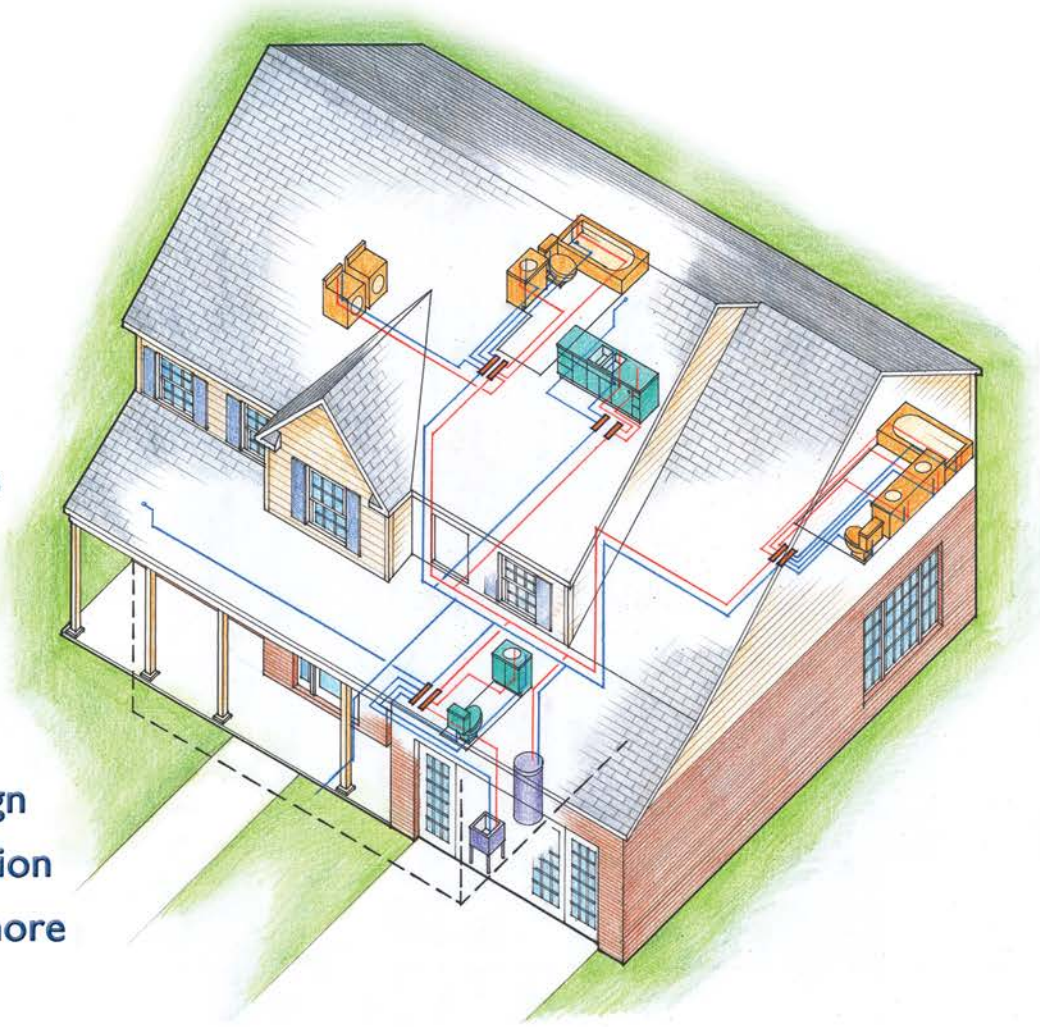
DESIGN GUIDE

Residential PEX Water Supply Plumbing Systems

Second Edition



Applications
Advantages
Material Properties
Joining Methods
Code Acceptance
System Design
Installation
and more

PPFA Plastic Pipe and Fittings Association
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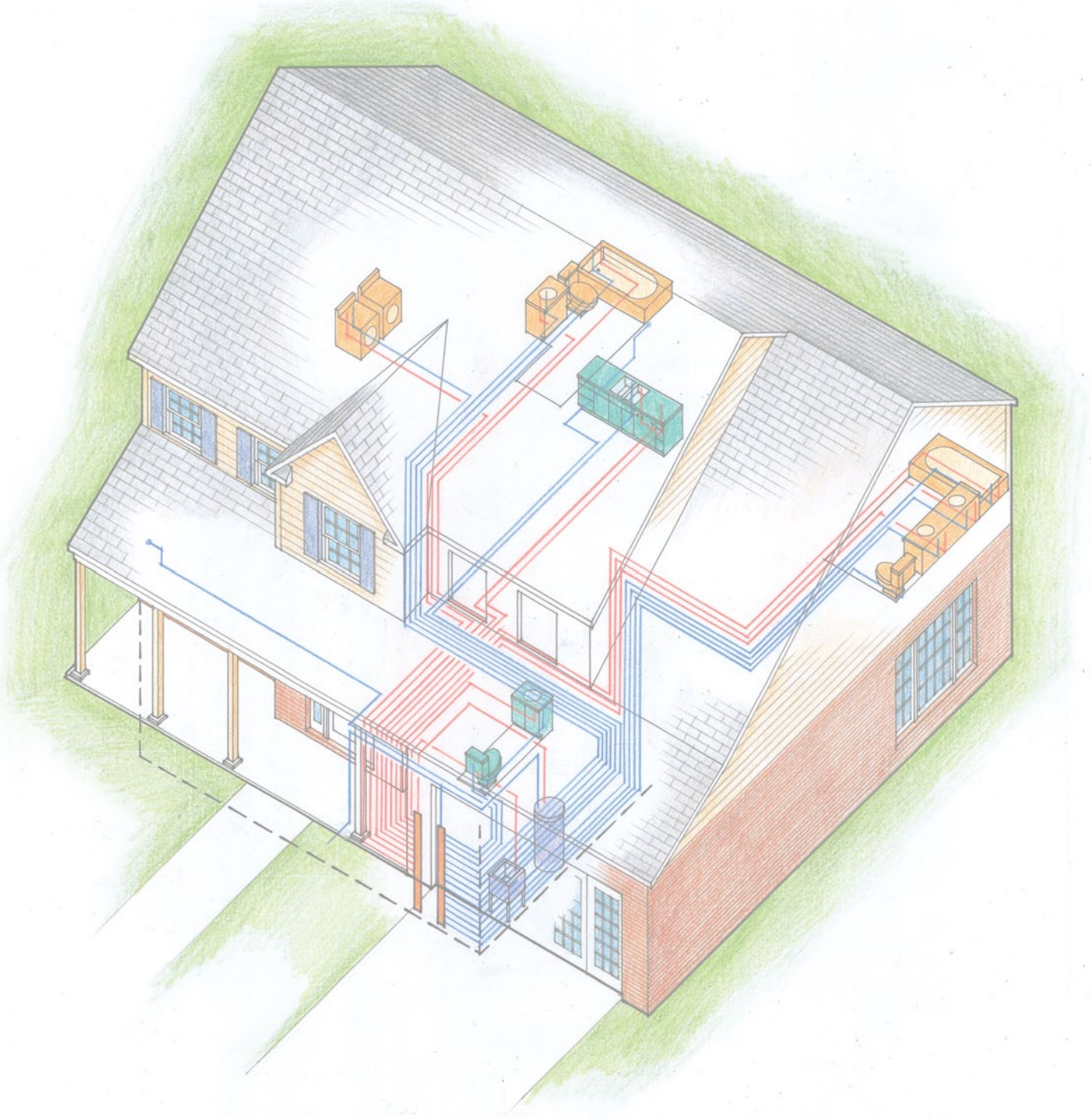

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Residential PEX Water Supply Plumbing Systems

Second Edition

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11 OTHER APPLICATIONS

Radiant Heating and Cooling Systems

Warm water or "hydronic" radiant heating systems utilize PEX pipes embedded within floors, walls or ceilings. Warm water is circulated through the pipe, which conducts heat to the panel, usually the floor. The warm floor then radiates heat to the space above it, warming the objects and people in the room, while also allowing warm air to gently rise from the floor. The resulting comfort is unmatched with other forms of heat delivery. The warm water may be produced by a variety of heat sources such as

Figure 11.1 – Radiant Floor Heating Piping in a Residential Application

Figure 11.2 – Radiant Floor Heating Piping in a Commercial Application

high efficiency boilers, geothermal heat pumps and thermal solar collection systems. Benefits of radiant heating include increased efficiency, more uniform heat distribution in the lower portion of rooms, and easier zoning. Radiant heating systems are commonly found in all types of construction and applications, from houses to schools to hotels.

Some radiant heating systems also operate as cooling systems, circulating chilled water through floors, walls or ceilings in the cooling season to absorb heat energy from spaces. Radiant cooling systems improve comfort and efficiency, as the reduced cooling load on the traditional air-based system can be significantly reduced, lowering air movement, noise and drafts. The reduction in size of the air handling equipment is often enough to offset the cost of the PEX heating/cooling pipes. Radiant cooling systems are usually installed in commercial spaces where the humidity can be controlled by computerized control systems to manage air dehumidification and prevent condensation.

Municipal Water Service Pipe

Figure 11.3 – PEX Water Service

In addition to supplying water within a home or building, PEX pipe is also used to distribute water to buildings and entire communities through municipal water service pipes in sizes up to 3 in. Unlike buried metal pipes, PEX water service pipes will not corrode or suffer mineral build-up. Because PEX pipe has higher resistance to slow crack growth than other piping materials, it ensures high-impact resistance with normal backfill. PEX pipe is more flexible and resistant to freeze damage, lessening the chance of splitting or cracking. It provides excellent resistance to chlorine and chloramines, reducing risk of damage due to disinfectants. It connects to standard compression joint valves, and fittings, so it's easy and convenient to install. Finally, PEX water service pipes can save up to half the cost of copper—a significant savings for budget-constrained waterworks professionals.

Snow and Ice Melting Systems

PEX pipes are often used in hydronic systems designed to augment the removal of snow and ice by circulating a heat transfer fluid (usuallyglycol and water) through pipes installed within outdoor surfaces. The durability and flexibility of PEX pipes designed for these applications allows these systems

Figure 11.4 – Snow and Ice Melt Piping for a Driveway

to provide years of reliable service, with no worries about pipe corrosion or failing electrical connections. Common applications of hydronic SIM systems include driveways, steps, sidewalks, hospital entrances, parking garage ramps, wheelchair ramps, car washes, hot tub/pool surrounds, and even helicopter landing pads. Benefits include safety, access, reduced maintenance costs, no snow removal costs, reduced liability, and obvious convenience.

Figure 11.5 – Snow and Ice Melting in a Commercial Application

Turf Conditioning

For outdoor playing surfaces like football, baseball and soccer fields, reliable PEX pipe is installed within the soil layer of the natural turf. Fluid is circulated at varying temperatures to gently warm the grass roots to provide optimal root zone temperature. These systems can extend the growing season of natural grass surfaces for use in late autumn and even winter, allowing the fields to recover faster after use. The systems will also melt snow, keeping playing surfaces accessible. Turf conditioning systems have been used for decades in European soccer fields, and are widely used across North America in playing fields used in the NFL and MLB, in golf courses and other sports field surfaces. Similar systems are also used in greenhouse applications with bedding plants and other foliage.

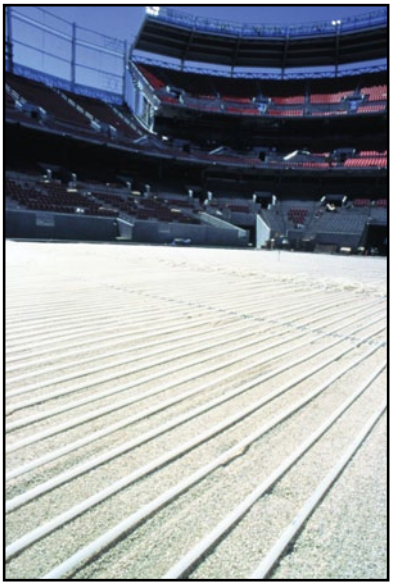

Figure 11.6 – Turf Conditioning in a Stadium

Geothermal Earth Energy Systems

Most geothermal ground source, or "earth energy", systems utilize buried pipes as the ground heat exchanger, transferring heat to and from the earth

Figure 11.7 – PEX Piping in a Geothermal Application

during cooling and heating operation, respectively. Ground source geothermal systems have the potential to reduce heating costs by 70% and cooling costs by 50%, or more, as compared to other sources of heating and cooling energy. PEX pipes are ideally suited for these applications, due to their flexibility, toughness and proven longevity. The flexibility of PEX assists installation in curved trenches, its high resistance to slow crack growth provides resistance to damage in both vertical and horizontal applications, its smooth interior permits excellent flow of heat transfer fluids, and its long-term history in pressurized applications ensures reliability, even when buried in the ground.

Figure 11.8 – Fire Sprinkler with PEX Piping

Fire Suppression

UL-approved PEX piping and fitting systems listed to UL Standards can be used to supply water to fire suppression sprinklers for residential applications. While many sprinkler systems are largely independent from the water distribution system, for some building types they can be combined with a building's cold-water plumbing system. This has the potential to reduce installation costs and the total amount of installed pipe and fittings. Sprinklers, PEX piping, and fittings must comply with National Fire Protection Association (NFPA) requirements for residential fire sprinkler systems. Already, several PEX systems meet the requirements of NFPA 13D for domestic applications. Local codes must be consulted when implementing any fire suppression system to ensure that PEX and/or combined systems are permitted for each building type.

Water Reuse/Reclaim

Reclaim water systems reuse greywater, commonly defined as wastewater from bathtubs, shower drains, sinks, washing machines, and dishwashers. Greywater accounts for 60% of the outflow produced in homes. By designing plumbing systems to separate it from blackwater, greywater can be recycled for irrigation, toilets, and exterior washing, resulting in water conservation. Certain PEX pipe and fitting systems are intended for reclaim water systems and may contain special color codes or marking on the products to indicate this application. Be sure to consult your local codes, the Authority Having Jurisdiction and the pipe and fitting manufacturer when selecting a PEX piping systems for reclaimed water systems.

Figure 11.9 – Purple PEX for Water Reuse Applications

[10] NAHB Research Center, Surge Pressure in Plumbing Pipe Materials, 2009, www.HomeInnovation.com

GLOSSARY

ASTM: American Society for Testing and Materials

Corrosion: deterioration in metals caused by oxidation or chemical action

Crosslinked polyethylene: a polyethylene material which has undergone a change in molecular structure using a chemical or a physical process whereby the polymer chains are chemically linked. Crosslinking of polyethylene into PEX for pipes results in improved properties such as elevated temperature strength and performance, chemical resistance, and resistance to slow crack growth.

Elasticity: a measure of material stiffness or the ability of the material to stretch or deform temporarily under a load

Fitting: a device or connection that allows the PEX pipe to change direction or size, such as a tee, elbow, or coupling

Fixture: a device or appliance at the end of a water supply distribution pipe line. Example: lavatory, water closet, tub/shower, dishwasher

IAPMO: International Association of Plumbing and Mechanical Officials

ICC: International Code Council

IPC: International Plumbing Code

IRC: International Residential Code

Joint: the connection of the PEX pipe to a fitting, fixture, or manifold

Manifold: a device having a series of ports that are used to connect distribution lines for several fixtures

NSPC: National Standard Plumbing Code

Outlet: see fixture

Parallel: a plumbing design that utilizes a central manifold and distribution piping to each hot and cold water fixture

pH: a scale ranging from 0 to 14 that ranks how acidic or alkaline a liquid is; water with a pH below 7 is considered acidic and water with a pH above 7 is considered alkaline

PPFA: Plastic Pipe and Fittings Association

PPI: Plastics Pipe Institute

Scaling: process of mineral buildup on the interior of a pipe

Test fixture: the tub-shower unit farthest from the water source that was instrumented to measure flow rate, flowing pressure, and mixed water temperature in the lab tests

Thermoplastic: having the property of becoming soft when heated and hard when cooled

Thermoset: having the property of becoming permanently hard and rigid when heated or cured

Trunk and branch: a plumbing design that has a large main line that feeds smaller pipes to each fixture

Ultraviolet: high energy light waves found in sunlight that lead to the degradation of many plastics and materials (UV)

UPC: Uniform Plumbing Code

Wait time: the time it takes for hot water to be delivered to the Test Fixture; delivery time

Water hammer: a banging noise heard in a water pipe following an abrupt alteration of the flow with resultant pressure surges

Zone: a plumbing system that uses trunk lines from the water source to small manifolds at grouped fixtures, such as a bathroom; can be flow-through or closed end