

ESCON-A[®] FERRO-SHIELD[™]

Class A Steel Conduit System

The premier prefabricated, preinsulated piping system for the distribution of low to high pressure steam, high temperature hot water and general fluid transportation systems. Featuring a urethane elastomer outer coating.



ESCON-A / FERRO-SHIELD APPLICATIONS

Industrial & Municipal Steam Transmission
Geothermal Collection & Distribution
District Heating
Cogeneration
Process Fluid Transport
Transportation of Fuel & Heavy Oil
Solar Collection & Distribution

ESCON-A/FERRO-SHIELD

Why?

There is not a more cost effective means of conveying fluids and gases below grade, at temperatures above 250°F, than a DDT (Drainable, Dryable and Testable) air gap piping system.

Why are these features important to an engineer or system owner?

A system that is drainable speeds the recovery of fluids in the event of moisture entering the system during installation or in the event of a leak. The dryable feature allows for the entire system, including the insulation, to be dried in place in the trench. The testable feature insures that the entire system is airtight right from the start. This testable feature applies to all fittings, anchors, end terminations and field joints. No other system supplied for fluids above 250°F can provide this type of integrity.

What else is important in a DDT system?

The thermal movement of the service pipe is critical. The system has to be designed so that no undue stresses are caused to the service pipe. The design of a DDT system allows the service pipe to expand within the outer conduit, thus eliminating stress to the outer conduit. There is no damage to the service pipe insulation. This can not be said for non-air gap systems.

The DDT system outer coating is another important area in the design of a DDT system. The conduit coating should be designed to operate effectively in wet environments. The coating should provide the same protection at the fitting assemblies as for the straight sections of the piping system. Any coating that can not handle the temperature in wet environments should be avoided. No cathodic protection system can be designed to protect a bad coating choice. PERMA-PIPE®'s elastomer coating provides the protection needed to perform in these critical environments.

SYSTEM FEATURES

Urethane Elastomer Coating

This state-of-the-art coating provides an outstanding corrosion resistant covering for the underground steel conduit system. (Contact PERMA-PIPE for the appropriate coating system for aboveground applications.) The coating is applied hot over the shot-blasted steel casing at PERMA-PIPE's factory to meet rigid quality standards.

Fully Insulated Pipe Supports

The piping system is supported utilizing insulated supports at 10 foot intervals that maintain and guide the service pipe in the center of the conduit casing. PERMA-PIPE's support design permits full insulation of the service pipe for optimum thermal efficiency, while maximizing drainability and dryability of the piping system. The support design also permits the installation of a cable type leak detection/location system.

Electric or Steam Heat Trace (Optional)

Cathodic Protection System (Optional)

Dryable Insulation

The service pipe is insulated with your choice of today's thermally efficient dryable insulations.

Computer Aided Engineering and Design

Over forty years of experience has made PERMA-PIPE the leader in the design of prefabricated systems. PERMA-PIPE's proprietary CAD programs encompass the major design parameters of the piping systems, including service pipe stress, heat transfer and soil loading. Be assured that the engineering behind your distribution system is state-of-the-art. **Urethane Elastomer Coating**

PERMA-PIPE

INSULATED PIPING SYSTEMS



PAL-AT® LEAK DETECTION/LOCATION SYSTEM

ESCON-A/FERRO-SHIELD can be provided with the advanced electronic monitoring system, PAL-AT, that provides full time system surveillance for system integrity.

The PAL-AT continuously monitors for the presence of moisture in the conduit and will signal the location of the moisture.

PAL-AT is a registered trademark of PermAlert, Inc., Niles IL

TYPICAL HEAT LOSSES FOR ESCON-A/FERRO-SHIELD			
NOMINAL PIPE SIZE (IN)	TYPICAL INSULATION THICKNESS (IN)	TYPICAL CONDUIT O.D. (IN)	HEAT LOSS (BTU/FT-HR)
1	1½	6⅝	34
1½	1½	8⅝	43
2	1½	8⅝	48
2½	2	10¾	44
3	2	10¾	53
4	2	10¾	63
5	2	12¾	74
6	2	14	84
8	2½	16	84
10	2½	18	102
12	2½	20	115
14	3	24	114
16	3	26	126
18	3	28	139
20	3½	30	135
24	3½	34	157

Based on 3 foot burial depth, 353°F operating temperature, 40°F ground temperature, soil conductivity of 15 Btu-in/hr-ft²-°F and mineral wool insulation.

MINERAL WOOL AND CAL-SIL PHYSICAL VALUES				
PROPERTY	MINERAL WOOL		CALCIUM SILICATE	
	Value	ASTM Test	Value	ASTM Test
"K" factor at 200°F	.33 $\frac{\text{Btu-in}}{\text{hr-ft}^2\text{-}^\circ\text{F}}$	C-335	.42 $\frac{\text{Btu-in}}{\text{hr-ft}^2\text{-}^\circ\text{F}}$	C-335
Maxium Service Temperature	1200°F		1200°F	
Compressive Strength	3.1 psi at 10% of deflection	C-165	120 psi at 5% of deflection	C-165
Linear Shrinkage at 24-hr soak and 1200°F	None	C-356	1%	C-356
Density (Nominal)	10 lb/ft³	C-302	14 lb/ft³	C-302

ESCON-A / FERRO-SHIELD

SPECIFICATION GUIDE

GENERAL

All underground fluid, steam, hot water, oil and condensate lines, as indicated on contract drawings, shall be drainable and dryable ESCON-A/FERRO-SHIELD type as manufactured by PERMA-PIPE. All straight sections, fittings, anchors and other accessories shall be factory prefabricated to job dimensions and designed to minimize the number of field welds. Each system layout shall be computer analyzed by the piping system manufacturer to determine stresses on the service pipe and anticipated thermal movement of the service pipe. The system design shall be in strict conformance with ANSI B31.1, latest edition. Factory trained field technical assistance shall be provided for the critical periods of installation, i.e., unloading, field joint instruction and testing.

SERVICE PIPE

Internal pipe shall be standard weight carbon steel, except for condensate piping, which shall be Schedule 80 carbon steel. All joints shall be butt-welded for sizes 2.5 inches and greater 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. Socket weld couplings shall be furnished by the installing contractor.

SUB-ASSEMBLIES

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

INSULATION

Service pipe insulation shall be customer choice. Split insulation shall be held in place by stainless steel bands installed on 18 inch centers. The insulation shall have passed the most recent boiling test and other 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 thickness 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 required to allow for service pipe expansion, shall be accomplished by oversized casing and by eccentric and/or concentric fittings to provide for continuous drainage.

CONDUIT COATING

The conduit system sections shall be covered with urethane elastomer coating. Quality control at the manufacturing facility shall ensure that all coatings are able to pass a 5,000 volt holiday test. The coating shall be spray applied onto a shot-blasted steel conduit to a thickness of 30 mils. All field joints shall be covered with a heat shrinkable, adhesive backed sleeve. The factory applied coating on the conduit fittings shall be spray applied urethane to the same requirements as the straights.

PIPE SUPPORTS

All pipes within the outer casing shall be supported at not more than 10 foot

intervals. 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 calcium silicate pipe insulation thermally and electrically isolates the service pipe from the outer conduit. Supports which directly contact both the service pipe and the outer casing shall not be allowed. The surface of the insulation shall be protected at the support by a metal sleeve not less than 12 inches long, fitted with traverse and where required, rotational arresters.

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 at 150 psig, or 1.5 times the operating pressure or as specified in the contract documents. The test pressure shall be held for not less than one hour. The contractor shall holiday test the entire conduit system at 5,000 volts. All holidays shall be repaired and tested.

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 conduit. 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®

PERMA-PIPE, Inc.

A Subsidiary of MFRI, Inc.
7720 North Lehigh Avenue
Niles, Illinois 60714-3491
Phone (847) 966-2235
Fax (847) 470-1204
www.permapipe.com

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