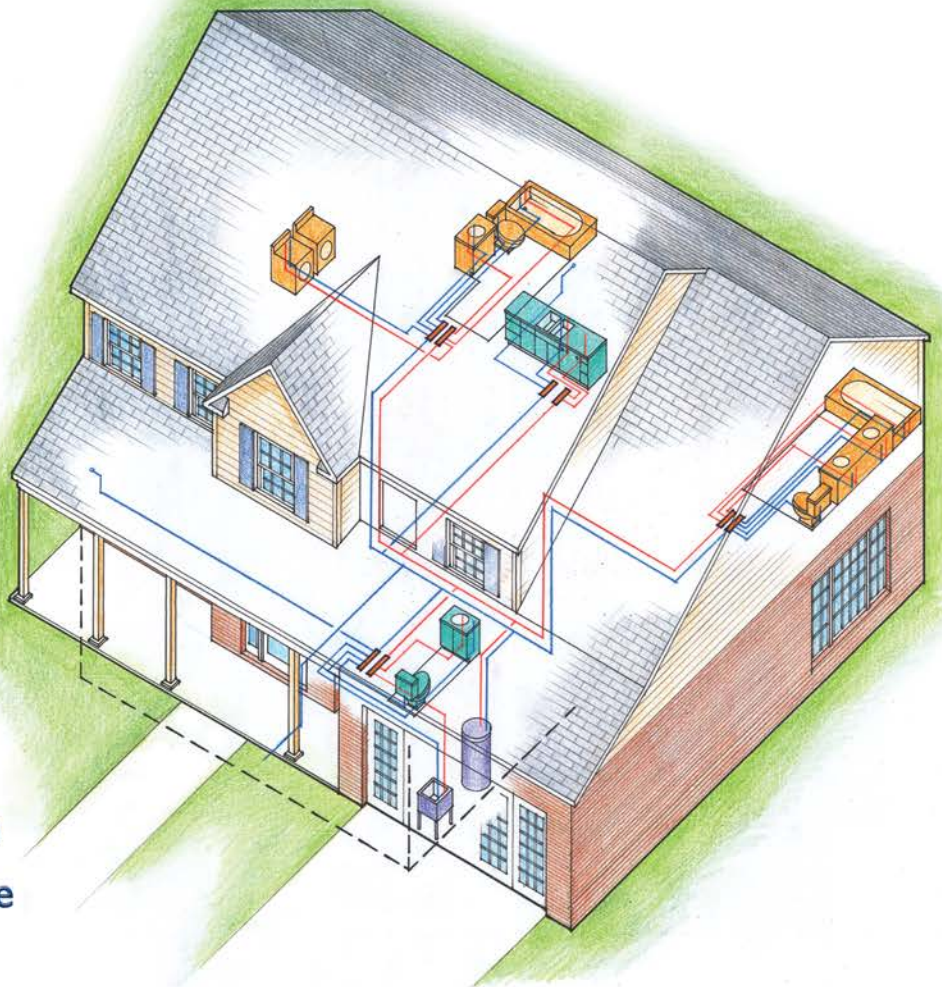


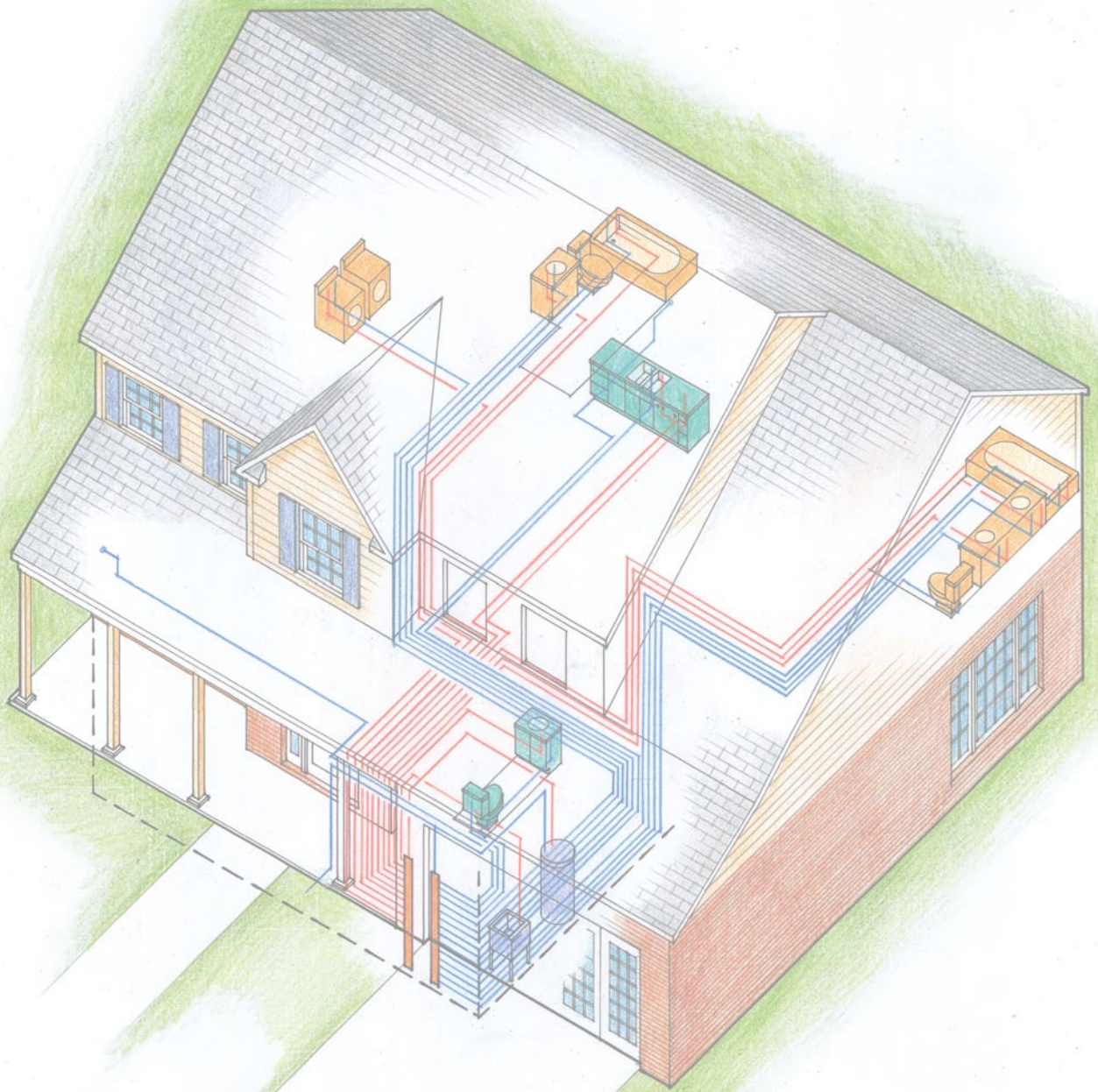
DESIGN GUIDE

Residential PEX Water Supply Plumbing Systems

Second Edition

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





DESIGN GUIDE

Residential PEX Water Supply Plumbing Systems

Second Edition

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ADVANTAGES

Ease of Installation

The installation of PEX pipe is generally easier than rigid pipe. It is available in long coils which eliminates the need for coupling joints. Its flexible nature allows it to be bent gently around obstructions, minimizing the use of fittings. No solvent, chemical, or solder joining is required. The mechanical fittings are secure and reliable when installed properly. The pipe is lightweight, making it safe to transport and easy to handle. For a comparison of the installation of rigid metal pipe to PEX pipe, refer to the PATH Field Evaluation in Lincoln, Neb.¹

Durability

Based on extensive testing and material performance over the span of more than 40 years, PEX piping has proven to be a durable material that does not suffer from some of the historical problems associated with metallic piping, such as reduced interior dimension (occlusion), corrosion, electrolysis, filming, mineral build-up, and water velocity wear. PEX piping will typically expand if the system accidentally freezes, and return to its original size when the water thaws.

Cost Effectiveness

PEX plumbing systems have lower installation costs than rigid metallic plumbing systems. Installation time and labor required is greatly reduced. In service, the use of PEX systems can reduce energy and water use by delivering water to the fixtures faster and by reducing heat loss in the piping.

¹ The full PATH Field Evaluation report is available at <http://www.HomeInnovation.com>.



Energy Efficiency

PEX piping offers reduced heat loss and improved thermal characteristics when compared to metallic pipe. In addition, less energy is used by the water heater because of shorter delivery time for hot water with PEX parallel plumbing systems. For a definition of PEX parallel plumbing systems, see Chapter 6.²

Noise Reduction

When properly secured, PEX piping is quieter than rigid systems. It is inherently less noisy due to its flexibility and ability to absorb pressure surges (see Chapter 3).

Water Conservation

Properly designed PEX plumbing systems have the potential to conserve water (see Chapters 5 and 7). The flexibility of PEX allows it to bend around corners and run continuously, reducing the need for fittings; this allows downsizing the pipe diameter to 3/8-inch for certain fixtures. Parallel systems and 3/8-inch pipes minimize the time it takes hot water to reach the fixture. Lengthy delivery time for hot water represents a significant waste of water as well as energy; a problem exacerbated in larger homes.

In 2002, the Home Innovation Labs conducted software simulations and laboratory tests on a “typical” hot water system using a trunk and branch rigid pipe design and one that included a 3/8-inch diameter PEX parallel system. Results indicated that systems using shorter 3/8-inch runs with a parallel manifold reduced the wait time for hot water and wasted less water than longer runs of rigid pipe with numerous elbows and connections.³

Environmentally Sound

PEX is a modification or enhancement of high-density polyethylene, an economical and highly cost-effective construction piping material. Generally, as indicated by a peer reviewed life cycle inventory report⁴ manufacturing of plastic pipe consumes less energy than producing similar lengths of metallic pipe. The lighter weight of PEX compared to metallic piping helps to lower transportation costs and energy consumption, offering even greater benefit.

PEX pipes can be recycled as an inert filler material that can be incorporated into other polymers for specific applications. There is also reduced water use through faster delivery time. In addition, PEX pipe does not contain lead, harmful VOCs, or bisphenol A (BPA).

² Evaluation of Hot Water Distribution Systems by Numeric Simulation, 2004. Building Technology Center, Oak Ridge National Laboratory.

³ Performance Comparison of Residential Hot Water Systems, November 2002, NAHB Research Center report available at <http://www.HomeInnovation.com>.

⁴ The Life Cycle Inventory Report Peer-Reviewed Life Cycle Inventory for the Production and Use of Installed Residential Piping Systems for three House Layouts, February 3, 2011, commissioned by the Plastic Pipe and Fittings Association and prepared by Franklin Associates is available at http://www.ppfahome.org/pdf/Peer_Reviewed_Pipe_Use_Phase_Report_combined_Final.pdf.

Versatility

In addition to being used for domestic hot and cold water plumbing, PEX piping has numerous other applications because of its physical properties (flexibility, reliability, installation ease etc.) PEX lends itself to these and many other applications:

- Residential and commercial potable cold- and hot-water distribution systems
- Residential fire protection systems
- Hydronic radiant heating and cooling, using warm or chilled fluids
- Outdoor snow and ice melting
- Outdoor turf conditioning
- Ice surface piping
- Hot-water distribution piping
- Hot-water baseboard piping
- Warm- and hot-water radiator connection piping
- Potable water service pipes
- Geothermal ground loop heat exchangers
- Chilled water piping
- Specialized industrial and mining applications



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

