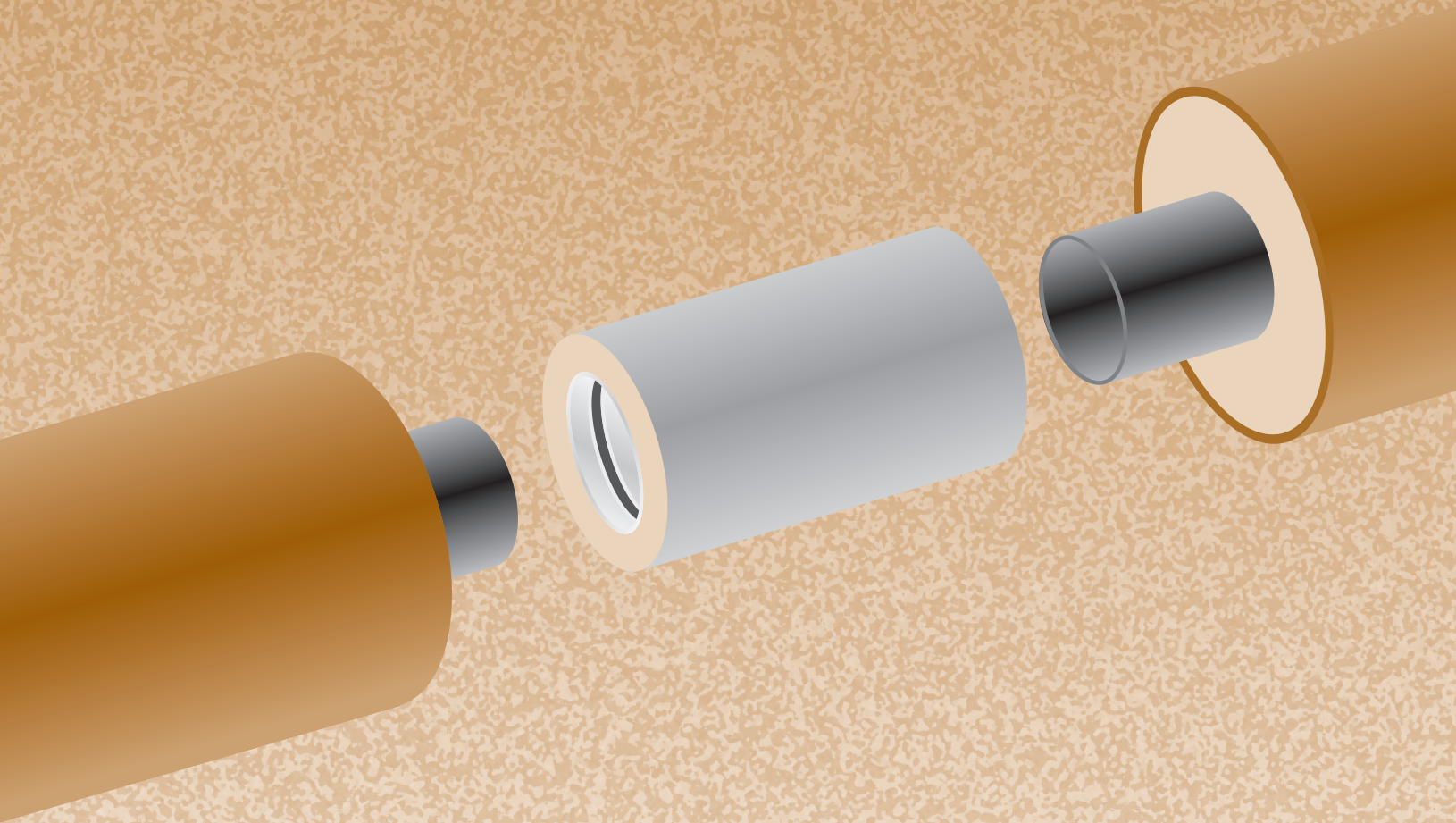


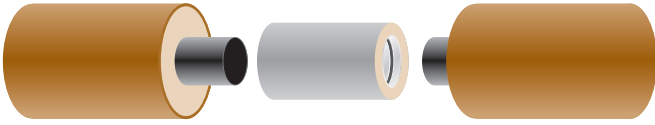
COPPER-GARD

*Preinsulated Copper Pipe
with O-Ring Coupling for Condensate
Chilled and Hot Water*



PERMA-PIPE® / RICWIL®

PREINSULATED PIPING SYSTEM FOR BURIED HOT AND CHILLED WATER, DOMESTIC HOT WATER AND CONDENSATE LINES TO 250°F



PERMA-PIPE®/RICWIL® Copper-Gard pipe is a completely factory-fabricated, insulated and jacketed copper piping system for the underground distribution of HW, CHW, domestic hot water and condensate lines. Copper-Gard consists of a Type "K" or "L" copper tube insulated with rigid, foamed-in-place, polyurethane foam that is encased and sealed in a rugged PVC jacket. Copper-Gard provides the maximum in corrosion resistance and insulation efficiency with a minimum of installation worry — with no field insulating required.

Service Pipe: TYPE "K" or "L" (ASTM B-88) Copper Tubing. Available in sizes 3/4 through 6".

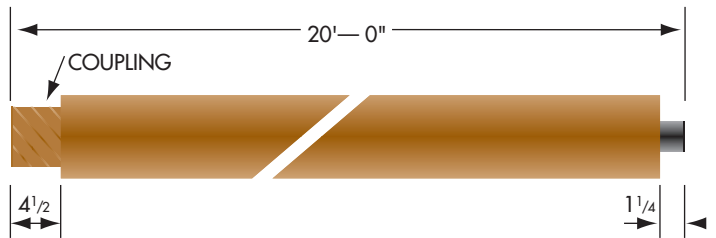
Insulation: Foamed-in-place closed-cell polyurethane foam completely fills the annular space between the pipe and outer jacket and has the lowest thermal conductivity of any commercial insulation. Ninety to 95 percent closed-cell structure provides high resistance to water absorption. Nominal density is 2 LB/FT³, thermal conductivity ("K" factor) is 0.14 BTU in./ (HR) (SQ.FT.) (°F) at 73°F.

PVC Outer Jacket: Type 1, Grade 1 Polyvinyl Chloride provides a tough yet flexible vapor barrier to protect both the insulation and pipe. It is highly corrosion-resistant and is strong enough so the system can withstand H-20 loading with 2 feet of cover with 90 percent backfill compaction.

End Seal: A latex coating is factory applied to both ends of the pipe insulation to ensure moisture protection at all couplings.

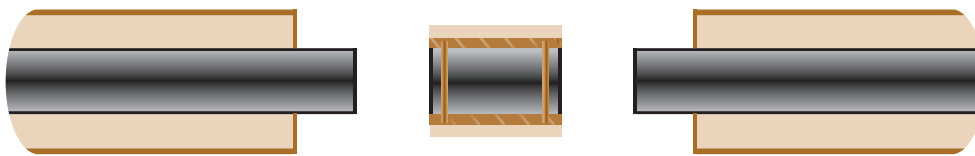
Pressure-Temperature Rating: 150 psig continuous working pressure through a temperature range of +40°F to + 250°F.

Lengths Available: Furnished in 20' lengths with field joint coupling and protective PVC jacket. Units can be field-cut to length with conventional tube cutting tools.



Coupling: Each 20-foot length is furnished with a machined coupling containing two o-ring seals. When two lengths are joined in the coupling the o-rings are compressed to form a watertight connection and also provide separation of pipe ends for expansion and contraction. Expansion loops or expansion joints are not required because each coupling acts as an expansion joint, evenly distributing free expansion and contraction along the entire line.

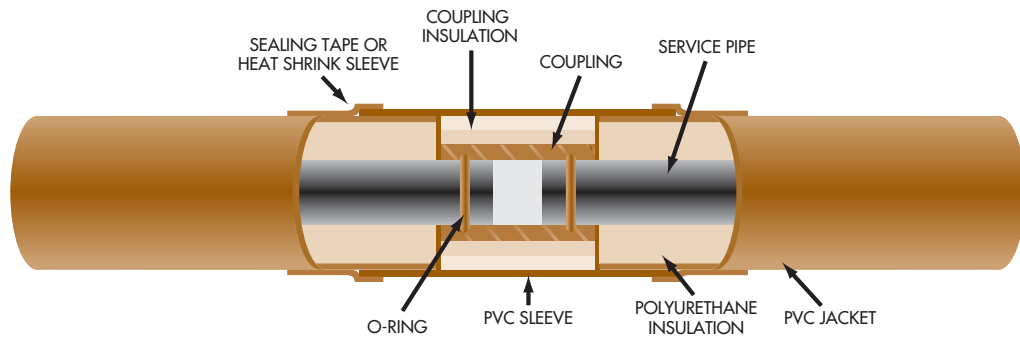
Special Note: It is important that flash tanks or other piping arrangements and accessories be used at high-pressure drip points to prevent the Copper-Gard condensate lines from being subjected to steam. Condensate requires no special accessories when pumped directly from vented condensate receivers.



TYPICAL HEAT GAIN/LOSS DATA:

Nominal Pipe Size (In.)	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"
PVC Jacket Size (Nominal) (In.)	3	3	3	4	4	5	5	6	8
Jacket Wall Thickness (In.)	.060	.060	.060	.060	.060	.080	.080	.070	.080
Insulation Thickness (In.)	1.25	1.13	1.00	1.38	1.13	1.39	1.14	0.94	0.94
*Heat Gain at ΔT 30°F	1.6	1.8	2.3	2.1	2.8	2.9	3.8	5.4	7.4
*Heat Loss at ΔT 150°F	7.9	9.6	11.7	10.7	14.4	14.5	18.9	26.8	36.8
Weight Per 20' Unit (lbs.)	31	35	39	54	67	90	110	159	320

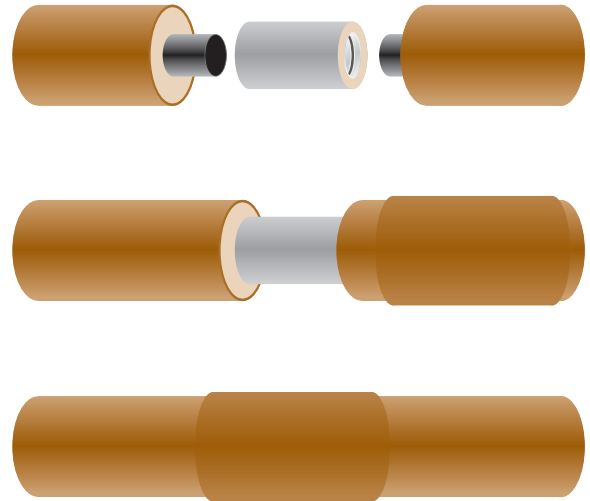
*Above figures are: BTU/HR FT. and based on 4' center line depth; soil conductivity, $k_s = 15$ BTU-IN/HR-FT²°F



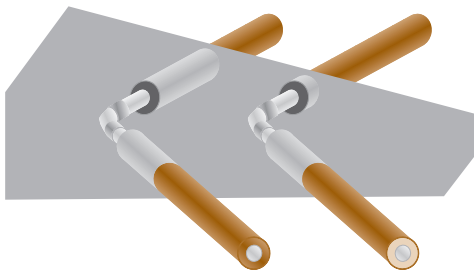
INSTALLATION PROCEDURE

For complete installation instructions see Installation Manual.

1. Exposed pipe ends of each length and the interior of pipe and of couplings are inspected for dirt, nicks or damage. The coupling o-rings and pipe ends are lubricated.
2. The coupling is slipped onto one pipe end until it is snug against the end of the insulation.
3. The adjoining length of pipe is inserted into the coupling, butting the insulation end against the coupling. Service pipes will not touch. Space for expansion or contraction is built in to the system.
4. After final hydrostatic test of the system, the coupling is covered with a pvc sleeve and sealed with sealing tape or an optional heat shrink sleeve for protection against outside elements.



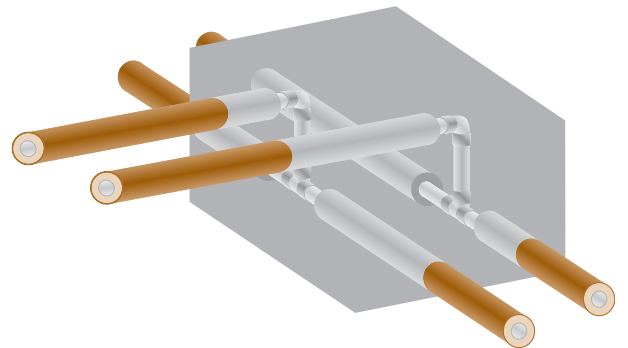
FIELD-INSTALLED FITTINGS



Fittings are incorporated into the system using ASA B16.22 wrought copper fittings. Silver brazing alloys melting at or above 1100°F are recommended. 50-50 tin-lead solder is not acceptable. Where straight lengths are field-cut to length, a minimum exposed pipe end is shown in the installation manual.

Field insulation of fittings is not necessary. Minor heat loss or gain is compensated for by the high efficiency of the insulated system.

Concrete thrust blocks are poured prior to hydrostatic testing. If a hydrostatic test is required prior to pouring thrust blocks, all directional changes must be blocked in an acceptable manner to overcome hydraulic thrust at all straight coupled joints. The system should be re-tested after permanent blocks are poured to demonstrate the blocks' resistance to the thrust. Thrust block design and dimensions vary with local soil conditions and the number of pipes involved. Bearing must



be directly against undisturbed soil and perpendicular to the resultant direction of the thrust.

Final design and dimensions are the responsibility of the Design Engineer who is designing the system and who has knowledge of conditions on site.

Thrust Blocks must be installed at:

- All changes in direction, both vertical and horizontal such as tees and elbows;
- All changes in size;
- All terminal ends such as caps, plugs or closed valves.

Connecting piping in buildings and/or manholes must be anchored at or near the point of connection. It is also recommended that any copper connection to steel piping be made with dielectric unions or flanges to prevent galvanic corrosion of the steel due to the dissimilar metals.

PERMA-PIPE®/RICWIL® COPPER-GARD™ — GUIDE SPECIFICATION

1.0 GENERAL

- 1.1 Underground piping system shall be PERMA-PIPE®/RICWIL® Copper-Gard and shall consist of integral sealed, 20-foot long units of copper tubing insulated with rigid polyurethane foam, which is protected with a PVC outer jacket and factory-applied latex coating on the ends of the insulation.

2.0 MATERIALS

- 2.1 Basic Pipe Units
 - 2.1.1 Pipe shall be Type "K" or "L" (ASTM B-88) copper tubing.
 - 2.1.2 Insulation shall be a rigid, 90 to 95 percent closed-cell polyurethane with 2.0 pound per cubic foot nominal density and thermal conductivity (K) of .14 BTU IN. (HR.) (SQ. FT.) (°F) at 73° F.
 - 2.1.3 Jacket shall be a Type 1 Grade 1 Polyvinyl Chloride (PVC) with a minimum wall thickness of .060 inches.
- 2.2 Joints
 - 2.2.1 Coupling shall be machine-grooved for o-ring seals. Coupling shall be insulated, jacketed and sealed.
 - 2.2.2 All fittings shall be ASA B16.22 wrought copper fittings. Solder joints shall be made with silver brazing alloys melting at above 1100°F. 50-50

tin-lead solders are not acceptable.

3.0 INSTALLATION AND TESTING

- 3.1 All pipes, fittings and o-ring couplings shall be installed in accordance with the manufacturer's recommendations.
- 3.2 All solder joints shall be hydrostatically tested prior to pouring thrust blocks.
- 3.3 Immediately after installation in the ditch, a partial backfill shall be made in the middle of each unit leaving the joints exposed for inspection. After all thrust blocks are poured and cured, a hydrostatic test of ___ psig (or 1½ times operating pressure) shall be required for a period of four hours.
- 3.4 After hydrostatic testing, complete backfilling. Backfill material and compaction shall be in accordance with the manufacturer's recommendations. Do not use tracked or wheeled vehicles for tamping.

PERMA-PIPE® factory-insulated piping systems — leading the industry since 1910 — used for distribution of hot and cold water, steam, condensate, oil and other viscous materials.

PERMA-PIPE representatives are located in all major United States and Canadian cities.

PERMA-PIPE will provide design service and assistance to engineers, owners and contractors. Field instruction for installation personnel will be provided to teach proper handling and to show assembly techniques to supervisory personnel that should be practiced during installation.

PERMA-PIPE warrants its products to be free from defects in material and workmanship. Claims for shortages or apparent defects must be made within 30 days after delivery or before installation, whichever occurs first. With respect to latent defects, PERMA-PIPE will replace or repair any materials which prove defective within a period of one year after shipment provided the materials have been properly installed, operated and have not been damaged by neglect or abuse. PERMA-PIPE shall not be liable for consequential damages. Liability is expressly limited to the replacement or repair of materials. The PERMA-PIPE warranty is exclusive and in lieu of all others. The full terms and conditions of the PERMA-PIPE warranty are set forth on each PERMA-PIPE proposal.

**PRICES WILL BE SUPPLIED UPON REQUEST.
TECHNICAL DETAILS AND PRICES ARE SUBJECT TO
CHANGE WITHOUT NOTICE.**

PERMA-PIPE®

PERMA-PIPE, Inc.

A Subsidiary of MFRI, INC.

7720 North Lehigh Avenue
Niles, Illinois 60714-3491

Phone (847)966-2235

Fax (847)470-1204

<http://www.permapipe.com>