Design and Installation

Effective - May 2004

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The Plumb-Pex® System

Plumb-Pex® System Assembly Components

The Plumb-Pex® System consists of Plumb-Pex® Tubing, fittings and additional components supplied by RTI. Plumb-Pex® is a premium product with high temperature, pressure, and chemical resistance.

Applications

 Uses for Plumb-Pex® include:
* Potable hot and cold water distribution
* Water service
* Snow/ice melt systems
* Turf conditioning systems

Plumb-Pex® Tubing

Plumb-Pex® Tubing is cross-linked polyethylene. The tubing is numerically marked for easy measuring, and either boxed or bagged for added protection, and easy storage. Plumb-Pex® tubing is available in both coils and straight lengths. For easy hot and cold identification Plumb-Pex® is available in red and blue in addition to standard Plumb-Pex®.

Plumb-Pex® Fittings

Plumb-Pex® fittings are manufactured of brass to ASTM F-1807 “Metal Insert Fittings” specifications. Fittings are also available manufactured of engineered polymer to ASTM F-2159 “Plastic Insert Fittings” specifications. Fittings are NSF Listed under Standards 14 and 61. The Plumb-Pex assembly compresses the tubing onto the insert of the fitting producing a watertight seal.

Plumb-Pex® Clamp

The patented Plumb-Pex® Clamp is manufactured of #304 annealed Stainless Steel to ASTM F2098. The clamp is an interlocking ring that forms a complete 360° uniform watertight seal which is constantly maintained by the clamp’s unique spring action. No gauge is required to check the completed clamp assembly.

Plumb-Pex® Cutting Tool

A cutting tool is available for cutting of Plumb-Pex® tubing. A straight, burr free cut is provided to ensure proper fitting assembly.

Plumb-Pex® Standards, Ratings and Certifications

* Plumb-Pex® Tubing is manufactured to ASTM F876/F877 SDR9
* Plumb-Pex® Tubing carries the following pressure/temperature ratings:
  - 160 psi at 73.4°F
  - 180 psi at 180°F
  - These pressure/temperature ratings are issued by the Hydrostatic Stress Board of PPI (Plastic Pipe Institute).
* Plumb-Pex® fittings are manufactured to ASTM F877/F1807/F2098
* Plumb-Pex® Clamps are manufactured to ASTM F877/F2098
* Plumb-Pex® system components are listed under NSF (National Sanitation Foundation) International Standard 14 that defines requirements for ingredients, materials, products, quality assurance, marking, and performance criteria.
* Plumb-Pex® system components are listed under NSF Standard 61 that defines requirements for toxicity.

Standard Dimensions and Lengths

Plumb-Pex® Tubing is available in the following coil sizes:

<table>
<thead>
<tr>
<th>Pipe Size (I.D.)</th>
<th>1/4&quot;</th>
<th>3/8&quot;</th>
<th>1/2&quot;</th>
<th>3/4&quot;</th>
<th>1&quot;</th>
<th>1-1/4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual O.D.</td>
<td>.375</td>
<td>.500</td>
<td>.625</td>
<td>.875</td>
<td>1.125</td>
<td>1.375</td>
</tr>
<tr>
<td>Actual I.D.</td>
<td>.251</td>
<td>.360</td>
<td>.485</td>
<td>.681</td>
<td>.875</td>
<td>1.069</td>
</tr>
<tr>
<td>Coil Sizes</td>
<td>100’</td>
<td>100’</td>
<td>100’</td>
<td>100’</td>
<td>100’</td>
<td>100’</td>
</tr>
<tr>
<td>Straight Lengths</td>
<td>500’</td>
<td>500’</td>
<td>500’</td>
<td>300’</td>
<td>1000’</td>
<td>500’</td>
</tr>
</tbody>
</table>

Plumb-Pex® Warranty

The following Warranty coverage’s are provided (please contact RTI or your local Plumb-Pex® distributor for the complete text of the warranty and conditions):

Plumb-Pex® Tubing 25 Years
Plumb-Pex® Fittings/Clamps 10 Years
Plumb-Port® Manifold 10 Years
Plumb-Pex® Tool 1 Year
Valves & Accessories 1 Year

2 RTI/PLUMBING SYSTEMS DESIGN AND INSTALLATION THE PLUMB-PEX® SYSTEM
Working With Plumb-Pex®

Plumb-Pex® is flexible and installer friendly. The following information will help to simplify and aid in the installation of Plumb-Pex®.

Bending Plumb-Pex®

Bends less than 10" in diameter should be made slowly and carefully to avoid over-bending. Bend supports are available and may be used to provide additional support when a 90° bend is required.

The chart below illustrates the minimum bending radius for each size of Plumb-Pex® Tubing.

<table>
<thead>
<tr>
<th>Minimum Bend Radius</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8&quot; Plumb-Pex®</td>
<td>3&quot;</td>
</tr>
<tr>
<td>1/2&quot; Plumb-Pex®</td>
<td>3.75&quot;</td>
</tr>
<tr>
<td>3/4&quot; Plumb-Pex®</td>
<td>5.25&quot;</td>
</tr>
<tr>
<td>1&quot; Plumb-Pex®</td>
<td>6.75&quot;</td>
</tr>
<tr>
<td>1-1/4&quot; Plumb-Pex®</td>
<td>8.25&quot;</td>
</tr>
</tbody>
</table>

Cutting Plumb-Pex®

It is important that the cut be straight and perpendicular to the tubing. Cutting the tubing on an angle may result in an improper fitting assembly.

Uncoiling

Plumb-Pex® Tubing is available in coils and straight lengths. Coiled tubing can be easily straightened due to the unique thermal memory of Plumb-Pex®. Simply cut the length of desired tubing and straighten by hand. A tubing uncoiler is also available if desired.

Re-forming "Kinked" Plumb-Pex®

Plumb-Pex® can be described as a "plastic with memory." In the event that it is kinked, repairs can be made in the following manner:

1. a) Straighten the kinked portion by hand. Do not attempt to work the tubing manually to repair the kink.
   b) Using an electric heat gun, heat the kinked area to approximately 265°F. Apply the heat evenly around the circumference of the tubing. Do not place the heat source directly onto the tubing.
   c) Let the re-formed tubing cool undisturbed to room temperature before continuing.

2. Cut out kinked section and reconnect cut ends with a Plumb-Pex® coupling.

Hot Water Recirculating Systems

Plumb-Pex® Tubing can be safely used for hot water recirculating systems. Maximum temperature should be no greater than 140 degrees F. at 120 psi max.

Limitations

Soldering - Soldering of Plumb-Pex® transition fittings (copper x Pex) must be done first, prior to assembling the fitting to Plumb-Pex® Tubing. In the event that a solder joint must be made in the vicinity (within 18") of a previously installed Plumb-Pex® assembly, care should be taken to provide a suitable heat sink between the solder joint and Plumb-Pex® assembly. The Plumb-Pex® assembly should not be allowed to exceed 210°F.

UV Exposure - Plumb-Pex® should not be stored outside or used in any applications which are subjected to long term exposure to direct sunlight. Exposure to diffused sunlight during normal installation is not a problem.

Installation restrictions - Do not place tubing within 6 inches of flue vents or within 12 inches of recessed lighting fixtures. Do not install tubing where it may come into contact with fuels, oil products, solvents or chemicals. Contact RTI with MSDS information if there is a concern.

Codes - Check local code jurisdiction requirements prior to installing Plumb-Pex®.

Ratings - Do not exceed temperature and pressure ratings of tubing.

Pipe Supports and Linear Expansion

Only use plastic tubing ties and supports when securing Plumb-Pex® Tubing to a structure, studs, or under slab.

* The linear expansion rate for Plumb-Pex® is approximately 1.1" per 10 degree Fahrenheit change for every 100 feet of tubing.

* When installing runs of tubing, allow 1/8" of longitudinal clearance per foot of run to accommodate thermal expansion. Tubing should be allowed to dip between supports. Do not pull tubing tight during installation.

* Plumb-Pex® should be allowed freedom of movement to expand and contract.

* Allow adequate clearance between the tubing and the structure (bored holes or sleeves) to allow freedom of movement.

Expansion Loops

Linear expansion of tubing may also be countered by installing an expansion loop in the tubing run. This provides an area for the tubing to expand without causing stress. As the water warms and the tubing expands, the loop grows. As the water cools and the tubing contracts, the loop shrinks. (see diagram below)

Expansion Loop Installed at a 90° Bend

Expansion Loop Installed in a Straight Run

NOTE: Be sure to allow adequate space for the loop to grow.
Pipe Support Spacing

Plumb-Pex® must be anchored securely enough to support the tubing, yet relaxed enough to allow the tubing to expand and contract.

1) Along horizontal runs, install supports every 32" or less.

2) Along vertical runs, install supports every 48", at each floor, and as a mid-story guide.

Wood Stud Installation

When Plumb-Pex® is installed through wood studs, striker plates should be installed to protect tubing during construction and drywall installation (see illustration). Plumb-Pex® does not require sleeving when installed in wood studs if adequate clearance is provided. Should concern exist regarding chaffing or movement, steel stud installation practices may be utilized.

Steel Stud Installation

When passing Plumb-Pex® Tubing through steel studs use one of the following methods.

1) Use an approved insulator.
2) Pass the tubing through a section of plastic or poly pipe.

Penetrating Foundation Walls

It is recommended when entering or exiting a foundation that a rigid piping material be used to protect the tubing from being pinched or chaffed during expansion and contraction of the foundation material.

Installing Plumb-Pex® in a Slab/Underground Construction

1) Secure the tubing to wire mesh or rebar using Plumb-Pex® plastic ties at the intervals necessary to keep the tubing from floating up during the pour.
2) When Plumb-Pex® enters or exits a slab the tubing should be sleeved to provide protection. Pipe insulations rigid plastic conduit or Plumb-Pex® plastic elbows sleeves may be used. If Plumb-Pex® 90° metal bend supports are utilized at a slab penetration these also should be sleeved.
3) If the tubing must be run through an expansion joint, it must be sleeved or dipped below the joint and sleeved.
4) It is recommended that fittings not be buried directly in the slab or underground. A single continuous run of tubing should be used from entry to exit.

5) Maintain pressure either by filling the tubing with water or air during all phases of the pour.

When placing Plumb-Pex® Tubing in a trench be sure that:

1) The bottom of the trench is clear of all debris including rocks and gravel that may come in contact with the tubing.
2) The trench bottom should be compacted providing a smooth even surface.
3) Place tubing in a loose manner to allow for contraction and expansion. (See illustrations below)
4) First fill should be clean fill free of debris, first fill should be minimum of 6 inches above the tubing prior to final back fill.
5) If tubing is to be buried in a location where future excavation may occur, it is prudent to protect tubing by first installing a rigid protective pipe and pass the tubing through it for added protection.

Sealing Tubing Penetrations

Penetrations may be sealed to eliminate air infiltration by applying a high grade silicone caulking or siliconized acrylic caulking (Never use oil based caulking).

Tubing Runs

1) Leave extra tubing at the beginning and end of runs to simplify the connection to manifolds and fittings.
2) Identify both hot and cold water lines by either taking advantage of our 1/2" and 3/4" color coded CLAMPS (red & blue) or use a permanent marker to identify each service line.
3) Runs should be direct as possible between the manifold and the fixtures it supplies.
4) Insulate hot water tubing runs where the code requires, or as necessary.

When Using Sweat Fittings

When the use of Plumb-Pex® sweat fittings are required follow these instructions.

First solder or sweat the fitting onto the metal pipe using proper plumbing practices. After jointing fitting to metal tubing allow sufficient time for the joint to cool to room temperature. After joint has cooled, Plumb-Pex® PEX Tubing can be joined to the fitting.

When Using Engineered Polymer Fittings

DO NOT allow fittings to come into contact with pipe solvents, oils, grease, or glues. Lubrication or pipe dope may not be used with Engineered Polymer Fittings and all chemicals should be avoided prior to approval by RTI.
Lighting and Vent Restrictions

Clearance should be provided when Plumb-Pex® is installed near a recessed light fixture, flue vent, heating appliances, or any electric apparatus. All tubing that comes in the immediate area of these examples should have a minimum distance of 12 inches of vertical clearance and 6 inches horizontal clearance from the light or vent.

Connecting To Water Heaters

NOTE: Plumb-Pex® should not be connected within 6° of the vent on a water heater and not within the first 18° of piping connected to a water heater.

Plumb-Pex® Installation

*RTI offers a wide range of plumbing fittings and accessories for use with Plumb-Pex® Tubing (please refer to the Plumb-Pex® Product Catalog for a complete listing of products).

Assembly

The Plumb-Pex® fitting system utilizes our patented stainless steel “steepless” clamp to secure Plumb-Pex® Tubing to Plumb-Pex® insert fittings. The clamps provide a 360 degree uniform seal which is constantly maintained by the unique spring action of the clamp’s ear. The elastic memory of Plumb-Pex® Tube also engages the clamp’s spring action, resulting in an ever-tightening leakfree connection. The Plumb-Pex® connection withstands extreme water pressure, temperature changes, and multiple freeze cycles. All sizes of Plumb-Pex® Clamps are assembled with the Plumb-Pex® Ratchet Tool.

Plumb-Pex® Stainless Steel Clamp

Assembly of Connection

Cut the Plumb-Pex® Tube so that a clean, straight end is provided. Slide the Plumb-Pex® Clamp over the tube end. Insert a Plumb-Pex® fitting into the tube end making sure that the tube is fully seated over the insert barb. Care must be taken to assure that the tubing is positioned straight as it approaches the fitting with sufficient slack or support so that it is not being pulled or stretched to reach the fitting.

Correct

Incorrect

Connecting To Water Heaters

The Clamp should now be positioned so that it is 1/8" to 1/4" from the tubing’s cut end. Place the opened jaws of the Plumb-Pex® Ratchet Tool over the raised ear of the clamp. Check to be sure that the clamp is still properly positioned then, with the tool held perpendicular to the tubing, begin to compress the tool handles. Continue until a first “click” is felt. The tool ratchet is now engaged and the clamp is locked onto the tubing. The tool handles can now be compressed together to complete the assembly.

1) Slide the clamp
2) Slide the tubing over the tubing onto the insert fitting.
3) Close the clamp with the Ratchet Tool.

Note: The Ratchet Tool will not release until the assembly is completed.

Removal of a Completed Connection

If required, Plumb-Pex® Clamps may be removed as follows:

Using a Plumb-Pex® Clamp Removal Pincer, grab the edge of the clamp Tab and Retaining Ear (see Clamp description on left) with the pincer jaws. Rotate the pincer, pulling the Tab up and away from the Retaining Ear. The clamp will disengage from the Retaining Ear and be able to be easily removed.

Note: After removal of a clamp, the previously clamped section of Plumb-Pex® Tube should be cut off prior to assembly of a new connection.

System Sizing

The sizing of the potable water distribution system must be in accordance with good engineering practice. See applicable codes for minimum pipe size for the fixture supply lines, and minimum pressure at the fixture outlet.
Piping Options

There are three distinct piping methods that make use of Plumb-Pex® Tubing. Due to the flexibility of Plumb-Pex®, one or more of these methods may be utilized in a potable water distribution system installation. System performance, installation time, cost, and accessibility, should all be considered in order to establish the best method for a given installation.

Home Run (Manifold) System

A Home Run System utilizes two centrally located manifolds, one for the hot service and one for cold service. Typically, these should be located at the water source for each, the water meter for cold and the water heater for hot. From these locations Plumb-Pex® Tubing is run to each individual fixture. Depending upon the number of fixtures, the centralized manifolds will have the corresponding number of ports.

The benefits of using a Home Run System with a dedicated line to each fixture is the maintaining of a near constant water pressure, flow and temperature to all fixtures. Additionally, hot water is supplied to fixtures much faster, saving both water and energy. A home run system will utilize the fewest number of fittings while requiring the most tubing of all Pex Piping methods.

RTI Plumb-Port modular plastic manifolds and traditional copper manifolds are both suitable for Home Run System installation.

The following diagram is conceptual only. Some system components may be omitted for clarity. Please follow correct piping practices, engineering principles, and all applicable local Codes during installation.

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PIPING OPTIONS
Trunk & Branch System

The Trunk & Branch System is the traditional method inherent from non-flexible metal (copper) and plastic (CPVC) pipe. The main hot and cold lines (Trunks) are branched at individual points of service with Tee's, and reduced in size (dependent upon fixtures to be serviced), to supply various fixtures.

While requiring an equal footage of tubing as a traditional rigid pipe system, fewer fittings will be required because many elbows can be eliminated by using the flexibility of Plumb-Pex® Tubing. A Trunk & Branch System will utilize the highest number of fittings while requiring the least tubing of all Pex piping methods. This method of installation will result in a lower overall product cost but be more labor intensive than other Pex Piping methods.

The following diagram is conceptual only. Some system components may be omitted for clarity. Please follow correct piping practices, engineering principles, and all applicable local Codes during installation.

Second Floor

First Floor

Trunk & Branch Piping System
Zone Manifold System

The Zone Manifold System exploits both the Home Run and Trunk and Branch piping methods, providing reduced installation time, less tubing, and isolation of runs. Hot and cold trunk lines are run that are then either branched to remotely located manifolds or include remote manifolds within the run. Manifolds should be placed in the vicinity of a service location, i.e. kitchen, bathroom, laundry. From the remote manifold location, Plumb-Pex tubing is run to each individual fixture.

The benefits of using a Zone Manifold System are similar to a Home Run System, with near constant water pressure, flow and temperature to fixtures, and faster hot water delivery. It also provides the benefit of Trunk & Branch System by reducing the amount of tubing required.

RTI Plumb-Port manifolds and brass Mini-Mans are both ideal for a Zone Manifold System installation.

The following diagram is conceptual only. Some system components may be omitted for clarity. Please follow correct piping practices, engineering principles, and all applicable local Codes during installation.

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8 RTI/PLUMBING SYSTEMS DESIGN AND INSTALLATION

PIPING OPTIONS
The following diagram is conceptual only. Some system components may be omitted for clarity. Please follow correct piping practices, engineering principles, and all applicable local Codes during installation.

Zone Manifold Piping System
w/Mini-Man Fittings
Plumb-Pex® Manifolds

Utilizing manifolds in a Plumb-Pex® System provides several advantages to its operation and installation.

- Reduces installation time/labor
- Requires less fittings
- Maintains near constant pressure
- Increases water flow
- Maintains water temperature
- Provides faster delivery of hot water

Plumb-Port Manifold

Plumb-Port is a modular plastic manifold for both hot and cold potable water distribution. Similar to a home’s electrical service panel, Plumb-Port provides dedicated water lines to service all plumbing fixtures. Each port outlet is equipped with a quarter-turn shut-off valve to simplify both installation and future system service. Plumb-Port is available in 3, 5, 8 and 10 port models that are easily coupled together to satisfy any system requirement. Ports are suitable for either 3/8” or 1/2” Plumb-Pex® Tubing. Color coded (red/blue) valve discs and labels are provided for easy hot and cold line and fixture serviced identification of each port.

Mini-Man Multi Port

Mini-Man’s are a compact multi-port alternative to traditional manifolds. Designed to reduce the installation time, number of required fittings, and tubing, in the Plumb-Pex® System. Mini-Man’s are available in both “end run” and “in-line” configurations.

Manifold Location

A manifold location should be chosen that:

* Is accessible for future access.
* Provides convenient access to all fixtures. For some applications it may be beneficial to have more than one manifold location.
* Permits easy connections to the supply mains.
* Provides adequate protection from freezing.

System Testing

Test pressures shall be in accordance with code requirements as directed by appropriate local jurisdiction. Test pressures should not be allowed to exceed the Plumb-Pex® ratings (page 2). Do not use leak detectors or liquid solutions other than the municipal water supply when testing a Plumb-Pex® system using fluid pressure. In the absence of local code requirements system testing should be provided under water pressure not less than the working pressure under which the system will operate. An air pressure test of (50) psi may be substituted for a water test. In either method of test, the piping shall withstand without leaking or loss of pressure for not less than 15 minutes. Failure to perform system pressure testing as required by code or as outlined above will void applicable Warranty coverage.
Fire Stopping with Plumb-Pex®

Plumb-Pex® Tubing, used in conjunction with approved fire stop sealants, can provide either one or two hour ratings for Plumb-Pex® firewall penetrations. Acting as both a fire stop and smoke stop, fire stop sealants give Plumb-Pex® systems a unique fire stopping advantage over metal and other plastic piping systems.

Approved/Listed Fire Stop Sealants

The following fire stop sealant products are approved for use with Plumb-Pex® Tubing when installed as per sealant manufacturers design instructions:

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Product</th>
<th>Design No.</th>
<th>Pex Tubing Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>RectorSeal</td>
<td>Metacaulk 1000</td>
<td>F-C-2076</td>
<td>to 1” I.D.</td>
</tr>
<tr>
<td>PFP Partners</td>
<td>Firestop 4800DW</td>
<td>PFP/PHV 120-11</td>
<td>to 1” I.D.</td>
</tr>
<tr>
<td>Specified Technologies</td>
<td>SpecSeal Series S5S</td>
<td>WL-2100</td>
<td>to 1” I.D.</td>
</tr>
<tr>
<td>Johns Mansville Int.</td>
<td>Firetemp Cl, CE</td>
<td>JMI/PHV 120-09</td>
<td>to 1-1/4” I.D.</td>
</tr>
</tbody>
</table>

Fire and Temperature Ratings

Fire stop sealants listed above provide firewall penetration ratings to Fire Test (F), that prevents the passage of flame through wall openings, and the Temperature Rise (T), that prevents transmission of heat through the fire stop.

Certifications

Listed fire stop sealants are certified ICBO accredited testing laboratory Warnock Hersey and/or Underwriters Laboratories for use in through penetration fire stop systems with Pex tubing.

System Design

As per sealant manufacturers instructions.

Alternative Material

Fire stop sealants not listed above, intended for use with Plumb-Pex® Tubing, must be approved by RTI prior to use. Manufacturers Design Drawings and MSDS required.

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**Design Example**

**Single Penetrations**

Horizontal or Vertical (Floors, Ceilings or Walls)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Concrete or Concrete Block</td>
</tr>
<tr>
<td>2</td>
<td>Gypsum Wall Board (GWB)</td>
</tr>
<tr>
<td>3</td>
<td>Fire Stop Sealant</td>
</tr>
</tbody>
</table>

**Through GWB**

Wall detail

**Sill Plate**

Penetration detail

**Through GWB**

Ceiling detail

**Header Plate**

Penetration detail

**Through concrete or concrete block wall**

detail

**Through concrete floor**

detail