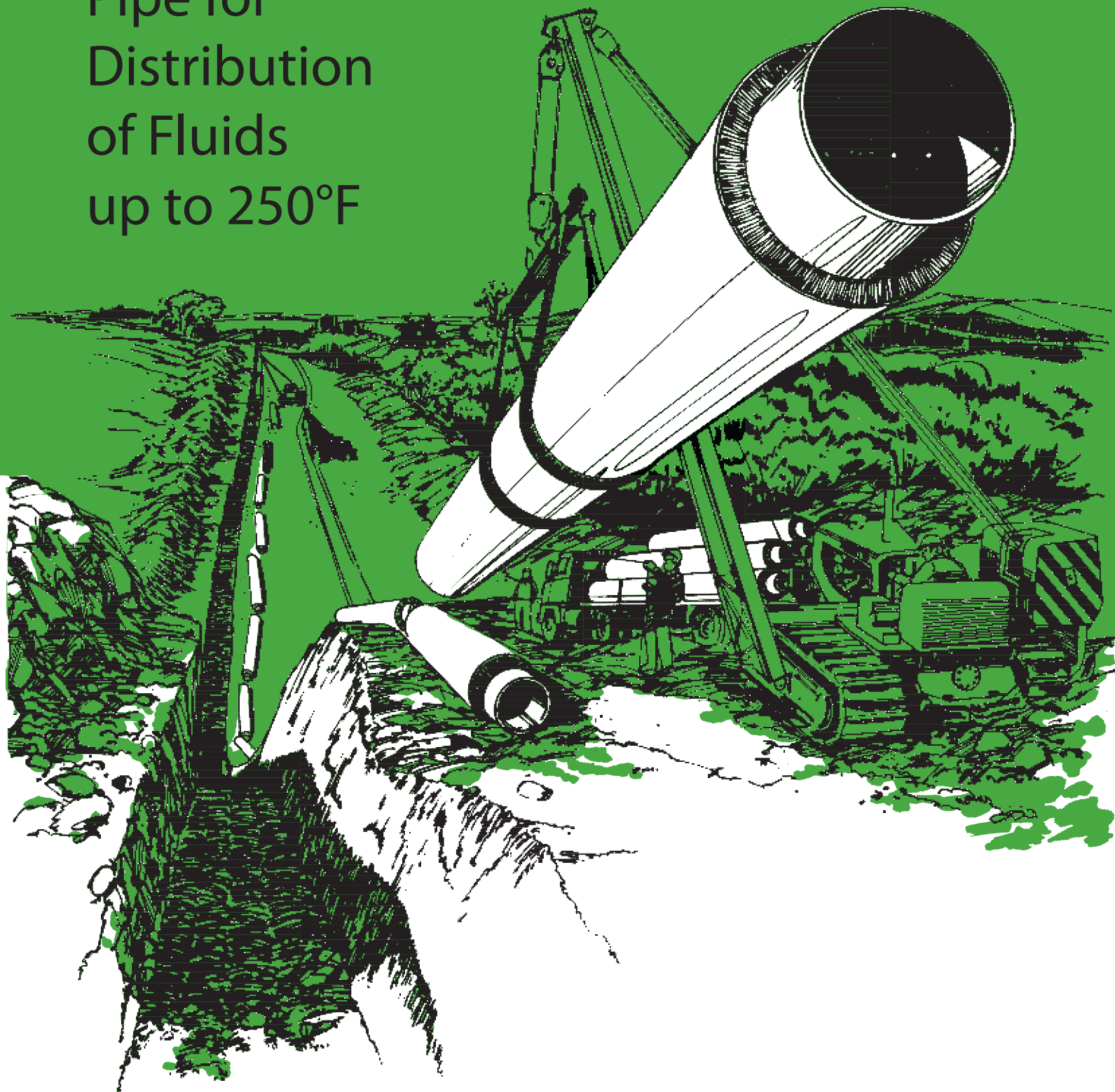


TERRA-GARD™

Preinsulated
Pipe for
Distribution
of Fluids
up to 250°F



PERMA-PIPE®/RICWIL®

Product Description



Service Pipe

Terra-Gard™ can be furnished with any service pipe to customers' specifications. Choose from steel, copper, stainless steel, aluminum, brass, polyvinyl chloride, fiberglass reinforced polyester and others. Consult PERMA-PIPE® engineering for service pipe pressure and temperature limitations.

Insulation

Insulation is polyurethane foamed into place, completely filling the annular space between the service pipe and jacket. Polyurethane is a closed cell insulation, stable within its stated temperature limits (-40°F to 250°F) Polyurethane is the most efficient insulation material up to 250°F.

Accessories

Elbows, tees, anchors and other accessories on Terra-Gard systems can be supplied factory prefabricated to suit job-site requirements. The installing contractor will be required to pour concrete anchor blocks around all anchor plates.

Jacket

Standard Terra-Gard jacket material is extruded white PVC (polyvinyl chloride) ASTM, D1784 class 12454-B. Polyethylene black industrial grade extruded high density jacket is also available. Jacket serves as a tough moisture resistant vapor barrier and when filled with urethane, will meet the H-20 highway loading with 24 inches of compacted backfill over the top of the jacket.

Standard PVC Jacket Wall Thickness (Nominal)	
Diameter	Wall
3" to 3½"	.060"
4"	.070"
4½"	.085"
5"	.085"
6"	.070"
8"	.080"
10"	.100"
12"	.120"
14"	.140"
16"	.160"
18"	.180"

Large diameters available with polyethylene and fiberglass reinforced polyester jacket materials.

BENEFITS

PERMA-PIPE's staff has devoted its activities solely to the design, manufacture and installation instructions of preinsulated, prefabricated piping systems for many years. Terra-Gard is an inexpensive underground distribution system that will provide many years of efficient service.

Terra-Gard - Single Source for Entire System

Give PERMA-PIPE one purchase order for your Terra-Gard system and receive a complete, engineered preinsulated system, including service pipe, thermal insulation, protective jacketing, fittings and joining materials to meet customers' requirements. Included with our total package are engineered installation and the services of a factory-trained field instructor.

Design Flexibility

Terra-Gard is not a stock item, but rather a combination of available material, fabricated to your specific design requirements.

Faster Installation

One delivery brings all piping materials preinsulated and prefabricated, resulting in fewer handling and storage problems. All units are part-numbered in accordance with installation drawing for easy identification, which results in a fast, systematic installation of your system.

Reduced Field Cost

Terra-Gard system is prefabricated to actual job requirements and dimensions so there is no material wastage. Prefabrication eliminates field insulating and jacketing.

Quality Controlled

PERMA-PIPE®/RICWIL® systems must pass a rigid inspection at our plant, Pre-engineered and factory fabricated with modern techniques by well-trained fabricators are the customer's assurance of quality. Terra-Gard systems arrive at the job site with all insulation protected from the elements. Insulation remains dry and efficient throughout shipping, storage, and installation.

Maximum System Efficiency

All Terra-Gard jackets provide a positive moisture barrier. Polyurethane foam insulation with its low K factor along with the jacket material assures minimal system heat loss or gain.

Physical Characteristics

Service Pipe

The service pipe is furnished to customer's specifications.

Insulation

Operating Temperature: 40° F. to +250° F
In-Place Density: 2.0 lbs/ft³

Compressive Strength: 40 psi (parallel to rise)
Closed Cell Content: ≥ 90%

K Factor (initial): (BTU-in/hr-ft²-°F) .18

Jacket Materials

Size Available
Color
Specific Gravity @ 73.4° F.

(ASTM D-792)
Tensile Strength @ 73° F.
(ASTM D-638)

Flexural Strength
(ASTM D-790)
Coefficient Thermal Expansion
(ASTM D-696)

Highway Loading (H-20)

Thermal Conductivity
(ASTM D-177)
BTU.- hr. /ft² /°F/in.

PVC

3" thru 24"
White

1.38
7,000 psi

13,000 psi
3.0 x10⁻⁵ in/in/°F

32,000# Axle
with 24" cover

1.2

Polyethylene

4" thru 36"
Black

.94
2,600 psi

3,000 psi
1.0 x10⁻⁴ in/in/°F

32,000# Axle
with 24" cover

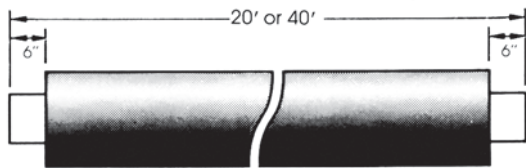
2.8

Typical Heat Gain/Loss Data

Nominal Pipe Size (in.)	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"	10"	12"	14"	16"
Nominal Jacket Size (in.)	3"	3"	4"	4"	5"	5"	6"	8"	8"	10"	12"	14"	16"	18"	20"
Jacket Wall (in.)	.06"	.06"	.07"	.07"	.085"	.085"	.07"	.08"	.08"	.10"	.12"	.14"	.16"	.18"	.20"
Insulation Thickness (in.)	1.16"	1.03"	1.35"	1.23"	1.5"	1.26"	1.25"	1.75"	1.22"	1.69"	1.69"	1.64"	1.62"	2.0"	2.0"
Heat Gain at ΔT30F	2.3	2.8	2.8	3.2	3.3	4.2	4.8	4.6	6.9	6.2	7.6	9.3	10.8	9.9	11.0
Heat Loss at ΔT150 F	11.6	14.1	13.9	16.0	16.3	20.8	24.0	22.8	34.6	31.1	38.1	46.5	53.9	49.4	55.2

Above heat gains/losses are BTU/Lin, Ft./Hr.

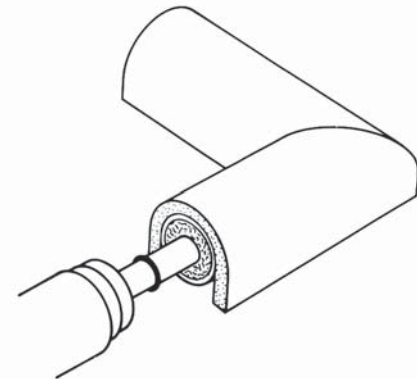
Unit Description



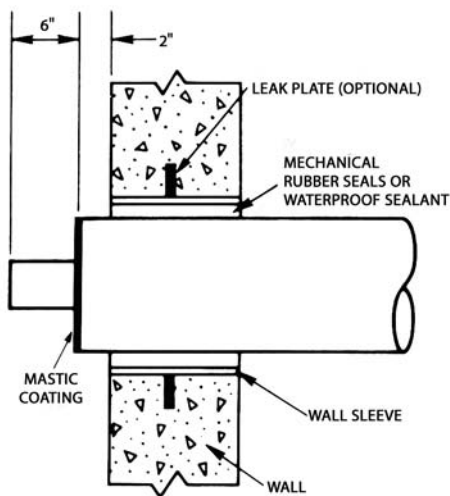
Terra-Gard straight lengths are furnished in either nominal 20-foot single random or 40-foot double random lengths (40' not available in pipe sizes below 4"), Six inches (6") of exposed pipe facilitate field joining without damaging urethane insulation. When necessary field alterations are easily accomplished.

Expansion/Contraction

Allowance for pipe expansion and/or contraction is accommodated at elbows using field installed flexible expansion cushions. All accessories, such as elbows, expansion loops and anchor units, are supplied preinsulated and prefabricated and are part-numbered in accordance with installation drawings to expedite system installation.



Building or Manhole Entry



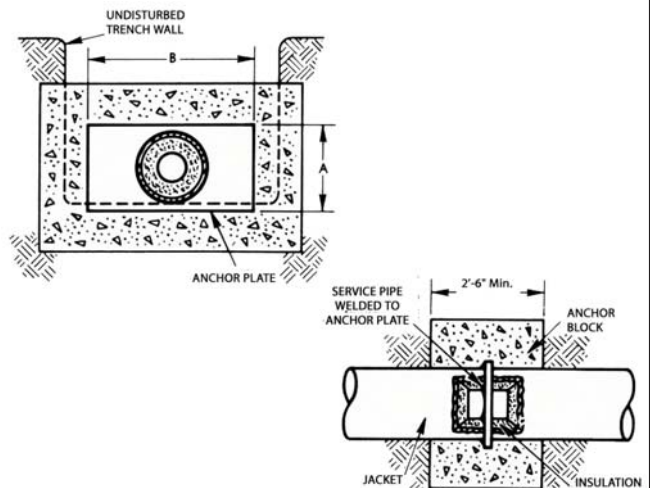
It is recommended that all building or manhole entries be sleeved and that the annular space between the jacket and sleeve be sealed with either a mechanical rubber seal or a waterproof sealant. Wall sleeve and mechanical rubber seals are available from PERMA-PIPE. All terminal units must have ends sealed against moisture intrusion. PERMA-PIPE factory seals all terminal ends.

Anchors

An anchor controls pipe movement caused by expansion. The concrete block (not furnished by PERMA-PIPE) must be large enough for firm anchorage into undisturbed trench walls and/or undisturbed trench bottom-minimum 9" beyond top and bottom of anchor plate. The installing contractor must pour a concrete anchor block around each anchor plate.

Schedule of Anchor Plate Size

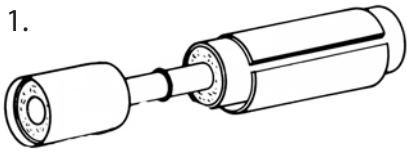
Jacket Size	3"	3½"	4"	4½"	5"	6"	8"	10"	12"	14"	16"	18"
A	4"	5"	5"	6"	6"	7"	9"	11"	13"	15"	17"	19"
B	10"	11"	11"	12"	12"	13"	15"	17"	19"	21"	23"	25"



Easy Field Installation

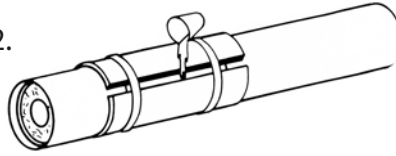
Terra-Gard Unit Joining Method

1.



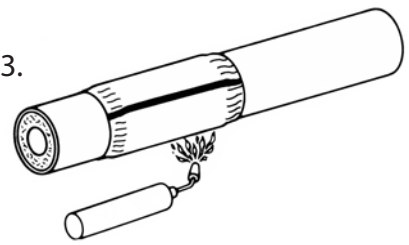
Split PVC jacket sleeve must be slid over the end of unit prior to connection of service pipe. Connect service pipe and hydrostatically test pipe as specified.

2.



Center split jacket over joint area and hold in position with fiberglass tape. Split located at 1 to 2 o'clock position. After mixing A & B components, pour urethane foam into cavity.

3.



Trim cured urethane with jacket. Center heat actuated shrink blanket over split jacket and position lap of shrink blanket over split in jacket to provide double layer protection. Using a soft orange flame from a propane torch, work from center toward one end moving rapidly back and forth and around shrink blanket. All air pockets must be worked out from under the shrink blanket.

Terra-Gard Guide Specifications

ITEM	TERRA-GARD
General:	Underground piping system shall be PERMA-PIPE/RICWIL Terra-Gard and shall consist of 20 or 40 foot units insulated with rigid polyurethane foam which is protected with polyvinyl chloride outer jacket.
Material:	
Pipe:	Pipe shall be as specified.
Insulation:	Insulation shall be rigid 90% minimum closed cell polyurethane with 2.0 lbs/ft ³ minimum density and a coefficient of thermal conductivity (k) with .18 BTU-hr. /ft ² /°F/in at 73°F.
Jacket:	Jacket shall be ASTM -1784 polyvinyl chloride with a minimum wall thickness of .060 inches.
Fittings:	As specified. All fittings shall be factory prefabricated and preinsulated.
Installation:	<ol style="list-style-type: none"> 1. All pipes and accessories shall be in accordance with the manufacturers recommendations. The services of a factory-trained field service instructor shall be required during all critical stages of installation and testing. 2. Immediately after installation in the ditch, a partial backfill shall be made in the middle of each unit leaving joints exposed for inspection. 3. After all anchor blocks are poured and cured, a hydrostatic test of _____ psig (or 1½ times operating pressure) shall be required for a period of four (4) hours. 4. After hydrostatic test, a final backfill of selected earth shall be hand placed and hand tamped in 4 inch layers to 12 inches minimum over the top of the jacket. Remainder of the backfill shall be free of large boulders, rocks over 6 inches in diameter, frozen earth or foreign matter. The backfill operation can now be completed by any convenient means. Do not use tracked or wheeled vehicles for tamping.

TERRA-GARD™

PERMA-PIPE/RICWIL 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/RICWIL Representatives are located in all major United States and Canadian cities.

PERMA-PIPE/RICWIL 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 supervisory personnel assembly techniques that should be practiced during installation.

PERMA-PIPE/RICWIL 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/RICWIL 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/RICWIL shall not be liable for consequential damages and liability is expressly limited to the replacement or repair of materials. The PERMA-PIPE/RICWIL warranty is exclusive and in lieu of all others.** The full terms and conditions of the PERMA-PIPE/RICWIL warranty are set forth on each PERMA-PIPE/RICWIL proposal.

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

PERMA-PIPE®

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