flexible copper is available and will work with the compression fittings used with DiaNorm panel radiators.

If copper tubing is used for the risers from the floor to the radiator connections, it should be of type L wall thickness for added resistance to denting. To provide a good appearance this tubing can be cleaned to a bright

shine and coated with clear lacquer to preserve the bright appearance. Another option is to clean and paint the copper tubing to match the radiator or adjacent trim. The copper risers can also be covered with a white plastic sleeve available from HeatLines, Inc. In all cases, a dual escutcheon plate (available from HeatLines, Inc.) should be installed for a neat and clean appearance where the piping penetrates the floor.

Whenever copper tubing is used, there is some residual soldering flux present in the completed piping system. There may also be small chips of copper or pellets of solder. These materials can create corrosion reactions when combined with steel. For this reason, DiaNorm recommends that copper distribution systems be assembled using a rough in U-bend tool (described in the previous section) at each radiator location. This tool accurately locates the piping connections through the subfloor. It also provides a pressure tight piping U-bend that allows the system piping to be thoroughly flushed of any metal chips and soldering flux before the panel radiators are attached. This flushing prevents contaminants in the piping system from being deposited in the panel radiators.

After the system is flushed, and possibly treated with a system cleaning agent, it should be rinsed clean and partially drained. The rough-in tools can then be removed as the panels are set in place and connected to the copper tubing.

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Copper tubing must be properly supported to prevent sagging or buckling. On horizontal runs of hard temper tubing, the following maximum support spacings are suggested:

- 1/2-inch and 3/4-inch tube: 5-foot maximum support spacing
- 1-inch and 1 1/4-inch tube: 6-foot maximum support spacing
- 1 1/2-inch and 2-inch tube: 8-foot maximum support spacing

On vertical runs, copper tubing should be supported at each floor level, or a maximum of every ten feet.

A number of different supports are available for small tubing. In residential systems, horizontal piping runs are often supported by plastic coated wire hangers that allow the piping to expand and contract without creating noises. This is extremely important to keep the piping quiet as the water temperature changes.

Other hangers include "bell" hangers, and rail/clamp systems. These can be used on relatively short piping runs (ten feet or less), but should not be used on longer straight runs because they rigidly hold the tubing in place and accommodate very little thermal expansion.

The customary method of joining copper tubing in hydronic heating systems is soft soldering. The solder of choice is usually 50/50 tin/lead solder, which has a working range of 361 °F to 421 °F. Non-lead based solders such as 95/5 tin/antimony can also be used, but require higher working temperatures.

An alternative joining system for copper tubing uses a mechanical compression fitting containing elastomer (EPDM) O-rings. The

tool used to compress the fittings is capable of exerting a crimping force of 35,000 pounds. This tool can be fitted with different jaws to accommodate tube sizes. Once the joint is made it cannot be taken apart.

Although the fittings for this type of system are more expensive than standard (solder-type) fittings, the time required for joint preparation is considerably shorter. The tube ends still require reaming to remove any burrs due to cutting. However, no mechanical cleaning or fluxing is required. This reduces the installation cost of the pressed joint system relative to that of a soldered joint.

All of the piping systems discussed in the next section of this manual can be constructed using copper tubing.

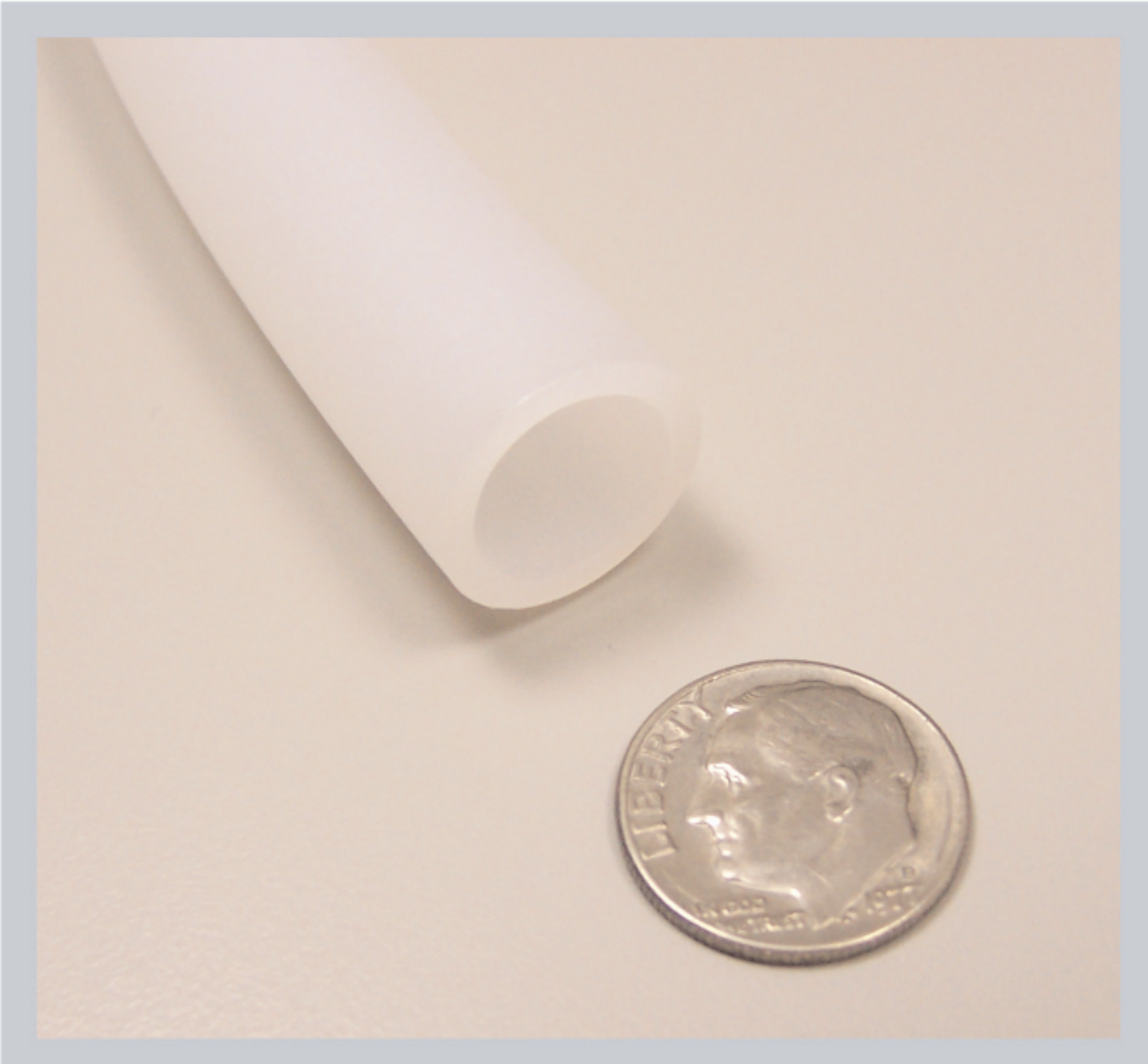
PEX Tubing

Cross-linked polyethylene tubing, commonly known as PEX tubing, is also an excellent choice for piping DiaNorm panel radiator systems. PEX tubing has proven itself a reliable alternative to metal piping in many hydronic systems worldwide.

PEX tubing meeting ASTM F876 standards in nominal sizes of 3/8-inch, 1/2-inch, and 5/8-inch can be connected directly to DiaNorm panel radiators using compression fittings available through HeatLines, Inc.. Tubing meeting the ASTM F876 standard has a temperature pressure rating of 180 °F at 100 psi and 200°F at 80 psi. These ratings are more than sufficient for typical panel radiator applications.

SECTION FOUR

Piping Material Options



Example of
1/2-inch size
PEX tubing

Only "barrier-type" PEX tubing meeting the DIN4726 standard for oxygen diffusion should be used with DiaNorm panel radiators. Such tubing is manufactured with an EVOH oxygen diffusion barrier that reduces oxygen entry through the tubing wall to acceptable levels.

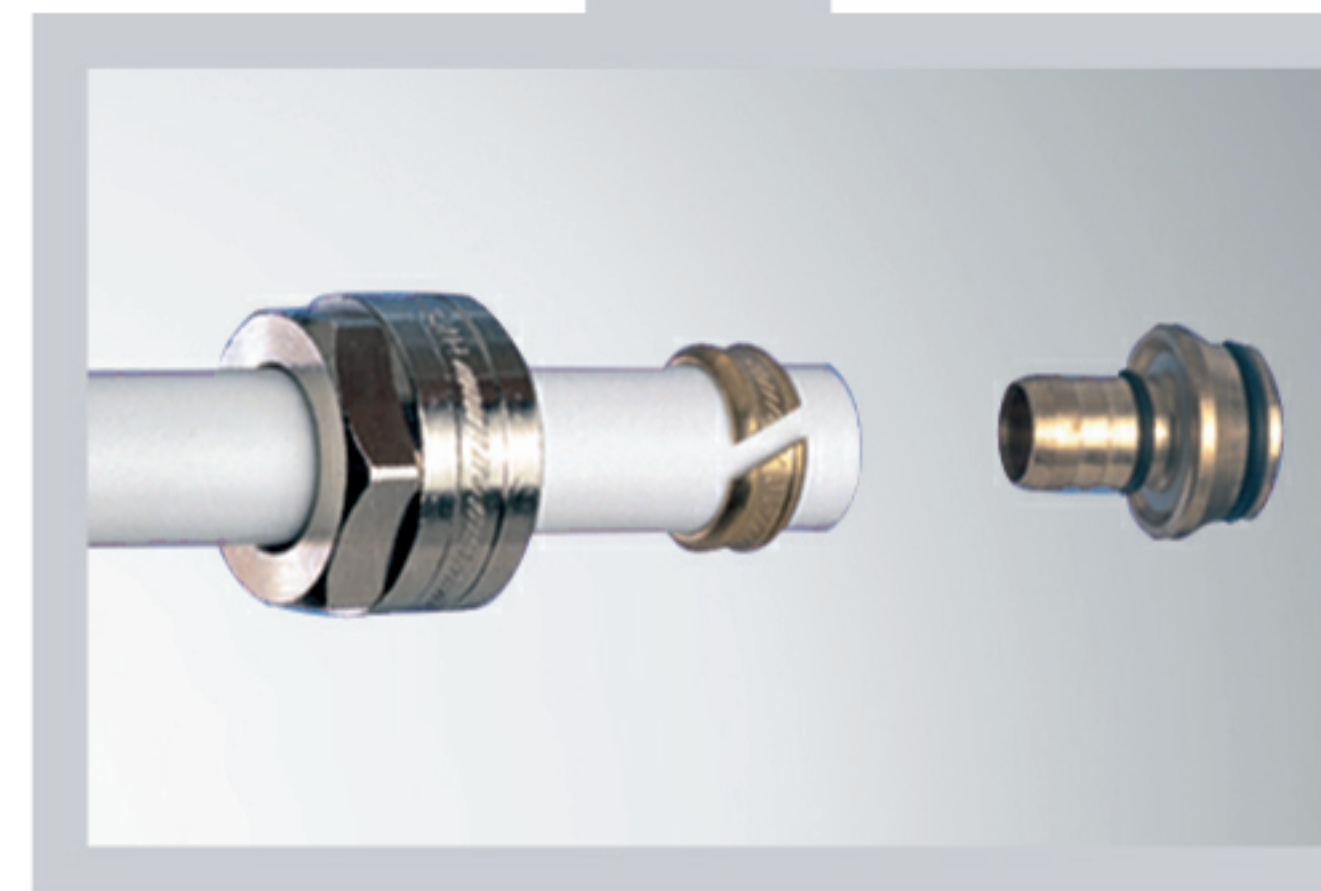
PEX tubing is sold in continuous coils ranging from 150 to more than 1,000 feet in length (depending on diameter and manufacturer).

One of the biggest advantages of PEX tubing is that long circuits can be installed without joints or fittings. This, along with the fact that small diameter PEX tubing can easily be formed and bent by hand make it a good choice for both new and retrofit installations.

PEX tubing expands significantly more than copper tubing when heated. While this does not harm the tubing, it does allow the possibility for expansion "ticking" sounds if the tubing is not properly installed. To eliminate expansion noises PEX tubing must be installed so that it can freely expand without rubbing tightly against the other materials. One horizontal run, small diameter PEX tubing should be supported every 24 to 30 inches to prevent excessive sagging when operat-

ing at higher temperatures. Use plastic support clips or sleeves that allow the tubing to slide back and forth as it heats and cools.

PEX tubing with nominal inside diameters of 5/16", 3/8", 1/2", and 5/8" can be connected directly to the inlet and outlet connections of the radiator, or to an isolating valve or bypass valve using the "Euroconus" fittings shown below (available from HeatLines, Inc.)



Euroconus fittings are used to connect PEX tubing to radiator or valves attached to radiator.

Composite PEX-AL-PEX Tubing

Another type of tubing that's well suited for panel radiator systems is called composite PEX-AL-PEX tubing. It consists of three concentric layers bonded together with special adhesives. The inner and outer layers are PEX. The middle layer is longitudinally welded aluminum.



Example of
1/2-inch size
PEX-AL-PEX
tubing

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Like PEX tubing, PEX-AL-PEX is supplied in continuous coils up to 1000 feet long. In the smaller sizes, PEX-AL-PEX tubing is easily shaped by hand, and can readily be "snaked" through closed framing cavities in retrofit applications.

The PEX-AL-PEX tubing commonly used in hydronic heating systems conforms to the standard ASTM F1281. The aluminum layer in the tubing provides a very tight oxygen diffusion layer.

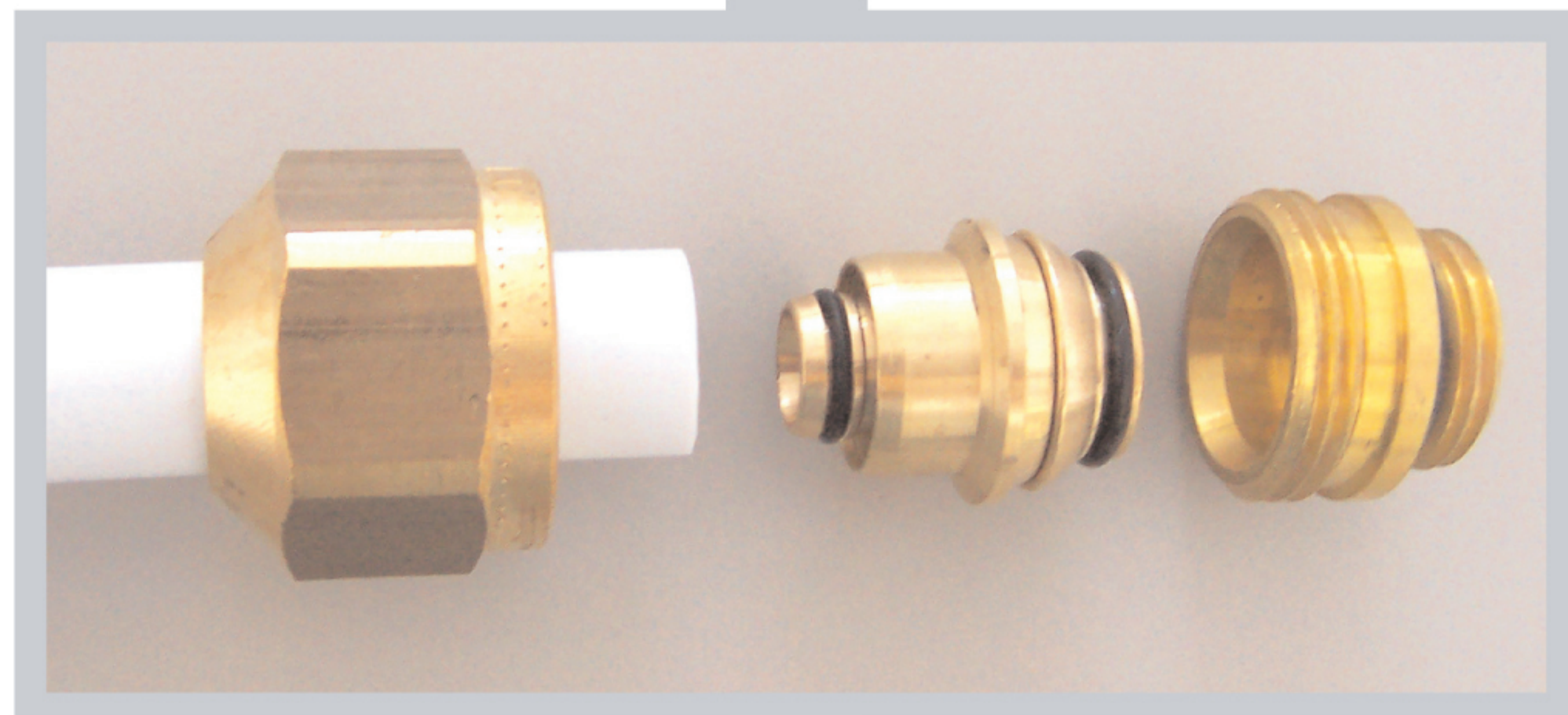
PEX-AL-PEX tubing has slightly higher temperature and pressure ratings than PEX tubing. Tubing that meets the ASTM 1281 standard is rated for 180 °F at 125 psi, and 210 °F at 115 psi. Again, these pressure temperature ratings are more than sufficient for panel radiator systems.

One significant difference between PEX and PEX-AL-PEX tubing is that the latter tends to retain the shape to which it is formed. This is due to the structural characteristics of the aluminum layer. This can be a significant advantage in retrofit applications where the tubing must be "snaked" through closed framing cavities. It also allows the tubing to be straightened to improve appearance.

The aluminum layer also reduces the expansion movement of PEX-AL-PEX tubing relative to PEX tubing. PEX-AL-PEX tubing should also be installed to allow space for expansion movement without the tubing rubbing tightly against other materials. Attention to these details will produce a quiet system.

When PEX-AL-PEX tubing is used, it can be connected to DiaNorm panel radiators using R20 Euroconical insert fittings supplied by the tubing manufacturer.

One of the best distribution piping systems for combining PEX or PEX-AL-PEX tubing with DiaNorm panel radiators is called a homerun system. This system, discussed in detail in section 4, uses separate lengths of tubing for supply and return to each panel. All circuits begin and end at a manifold station. A piping schematic for this approach is shown on the next page.



R20 Euroconical fittings are used to connect PEX-AL-PEX tubing to radiator or valves attached to radiator.

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