

PEX Manifold Piping Systems

Recent energy problems, politics and prices have reawakened people's interest in reducing energy consumption. In considering the energy to produce hot water, most people have focused on having an efficient water heater but overlooked the potential for savings in the distribution system.

Manifold hot water distribution systems (also called parallel piping or home run systems) replace typical main and branch plumbing layouts with direct 1/2" or 3/8" diameter tubes from a manifold at the water heater to each point of hot water use. There may be copper manifold systems out there, but most systems today are built using cross-linked polyethylene plastic tubing (PEX). This system is used for cold water distribution as well.

It's hard not to be enthusiastic about the possibilities of PEX manifold systems for hot and cold water distribution. The plusses include energy and water savings when compared to a traditional metallic branched system, reduced waiting time for hot (or cold) water, less temperature fluctuation, reduction of water hammer and velocity noise, superior freeze and corrosion resistance, and ease of installation. Cleaner water can be delivered and, the parasitic energy use of recirculation systems is avoided.

We found only one study, "Parallel Piping Studies", done by Davis Energy Group Inc., in 1991, which measures benefits using HWSIM, a hot water heating simulation program. This study used polybutylene, not PEX tubing, so the results are somewhat different. PEX has thicker walls than polybutylene yet the outside diameter is quite similar, so a given size of PEX holds roughly 15% less water per foot than the same size of polybutylene. This translates to greater flow restriction and/or faster delivery. Be sure there is adequate water pressure before installing a manifold system.

WATER AND ENERGY SAVINGS

The Davis study found an average water savings of 2600 gallons per year for single family homes. In areas where sewer fees are based on water use, manifold systems give additional savings.

The study used only gas water heaters. Gas usage for heating water in single family homes was cut by 6%. Distribution losses alone for single family dwellings were cut by 48%. And had water heaters with higher energy factors than .525 been used in the study, the piping system would have shown even greater overall savings.

SHORTER WAITING TIME

Waiting time for the delivery of hot water in these digital homes was reduced just over 39%. An advantage of PEX over metallic systems is that the low mass plastic takes less heat from the hot water than metal does. In metal pipe, if there is one gallon of water in the pipe between heater and tap, you must flush out roughly two gallons of water to get hot, (one gallon goes to replace the cooled water, one gallon to heat up the pipe). With PEX, much less is used warming the pipe. We imagine that if the manifold remained full of hot water (by placing it over the heater) delivery time could be reduced further still. Note that plastic manifolds cannot be installed this way.

Although PEX has a much lower rate of heat transmission than copper, it's still an advantage to insulate hot lines along their length and cold lines where they run in potentially warm spaces, like attics. Likewise, all lines should be insulated where freezing is a possibility, though PEX is relatively safe from freeze bursts. Should it be run past vents or any place where it could be exposed to sunlight, insulation would help to shield it from exposure.

The resilience of PEX is what accounts for substantial reduction in water hammer and greater freeze protection. Plastic pipe is also nearly corrosion proof, unlike metal.

EASIER INSTALLATION

Manifold systems take about 1/3 the time for an experienced person to install. It's just easier to run small flexible tubing than to put in larger rigid piping. (This is a particular advantage when repiping) There's less possibility of leakage because there are fewer fittings, and the risk of fire from using a torch is

eliminated.

Materials costs for PEX systems are usually somewhat higher than for copper, and it is necessary for the installer to have a few hours of training, (usually provided free of charge by the manufacturer's representative at the local supply house). Also, special tools are needed, and they aren't free. But, overall PEX systems usually cost less than copper piping because fewer hours and less skilled labor is needed.

PEX isn't fool-proof. Installers we talked with pointed out that other trades-people are just as prone to putting nails into PEX as into copper. Indirectly this is another PEX advantage: It's easy and safe to repair inside a wall.

Manifold systems may be best suited to modest homes and small mansions rather than large mansions. One manufacturer's literature suggests 80 feet as the maximum run of tubing. Another has developed a slide rule type calculator to size individual runs, depending on demand and available pressure. This method allows much longer runs. In general, the best solution for large mansions is multiple water heaters, each with its own manifold.

In an attempt to satisfy plumbers, some manufacturers suggest combining recirculation with manifolds when installing large systems. The result will deliver hot water nicely, but energy savings are much thwarted (unless something like the Metlund demand system is used). While the most efficient system would utilize 3/8" PEX, 1/2" is installed much more commonly. Both efficiency and savings could be increased if installers were educated on how to size systems. Just so you don't worry that we're suggesting extreme measures, here's a quote from "Audels Home Appliance Service Guide", copyright 1954. "It will be found that 3/8" copper tubing or 3/8" iron pipe size is adequate for hot water lines supplying only one fixture. For wash basins or runs not exceeding 20' to other types of faucets, 1/4" pipe or tubing will be sufficient". We note that some tubing manufacturers do make 1/4" PEX tube, but fittings are virtually nonexistent.

Both plastic and metallic manifold fittings available. Previous problems with leaking seals in the plastic manifolds have pretty much been fixed. Plumbers do seem to have a tendency to tighten plastic fittings too much, and there's no comfort in knowing a fittings' threads are leak free when you've snapped the thing off! Manufacturers also get upset when they find solder or flux residue melted into their manifolds. The plumber must avoid such mistakes to keep the warranty in force.

Various considerations will influence your choice of manifold materials. Both copper and brass manifolds are available and stand up well to installation hazards. In aggressive waters however, corrosion resistant plastic makes better sense. If you use brass fittings, remember lead is a concern, and there is ongoing discussion on how many parts per billion of lead in the water it takes to constitute a bad thing. In scale forming water, little if any lead is likely to make it into the water. But, if the water is over softened or otherwise aggressive, plastic fittings are probably a better choice. If you do choose brass, we suggest it have the NSF-61 certification. Because of the long shadow cast by problems associated with acetyl fittings and polybutylene, plastics used now for PEX fittings, (like polysulfone) have been tested in heat, pressure and chlorinated water over time, to prove their mettle.

CODE CONSIDERATIONS

Although PEX is approved by all major codes, these codes are interpreted and enforced differently across the United States. Local jurisdictions take precedence. Some areas require an engineers' approval for installation, or for using anything smaller than 1/2" tubing. 3/8" tubing has about half the internal volume of 1/2" and will provide more efficient service where it can be used. Plastic piping has its detractors. There is a long history of competition between the copper, cast iron and plastic piping industries. Also, in areas with vocal plumbing unions, the use of any plastic piping has long been discouraged, perhaps because it is seen as easier for the non-plumber to install. None the less, PEX will replace copper if the simple physics of the systems are allowed to compete. Granted, it will be hundreds of years before we know if PEX lasts as long as copper in non-aggressive waters.

PARTS POINTERS AND SUPPLIERS

One of the main difficulties with manifold plumbing seems to be availability of parts. Far fewer choices are available in 3/8" tube size than in 1/2". We found only one 3/8" plastic manifold. Copper and brass manifolds are more widely available, but cannot serve as well (long) in aggressive waters.

Unlike metal, PEX tubing degrades in sunlight. The maximum exposure time given by manufacturers varies from one month to two years. In addition to sunlight, solvents and oils can quickly ruin PEX as well. Be careful! Tubing protection has to be part of the picture when PEX is used.

In the recent past, there was much debate over what kind of PEX was best, as there are different methods of manufacture. Despite howls of complaint we expect to hear, we suggest to you it is more important to get tubing with a strong warranty from an established manufacturer.

Here's a short list of PEX tubing and/or fittings manufacturers who were available or who actually returned our phone calls. It will get you off to a good start if you see the possibility of PEX in your future!

Company	tube	fittings	phone	internet
Wirsbo	yes	yes	1-800-321-4739	www.wirsbo.com
Vanguard	yes	yes	1-800-775-5039	www.vanguardpipe.com
US Brass (Qest)	yes	yes	1-800-872-7277	www.zurn.com
Roth Industries	yes	yes	1-708-488-1511	www.roth-usa.com
RTI	yes	yes	1-800-784-0234	www.radiant-tech.com
Sioux Chief Mfg.	no	yes	1-800-821-3944	www.siouxchief.com