

# TOOLBASE<sup>SM</sup> TECHSPECS

## Home-Run Plumbing Systems

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## TECH @ A GLANCE

### BENEFITS (+) / DRAWBACKS (-)

- + **AFFORDABILITY:** Reduced installation time/costs
- + **ENERGY EFFICIENCY:** Reduced heat loss
- + **MARKETABILITY:** Easy maintenance and repair; steady pressure and temperature with simultaneous use of several fixtures; quicker hot water delivery
- **AFFORDABILITY:** May require added training time/learning curve for trades; may require more pipe which adds to material costs

### INITIAL COST

Cost of home-run plumbing system materials are often less than similar rigid pipe systems. Cost will depend on the system design, house size, distributor, and product availability.

### OPERATIONAL COST

Because manifolds are installed in easily accessible locations and have fewer connections, home-run systems can significantly reduce maintenance and repair costs. They also can contribute to hot water energy savings, which can reduce utility bills.



### CODE ACCEPTANCE

PEX piping is approved in all the major building codes, but has not received local code acceptance in some areas of the country. PEX tubing must comply with ASTM F876, Specification for Cross-Linked Polyethylene (PEX) Tubing, and ASTM F877, "Specification for Cross-linked Polyethylene (PEX) Plastic Hot and Cold Water Distribution Systems."

Section P2903.8 of the 2003 International Residential Code (IRC) covers Parallel Water-Distribution System Manifolds, and includes sizing, valves, distribution lines, and support. Section P2904 covers materials, joints, and connections.

### RESULTS FROM THE FIELD

PATH field evaluations have demonstrated significant material and installed cost savings compared with traditional plumbing systems.

### WARRANTY

Manufacturers typically offer a 10-year limited warranty on the manifold, piping, and fittings.

### MAKING THE SWITCH

- Home-run systems can take significantly less time to install than traditional rigid pipe plumbing systems once the learning curve has been overcome.
- Trades need to receive training in proper handling and installation.
- Requires some specialized tools.
- Special care required to eliminate construction and line debris from sensitive manifolds.

## THE BASICS

Home-run plumbing systems act as control centers, or manifolds, for hot and cold water that feed supply lines to individual fixtures. Also called "manifold systems," they consist of a plastic or metal plumbing manifold and flexible plastic piping. Generally, home-run systems use cross-linked polyethylene piping (PEX), which is suitable for hot water use and resistant to temperature extremes, chemical attack, and creep deformation. Because of the flexible piping, home-run systems can be installed more quickly than rigid plumbing systems, with only one fitting at the manifold, one transition fitting at the fixture, and no need for piping tees and elbows. However, fittings and couplings are available for special situations, such as repairing damaged piping or for creating changes in direction that are tighter than the minimum bend radius allowable for the piping.

Home-run systems equalize pressure, and therefore allow several fixtures to be used simultaneously without dramatic changes in pressure or temperature. In addition, PEX piping can be sized 1/8-inch smaller in diameter than piping in a "tree" type conventional piping system for some fixtures. Hence, hot water arrives at fixtures faster, and less hot water is left standing in pipes after a draw (standing water creates energy loss to the surrounding air). PEX piping can reduce heat loss from water in the pipe because it is a better thermal insulator than copper.

## DOLLARS AND SENSE

### Initial Cost:

Considerable labor and material savings have been documented in the field.

- \$300-\$1,200 less than copper for move-up production homes (Oakwood Homes)
- \$200 less than conventional copper in production builder's "Idea House" (K. Hovnanian)
- \$700 compared to copper for a remodeling application (Model remodel)

### Operating Cost:

Moderate savings may be achieved, however, savings are not easily quantifiable. Studies underway are seeking this information.

#### THE BASICS *continued*

Because manifolds are installed in easily accessible locations, plumbing upgrades and repairs are simplified. Manifolds can be mounted between stud framing, and should be secured on a flat surface to prevent warping. Each outlet from the manifold typically has its own valve, making repairs at the fixture much easier.

PEX tubing may melt, distort or crack if exposed to excessive heat, and should not be exposed to freezing or sunlight. In addition, abrasive surfaces that can damage PEX pipe should be avoided. Ensure that PEX piping has 12-inches vertical and 6-inches horizontal clearance from heat sources, such as light fixtures, gas flues, and heating appliances. Manifolds should be installed near, but not too close to, the water heater. Minimum clearances of 36-inches vertical and 18-inches horizontal are needed between a thermoplastic manifold and a water heater.

Central manifolds should be installed in a convenient and accessible location, such as a basement wall or a service closet, which allows easy access for shut off to individual fixtures. A single length of PEX piping can run directly from a manifold through studs and around obstacles. The pipe is pulled, like a wire, from the manifold location to fixture locations. Unrolling the pipe with a reel will prevent kinking. The pipe is then secured with clips and cut.

## RESULTS FROM THE FIELD

*This technology has been used by other builders in real-world building situations – learn from their experiences.*

Builders who have installed home-run systems as part of PATH Field Evaluations and Demonstrations have realized material and installation savings, and discovered tips for improving the transition from traditional plumbing.

### Denver, Colorado, Oakwood Homes (PATH Demonstration Site)

- Production builder of move-up homes implemented PEX and plastic plumbing manifold system
- Cost savings ranged from \$300 to \$1,200 less than lowest copper pricing
- Open-web floor joists facilitated installation of PEX and other technologies
- Installed waste and vent pipe prior to PEX installation to avoid damage to PEX from chemical welding
- Flushed main street line of sand and dirt before running water through manifold to prevent damage; installed valve upstream of manifold for this purpose
- To ease overhead work, plumbers used stilts commonly used by drywall contractors

### Freehold, New Jersey, K. Hovnanian (2002 PATH Field Evaluation)

- Production builder incorporated several advanced technologies in its "Idea House." System was hybrid copper/PEX
- Savings were approximately \$200 versus conventional copper
- Plumbers did not like transitioning between copper and PEX in this hybrid system; however, they agreed that system can save installation time
- Code officials reluctant to allow this technology
- Learned to unroll the tubing before pulling through walls to prevent kinking; pulling tubing may require two workers—one to push, one to pull
- Other lessons learned – tubing tends to become stiff in cold weather; crimping tool can become cumbersome in tight spaces

### Philadelphia, Pennsylvania, Model reMODEL (1999 PATH Field Evaluation)

- Remodel of a Philadelphia row home demonstrating numerous technologies including a home run plumbing manifold with PEX piping
- Cost savings was \$700 compared to conventional copper pipe
- Plumbing system installation took less than half the time to install copper piping

## MAKING THE SWITCH

*What is required to transition from your current building practices to using this technology?*

**Familiarize yourself with home-run systems** - Home-run plumbing is still a relatively new concept for residential construction. Being informed about its advantages, local code acceptance, and installation procedures will help ease the implementation process with consumers, code officials, and trades. Obtain a system design from the manufacturer, or use manufacturer-specified design tables.

**Consult your local codes** - Check your local codes to be sure PEX is permitted, and to get any local variations to the model codes pertaining to PEX.

**Evaluate Your Home Designs** – Look for opportunities to locate manifolds centrally and minimize total piping lengths, and find accessible locations to mount central manifolds.

**Work with your trade contractors** - According to manufacturers and field evaluations, home-run plumbing systems can be installed in about half the time of a traditional copper system. However, manifolds and PEX have some restrictions on use, and trades should be trained to ensure proper handling. Trades must be knowledgeable about manifold location, including proximity to water heaters and other heat sources.

**Tools** - Specialized crimping tools are needed to make connections; one tool is needed for each piping diameter. Crimping tools require periodic calibration. Therefore, it is important to check the crimps with a gauge to ensure they are adequately compressed. Tool costs can range up to \$300.

## FOOD FOR THOUGHT

*This section provides some things to think about before switching to this building technology – make sure it's the right choice for you.*

- Because of their accessibility, home-run systems work well with “open building” designs, where the home’s utilities are built to facilitate future changes. Disentangling plumbing from other utilities, the building structure, and interior walls simplifies construction and eliminates the mess and much of the expense associated with traditional plumbing changes. Open building designs are particularly suitable for homeowners who want a low maintenance home or who want to upgrade their home in the future.
- Remodelers may find that PEX is easier to work with because, unlike rigid pipe, flexible piping can be snaked through walls and floors.
- Home-run systems work best with a centrally-located water heater. Additional remote manifolds may be needed to serve very large homes with extra plumbing fixtures.
- Home-run systems require proper planning to ensure optimal manifold placement and routing of PEX lines.
- Familiarity with local codes is vital, as local code officials may not yet be familiar with home-run systems.
- Be informed about the differences between PEX and polybutylene piping. Many consumers and contractors have negative perceptions of plastic piping because of previous polybutylene piping failures.
- Installing home-run systems requires a learning curve, so be equipped for the additional time and training of trades. Manifolds and PEX piping have several restrictions for proper handling; plumbers will need training to ensure that piping is used correctly, and site supervision may be needed to ensure proper installation.
- Although the systems can cost less to install than traditional plumbing, they may require more pipe.

**TIP:** *An open-web floor joist design allows greater efficiency for PEX installations and can result in a lower plumbing bid.*

- Extra piping, on the order of seven inches per 50 feet of piping, is needed to allow for expansion and contraction. In addition, piping should not be secured too tightly to the framing, to account for expansion and contraction.
- Not all PEX piping is compatible with manifold systems, and special piping installation tools may be needed.
- A tee connection placed on the main supply line upstream of the manifold will allow flushing of the street line to eliminate sand or dirt that collects during construction before running water through the manifold.

## DEFINITIONS

### Cross-linked Polyethylene (PEX) Piping

A type of flexible plastic piping, used for its suitability for hot water use and resistance to temperature extremes, chemical attack, and creep deformation

### “Open Building” Design

A design approach that disentangles a building’s structure, various utilities and floor plan from each other in order to accommodate future changes

### Central Plumbing Manifold

the control center for multiple attachment of hot and cold water flexible plastic piping that runs to individual fixtures

### Polybutylene (PB) Piping

a type of flexible plastic piping that looks similar to PEX, but experienced failures and caused class-action lawsuits; no longer used in U.S. markets.

## TECH CHECK

*Below is a checklist of steps to follow if you decide to implement this technology in your next building project.*

- Train trades.** Although home-run systems can be installed significantly faster than traditional plumbing, trades may require additional training and time for proper installation. Purchase all AAV materials for the drainage system.
- Consider an “open building” home design [optional].** Home-run plumbing systems lend themselves to “open building” or “disentangled” home designs, where utilities are separated from each other and the building’s structure. This design offers several benefits, including ease of future upgrades and repair. After rough and finished plumbing testing, install and test the AAVs.
- Plan placement.** Planning is required for optimal placement of the manifold. The manifold should be installed securely on a flat surface, in an accessible area that is near the water heater, but at a proper clearance to avoid heat damage.
- Ensure proper handling and installation on site.** Plastic plumbing manifolds and PEX tubing both have specific handling and usage requirements to avoid damage from heat, freezing or puncturing. When getting started with home-run systems, site supervision may be required to ensure that these requirements are met.
- Conduct pressure test.**



The Partnership for Advancing Technology in Housing (PATH) is dedicated to accelerating the development and use of technologies that radically improve the quality, durability, energy efficiency, and affordability of America's housing. Managed by HUD, the PATH partnership includes the homebuilding, manufacturing, insurance and financial industries, and Federal agencies concerned with housing.

PATH addresses barriers to innovation, provides information on advanced building technologies, and advances housing technology research; making affordable, quality American homes a reality.

For more information on the PATH program, visit [www.pathnet.org](http://www.pathnet.org).

*Tech Specs are Prepared for PATH by the NAHB Research Center.*

**RESOURCES**

**ToolBase Services**

Information on this building technology and many others brought to you by PATH and the building scientists at the NAHB Research Center

Online installation videos are available for immediate download and viewing under the PATH Tech Inventory on ToolBase. [www.toolbase.org](http://www.toolbase.org)

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