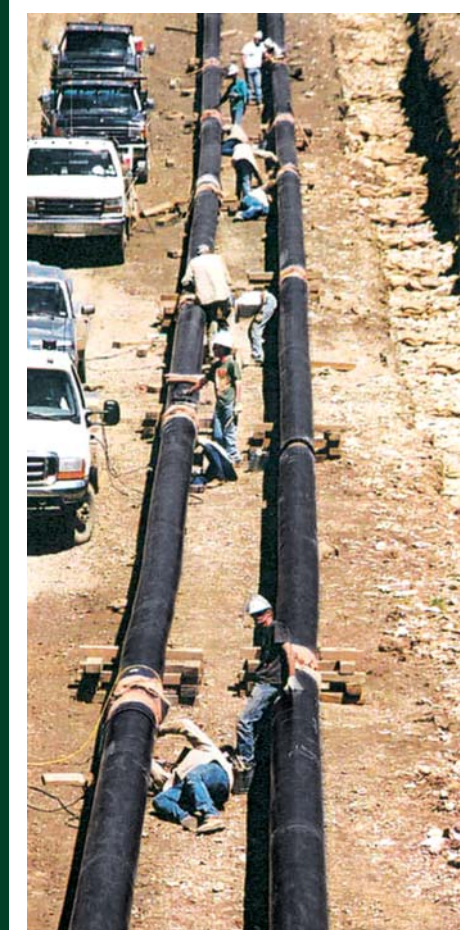


# XTRU-THERM<sup>®</sup>

## Polyethylene Jacketed Polyurethane Insulated Piping System

The most advanced insulated piping system  
for the distribution of hot and cold fluids.



**PERMA-PIPE<sup>®</sup>**

## **XTRU-THERM APPLICATIONS**

**District Heating & Cooling  
Domestic Hot Water Systems  
Condensate Return  
Chilled Water Distribution  
Cryogenic Piping**

**Process Fluid Piping  
Geothermal Collection & Distribution  
Waste Heat Recovery  
Solar Collection & Distribution  
Fuel & Heavy Oil Transport**



**XTRU-THERM insulation prior to the  
application of the seamless HDPE jacket**

### **SEAMLESS EXTRUDED HDPE JACKET**

PERMA-PIPE's extrusion process produces a high strength, seamless, high density polyethylene (HDPE) jacket over the insulation for maximum insulation protection from the environment.

Elbow insulation jackets are constructed of seamless, molded HDPE. Tee insulation jackets are extrusion welded construction.

PERMA-PIPE applies this high strength HDPE jacket to systems having an outside insulation diameter as large as 42 inches. The XTRU-THERM jacket is an excellent choice for both underground and above ground installations.

### **HIGH QUALITY INSULATION**

The XTRU-THERM insulation is a high thermal efficient polyurethane foam insulation, suitable for medium temperature to cryogenic applications.

In contrast to foam injected insulated piping systems, the XTRU-THERM spray process assures void-free insulation. By applying insulation before the jacket is applied, a complete visual inspection of the insulation is performed, assuring void-free insulation and therefore, providing maximum thermal efficiency.

### **SERVICE PIPE MATERIALS FOR ANY APPLICATION**

Steel, stainless steel, copper, ductile iron and plastics can all be supplied with the XTRU-THERM system. These materials can be supplied in a wide range of sizes, with the exact insulation thickness to meet the needs of your application.

### **FULLY ENGINEERED**

The XTRU-THERM piping system is completely engineered by PERMA-PIPE's experienced engineering staff. Straight lengths, elbows, tees, anchors and end seals are all preengineered components.

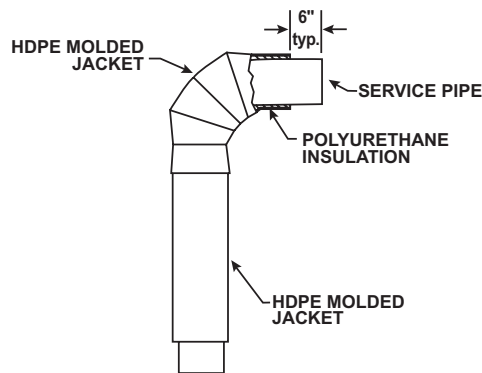
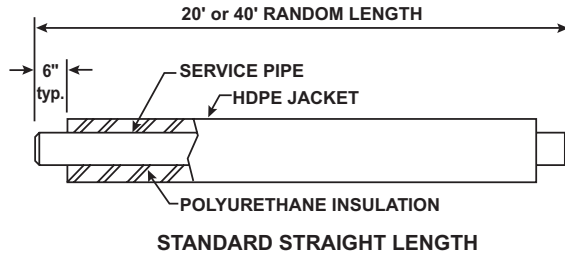
Thermal stress and displacement, heat loss/gain, soil loading calculations and layout drawings can be provided. The XTRU-THERM system is engineered to reduce field costs by providing factory fabricated fittings and components to reduce field connections, as compared to the field kit method.

### **FULLY BONDED SYSTEM**

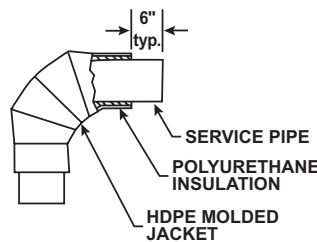
PERMA-PIPE treats the HDPE jacket so that it bonds to the polyurethane foam insulation. This bonding, along with the insulation bond to the service pipe, results in a completely bonded system. All components expand and contract as a system. There are no gaps for water to travel through, which can degrade the insulation or service pipe.

# XTRU-THERM SYSTEM FEATURES

**Seamless Extruded HDPE Jacket**  
**Low Thermal Conductivity Polyurethane Insulation**  
**Insulation Thickness to Meet Application Needs**  
**Fully Bonded Jacket / Insulation / Service Pipe System**  
**Available in a Variety of Service Pipe Materials**  
**Stocked in Common Sizes and Materials for Quick Delivery**  
**Preengineered Components**



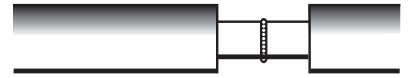
90° ELBOW WITH EXTENDED LEG  
FOR EXPANSION LOOPS



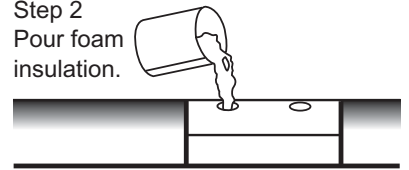
STANDARD 90° ELBOW FOR  
DIRECTION CHANGES

## FIELD JOINT CLOSURE

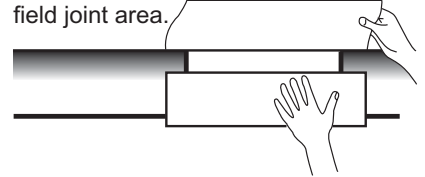
Step 1  
Complete service pipe joint.



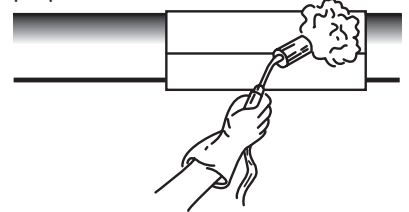
Step 2  
Pour foam insulation.



Step 3  
Wrap shrink sleeve around field joint area.



Step 4  
Shrink sleeve using propane torch.



## RECOMMENDED XTRU-THERM INSULATION THICKNESS

Pipe Size (in)	Minimum Insulation Thickness (in)	
	Chilled Water	Hot Water
1 to 8	1	1
10 to 12	1	1.5
14 to 36	1.5	2

## TYPICAL PROPERTIES OF POLYURETHANE INSULATION AND HDPE JACKET

Polyurethane Insulation		HDPE Jacket Material	
Density	> 2 lb/ft <sup>3</sup>	Density	≥ 58.7 lb/ft <sup>3</sup>
Thermal Conductivity	≤ 0.16 Btu-in/hr-ft <sup>2</sup> -°F	Tensile Strength	≥ 3,200 psi
Compressive Strength	> 30 psi	Elongation	> 500%
Closed Cell Content	≥ 90%	Hardness	> 60 Shore D
		Color	Black (2% carbon black for UV / weather resistance)

## SPECIFICATION GUIDE

### GENERAL

All underground and above ground chilled water, condensate return and hot water lines shall be XTRU-THERM, as manufactured by PERMA-PIPE. All straight sections, fittings, anchors and other accessories shall be factory fabricated, insulated and jacketed. Field insulation of fittings shall not be allowed. The piping system layout shall be analyzed by the piping system manufacturer, to determine the stresses and displacements of the service pipe. The piping system design and manufacture shall be in strict conformance with ASME B31.1, latest edition. Installation of the piping system shall be in accordance with the manufacturer's instructions. Factory trained field technical assistance shall be provided for critical periods of installation, unloading, field joint instruction and testing.

### SERVICE PIPE\*

The service pipe shall be standard weight ASTM A53 Gr. B, ERW carbon steel, except for condensate return lines, which shall be Schedule 80. All joints shall be butt welded for 2.5 inches and larger, and socket welded for 2 inches and smaller. Where possible, straight sections shall be supplied in 40 foot random lengths, with piping exposed at each end for field joint fabrication.

### ACCESSORIES

Elbows, tees, reducers, anchors, field joints and end seals shall be designed and factory fabricated to prevent the ingress of moisture into the system.

### INSULATION

The service pipe insulation shall be polyurethane foam with 2 lb/ft<sup>3</sup> minimum density, 90% minimum closed cell content and maximum initial thermal conductivity of 0.18 Btu-in/hr-ft<sup>2</sup>- F. The insulation shall completely fill the annular space between the service pipe and jacket and shall be bonded to both. Systems using open cell insulation or a nonbonded design shall not be allowed. The insulation shall be provided to the minimum thickness specified below:

Pipe Size (in)	Minimum Insulation Thickness (in)	
	Chilled Water	Hot Water
1 to 8	1	1
10 to 12	1	1.5
14 to 36	1.5	2

### INSULATION JACKET

The outer protective insulation jacket shall be seamless high density polyethylene (HDPE) in accordance with ASTM D3350 minimum cell classification PE 345444 C. PVC or tape materials are not allowed. The minimum thickness of the HDPE jacket shall be as follows:

Jacket OD (in)	Minimum Jacket Thickness (in)
OD ≤ 12	0.080
12 < OD ≤ 24	0.120
OD > 24	0.160

### FITTINGS

All fittings shall be factory prefabricated and pre-insulated. Straight tangent lengths shall be added to all ends, so that all field joints are at straight sections of pipe. Elbow insulation jackets shall be molded HDPE. Tee insulation jackets shall be extrusion welded or butt fusion welded HDPE. Gluing, taping or hot air welding of the insulation jacket shall not be allowed.

### FIELD JOINTS

The service pipe shall be hydrostatically tested to 150 psig or 1.5 times the design pressure whichever is greater. Insulation shall then be poured in place into the field joint area. All field applied insulation shall be placed only in straight sections of pipe. Field insulation of fittings is not acceptable. The installer shall seal the field joint area with a heat shrinkable adhesive backed sleeve. Backfilling shall not begin until the heat shrink sleeve has cooled. All insulation and jacketing materials for the field joint shall be furnished by PERMA-PIPE.

### BACKFILL

A 4 inch layer of sand or fine gravel shall be placed and tamped in the trench, to provide a uniform bedding for the pipe. The entire trench width shall be evenly backfilled with a similar material as the bedding in 6 inch compacted layers to a minimum height of 6 inches above the top of the insulated pipe. The remaining trench shall be evenly and continuously backfilled and compacted in uniform layers with suitable excavated soil.

*\*For alternate service pipe selections, contact PERMA-PIPE for specification details.*

## PERMA-PIPE®

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