

# MULTI-THERM<sup>®</sup> 750 SUPREME

with **ADVANCED  
NANOTECHNOLOGY INSULATION**



The first  
pre-insulated  
piping system  
fortified with  
Aerogel  
nanotechnology  
for the most  
advanced &  
thermally  
efficient  
steam and  
hot water  
transportation  
piping  
system

**A product  
for the 21<sup>st</sup>  
Century**

**PERMA-PIPE**<sup>®</sup>

**ENERGY  
EFFICIENT**

**CORROSION  
RESISTANT**

**EXTENDED  
SERVICE LIFE**

**A REVOLUTIONARY PRODUCT**

After years of research and testing, in cooperation with Aspen Aerogels, PERMA-PIPE is proud to introduce the most revolutionary product entering the steam and hot water piping transportation system market since the introduction of our Multi-Therm system in the early 1990's.

- Better and more efficient insulated system. Aspen Aerogel's Pyrogel® XT has an insulation K factor (2) times better than Mineral wool, (3) times better than calcium silicate and (4) times better than perlite.
- Superior resistance to water. Aerogel is hydrophobic (durably resistant to liquid water). When you make sure that the insulated system is installed dry, you will have years of service from a very reliable steam/hot water system
- Reduced diameter of the outer casing size, making transportation handling and installation easier and less costly than conventional steam piping systems.

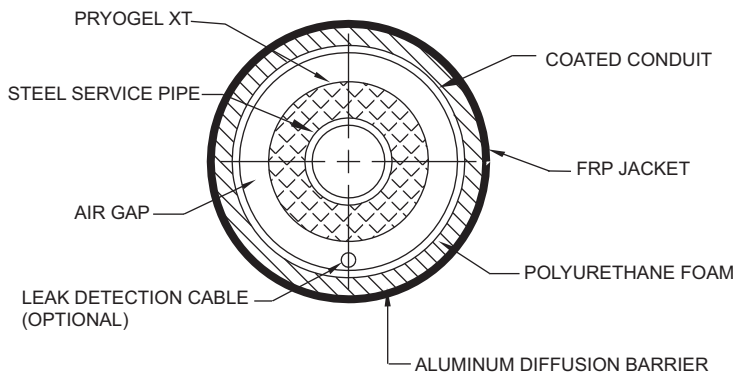
Most importantly, the system comes with PERMA-PIPE's unmatched technical expertise, decades of experience, engineering capabilities and after sales product services.

**NANOTECHNOLOGY FOR IMPROVED  
ENERGY EFFICIENCY**

Multi-Therm 750 Supreme introduces nanotechnology to underground District Heating piping. PERMA-PIPE has combined Aspen Aerogels' Pyrogel® XT insulation on the service pipe with polyurethane foam on the outer casing to achieve the most energy efficient piping system available for high temperature applications. The better insulation value of Pyrogel® XT results in a thinner insulation and smaller outer casing, saving both space and money.

Pyrogel® XT is an aerogel insulation formed from 3% silica solids with 97% air in extremely small nanopores. These characteristics make aerogel the world's lowest density solid and most effective thermal insulator. Its required thickness is typically 50% to 80% less than other high temperature insulation materials. Unlike these other insulations, Pyrogel® XT is hydrophobic and provides excellent resistance to moisture.

**SYSTEM COMPONENTS  
MULTI-THERM 750 SUPREME**



**Recommended insulation thicknesses and heat losses  
for aerogel and mineral wool insulation.**

Note: All conduits are insulated with 1" thick polyurethane foam.

Nominal Pipe Size (in)	Aerogel Thickness (in)	Conduit O.D. (in)	Heat Loss (BTU/FT-HR)	Min Wool Thickness (in)	Conduit O.D. (in)	Heat Loss (BTU/FT-HR)
2	0.59	6 5/8	35.8	1 1/2	8 5/8	38.2
3	0.79	6 5/8	38.3	2	10 3/4	43.2
4	0.79	8 5/8	47.4	2	10 3/4	49.1
6	0.79	10 3/4	62.8	2	12 3/4	63.2
8	0.79	12 3/4	76.7	2	16	77.6
10	1.18	16	75.8	2 1/2	18	79.7
12	1.18	18	86.8	2 1/2	20	90.3
14	1.18	18	91.6	2 1/2	22	100.4
16	1.18	20	102.3	2 1/2	24	111.1
18	1.18	22	112.9	2 1/2	26	121.7
20	1.38	26	116	3	28	119.1
24	1.38	30	135.2	3	32	137.8

Based on 3 foot burial depth, 353° F operating temperature, 40° F ground temperature and soil conductivity of 15 BTU-IN/HR-FT<sup>2</sup>-°F

**ADD INEXPENSIVE PROTECTION FOR YOUR NEW INVESTMENT**

**OPTIONAL GOLD COATING**

PERMA-PIPE recommends the same corrosion protection technology used in the Oil and Gas industry. An additional corrosion coating layer is applied to the outer shot blasted steel casing prior to the application of the polyurethane foam and fiberglass jacket. This coating will protect the steel in the event the outer jacket is ever breached during operation. PERMA-PIPE offers three different coating options: Epoxy, Urethane Elastomer and Zinc. Epoxy is one of the most widely used coatings in a wide variety of industrial applications. Urethane has been used for many years for direct burial in all types of soils. Zinc is an excellent coating for high temperatures and when boiling conditions may be present.

**AND FOR EVEN MORE LONG TERM THERMAL EFFICIENCY WE OFFER**

**OPTIONAL DIFFUSION BARRIER**

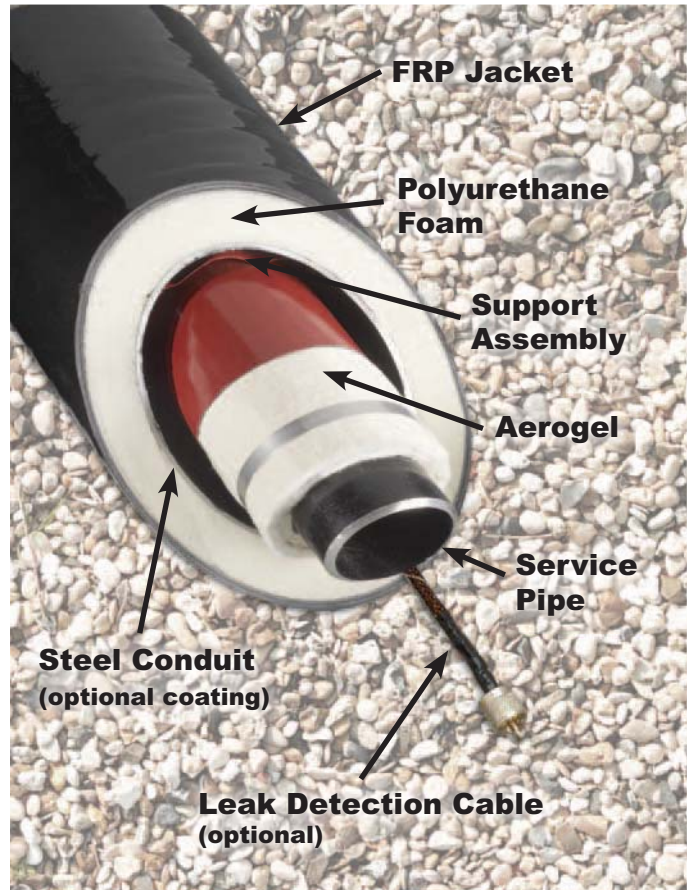
PERMA-PIPE's spray process for applying polyurethane foam on the outer casing results in the most uniform cell structure, and therefore the lowest possible insulating value (K). Now you can maintain this initial K value for the life of the system. PERMA-PIPE's spray process allows us to add an aluminum diffusion barrier on the foam before application of the outer jacket. This metallic barrier prevents diffusion of the blowing agent and results in an improved long term thermal efficiency of over 30%.



**PAL-AT  
LEAK DETECTION/LOCATION SYSTEM**

**MULTI-THERM 750 SUPREME**

Nanotechnology for District Heating



**FOR THE ULTIMATE PROTECTION OF YOUR UNDERGROUND PIPING SYSTEM**

**PAL-AT Leak Detection and Location System**

It is recommended that drainable, dryable systems be installed dry, to achieve a longer period of satisfactory performance and improved system life. MULTI-THERM 750 SUPREME can be provided with advanced electronic monitoring system, PAL-AT, that provides full time surveillance for system integrity. The PAL-AT continuously monitors for the presence of moisture in the conduit and will signal the location of any moisture. This system ensures that the conduit is installed dry and continues to stay dry.



# MULTI-THERM 750 SUPREME SPECIFICATION GUIDE

## GENERAL

All underground distribution lines as shown on the contract drawings shall be MULTI-THERM 750 SUPREME as manufactured by PERMA-PIPE. The system supplier shall have at least ten years' experience fabricating underground high temperature distribution systems. All straight sections, fittings, anchors and other accessories shall be factory prefabricated to job dimensions. Each system layout shall be computer analyzed by the piping system manufacturer to determine stresses and movements of the service pipe. The system design shall be in strict conformance with ANSI B31.1, latest edition, and stamped by a Registered Professional Engineer.

## SERVICE PIPE

Internal piping shall be standard weight carbon steel, except for condensate piping which shall be schedule 80. Pipe shall be butt welded for sizes 2.5 inches and larger and socket welded for 2 inches and below. Where possible, straight sections shall be supplied in 40 foot random lengths with 6 inches of piping exposed at each end for field joint fabrication.

## SUBASSEMBLIES

End seals, gland seals and anchors shall be designed and factory prefabricated to prevent the ingress of moisture into the system. All subassemblies shall be designed to allow for complete draining and drying of the conduit system.

## SERVICE PIPE INSULATION

Service pipe insulation shall be Pyrogel® XT as manufactured by Aspen Aerogels. Pyrogel® XT is a high temperature insulation blanket formed of silica aerogel and reinforced with a non-woven, glass-fiber batting. The insulation shall be held in place by stainless steel bands or staples installed not more than 18 inches apart.

## PIPE SUPPORTS

All pipes within the outer conduit shall be supported to allow for continuous drainage of the conduit in place. Supports shall be the type where Pyrogel® XT insulation thermally isolates the service pipe from the outer conduit. No calcium silicate or other type of insulation shall be allowed. The surface of the support insulation shall be protected by a steel sleeve not less than 12 inches long.

## OUTER CONDUIT

The steel conduit casing shall be smooth wall, welded steel conduit of the thicknesses specified below:

<u>Conduit Size</u>	<u>Conduit Thickness</u>
6"-26"	10 Gauge
28"-36"	6 Gauge
38"-42"	4 Gauge

Changes in casing size, as required at oversized casing to allow for service pipe expansion shall be accomplished by eccentric and/or concentric fittings and shall provide for continuous drainage.

## OUTER CONDUIT COATING

The exterior steel conduit surface shall be abrasive blast-cleaned to a minimum of a near white surface, SSPC-SP10-63T. Profile must be a minimum of 1.5 mil peak to valley range. Any areas of rust bloom or oil shall be wiped and reblasted. After blasting, the steel conduit shall be coated with (choose one option) (Epoxy) (Urethane Elastomer) (Zinc) The epoxy coating shall be a two part coating consisting of a base material and curing agent spray applied to a minimum thickness of 8-12 mils. The coated conduit shall be holiday tested at 1,000 volts to ensure a void free coating. Areas of the conduit not passing the holiday test shall be patch coated and retested. The urethane elastomer coating shall be a

sprayable two component, aromatic, corrosion protection elastomeric coating applied to a minimum thickness of 20 mils. The coated conduit shall be holiday tested at 2,500 volts to ensure a void free coating. Areas of the conduit not passing the holiday test shall be patch coated and retested.

The zinc coating shall be a high solids inorganic zinc rich coating that protects the steel galvanically, thus eliminating sub-film corrosion. The zinc coating shall be a two part sprayable coating consisting of a liquid base portion and a dry powdered metal. The two components when mixed together can be spray applied. The dry film thickness shall be in a range of 2 to 4 mils.

## OUTER CONDUIT INSULATION AND JACKET

Conduit insulation shall be spray applied polyurethane foam having a minimum density of 2 lbs/ft<sup>3</sup> for the straight lengths and fittings. The insulation thickness shall be 1 inch maximum. The polyurethane foam shall have a maximum initial K value of 0.18, minimum density of 2 lbs/ft<sup>3</sup> and a minimum closed cell content of 90%. The outer jacket shall be fiberglass reinforced polymer (FRP) and shall be applied directly onto the urethane foam insulation. No PVC or polyethylene jacket shall be allowed. All straights and fittings shall be factory jacketed.

## DIFFUSION BARRIER

An aluminum diffusion barrier shall be applied on the outside of the insulation before application of the outer jacket. The barrier shall prevent the diffusion of the blowing agent out of the foam to prevent the foam from aging. The diffusion barrier shall be of composite construction with a minimum 12 micron aluminum layer sandwiched between two layers of polyethylene each a minimum of 50 microns thick. The polyethylene layers shall be corona treated to guarantee bonding between the foam insulation and the outer jacket.

# PERMA-PIPE®

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