

MULTI-THERM 500

Fiberglass Jacketed Steel Conduit System

The only prefabricated, preinsulated piping system combining the strength of steel and the corrosion resistance of fiberglass, for the superior distribution of steam and hot water up to 500° F.



PERMA-PIPE®

MULTI-THERM 500 SYSTEM FEATURES

Industrial & Municipal Steam Transmission
Geothermal Collection & Distribution
District Heating & Cooling
Cogeneration
Process Fluid Transport

Transportation of Fuel & Heavy Oil
Solar Collection & Distribution

Fiberglass Jacketed Steel Conduit

MULTI-THERM 500 is the only preinsulated piping system that combines both the strength of steel and the corrosion resistance of fiberglass. Using the heat resistance of mineral wool insulation along with the thermal efficiency of polyurethane foam insulation, it is also the most energy efficient system available. This innovative piping system unites these materials in a unique combination to satisfy the most demanding criteria for underground heat distribution systems.

The steel service pipe is insulated with mineral wool insulation (optional cellular glass) and contained within a drainable, dryable, pressure testable steel conduit. This combination alone would be an excellent piping system, but we also insulate the conduit with polyurethane foam and jacket it with fiberglass. This union is formed to complete the highest quality, waterproof, corrosion resistant, high strength, thermally efficient system available.

Service Pipe Insulation

MULTI-THERM 500's preformed high temperature mineral wool insulation is rated for continuous service up to 1200°F. The mineral wool insulation has superior thermal conductivity, low moisture absorption and good physical properties. When specified, cellular glass insulation can be supplied.

Steel Conduit

Smoothwall, minimum 10 gauge steel conduit, is used for high strength and system integrity. It can withstand H-20 (highway) loads at minimal burial depths.

Polyurethane Foam Insulation

MULTI-THERM 500 is designed to maintain a conduit temperature below 250°F. Therefore, the conduit can be safely insulated with polyurethane foam, the most thermally efficient of all pipe



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insulations. Using polyurethane foam on the outside allows the service pipe insulation on the inside to be reduced in thickness, while still maintaining a low heat loss. Reducing the service pipe insulation allows the conduit size to be reduced, which saves on the piping system price and installation costs.

Fiberglass Jacket

PERMA-PIPE's multidirectional filament winding process produces a high strength fiberglass jacket over the outer foam insulation, to ensure maximum protection from the environment. This jacket provides complete protection to the insulation and conduit and is far superior to even the best conduit coatings. The need for cathodic protection is eliminated, which saves additional material, installation and maintenance costs.

Options

- Leak Detection/Location
- Electric or Steam Heat Traced
- Cellular Glass service pipe insulation
- Cathodic Protection - not required

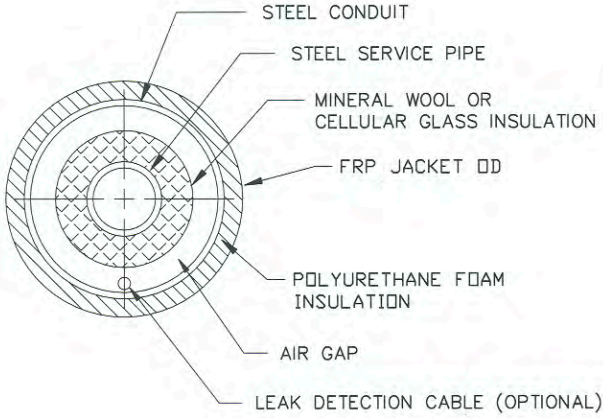


**PAL-AT
Leak Detection/Location System**

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 500 can be provided with the 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.

**SYSTEM COMPONENTS
MULTI-THERM 500**

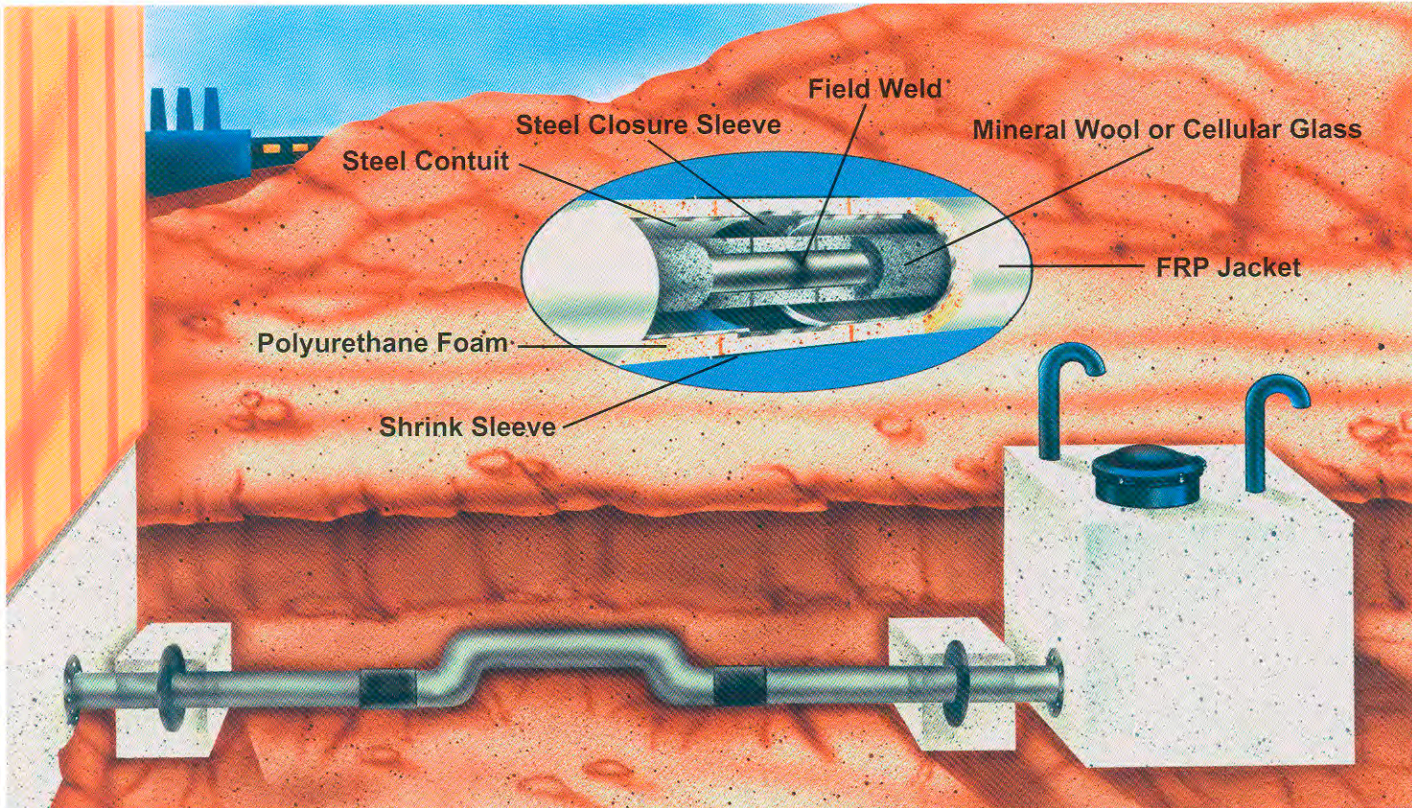


Recommended insulation thicknesses and heat losses for mineral wool and cellular glass insulation.

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

Nominal Pipe Size (In)	Mineral Wool Thickness (In)	Conduit O.D. (In)	Heat Loss (BTU/FT-HR)	Cellular Glass Thickness (In)	Conduit O.D. (In)	Heat Loss (BTU/FT-HR)
2	1	6 ⁵ / ₈	41	1½	8 ⁵ / ₈	49
3	1½	10¾	50	1½	10¾	62
4	1½	12¾	56	2	12¾	67
6	1½	12¾	71	2	14	81
8	2	16	77	2½	18	90
10	2	18	88	2½	20	104
12	2	20	99	2½	22	116
14	2	22	109	3	24	118
16	2	24	120	3	26	129
18	2½	26	119	3	28	140
20	2½	28	129	3	30	151
24	2½	32	148	3½	34	162

Based on 3 foot burial depth, 353°F operating temperature, 40°F ground temperature and soil conductivity of 15 BTU-IN/HR-F²-°F.



MULTI-THERM 500's field joints are made only at straight sections. The steel service pipe is welded and then insulated. Next, the steel conduit closure sleeve is welded in place and insulated with polyurethane foam. The entire joint is then sealed with a heat shrinkable sleeve.

GENERAL

All underground distribution lines, as shown on the contract drawings, shall be MULTI-THERM 500, as manufactured by PERMA-PIPE. The system supplier shall have at least five years experience fabricating systems of the composition defined herein. 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 movement 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. Factory trained field technical assistance shall be provided for the critical periods of the installation; i.e., unloading, field joint instruction and testing.

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 mineral wool. Split insulation shall be held in place by stainless steel bands installed not more than 18 inches apart. The insulation shall have passed the boiling test requirements specified in the Federal Agency Guidelines. The insulation shall be applied to a thickness of _____ inches.

OUTER CONDUIT

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

Conduit Size	Conduit Thickness
6" - 26"	10 Gauge
28" - 36"	6 Gauge
38" - 42"	4 Gauge

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

PIPE SUPPORTS

All pipes within the outer casing shall be properly supported. These supports shall be designed to allow for continuous airflow and drainage of the conduit in place. The straight supports shall be designed to occupy not more than 10% of the annular air space. Supports shall be of the type where insulation thermally isolates the carrier pipe from the outer conduit. The surface of the insulation shall be protected at the support by a sleeve not less than 12 inches long, fitted with traverse and, where required, rotational arresters.

OUTER CONDUIT INSULATION AND JACKET

Conduit insulation shall be spray applied polyurethane foam, having a nominal 2 lb/ft³ density for all straight lengths and fittings. The insulation thickness shall be 1 inch maximum. Quality assurance procedures for the insulation shall include either a visual check prior to jacketing, an infrared inspection or an x-ray inspection of the entire length to insure there are no insulation voids. The urethane foam shall have the minimum characteristics of 0.16 K-factor, density of 2 lb/ft³ and a closed cell content of 90 to 95%.

The outer jacket shall be fiberglass (FRP) and shall be applied directly onto the urethane foam insulation. No PVC or polyethylene jackets shall be allowed. All straights and fittings shall be factory jacketed.

INSTALLATION

The installing contractor shall handle the system in accordance with the directions furnished by the manufacturer and as approved by the architect and engineer. The casing shall be air tested at 15 psig and the service piping shall be hydrostatically tested to 150 psig or 1½ times the operating pressure, or as specified in the contract documents. The test pressure shall be held for not less than one hour.

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 system. The entire trench 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 piping system. The remaining trench shall be evenly and continuously backfilled in uniform layers with suitable excavated soil.

PERMA-PIPE®

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