PERFORMANCE PIPE
A DIVISION OF CHEVRON PHILLIPS CHEMICAL COMPANY LP

DRISCOPIPE® 8100 SERIES POLYETHYLENE PIPING PRODUCED FROM PE 4710-PE100 MATERIAL

Bulletin: PP 302

DRISCOPIPE® 8100 Piping Products for
LPG and Propane Gas Distribution
Natural Gas Distribution
Yard Gas

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Performance Pipe

PERFORMANCE PIPE is the successor to Plexco[1] and Driscopipe[2]. On July 1, 2000, Chevron Chemical Company and Phillips Chemical Company were joined to form Chevron Phillips Chemical Company LP. Performance Pipe, a division of Chevron Phillips Chemical Company LP, succeeds Plexco and Driscopipe as North America's largest producer of polyethylene piping products for gas, industrial, municipal, mining, oilfield, and utility applications.

Performance Pipe offers more than forty years of polyethylene pipe manufacturing experience, nine manufacturing facilities certified to ISO 9001-2000 in eight states, and one manufacturing facility in Mexico.

The unmatched quality and performance of Performance Pipe polyethylene piping products is enhanced and strengthened with over four decades of quality polyolefin plastic resin production from Chevron Phillips Chemical Company.

A Commitment to Quality and Performance

DRISCOPIPE® 8100

Performance Pipe DRISCOPIPE® 8100 gas piping is a product of choice for premium high-density polyethylene gas piping systems. DRISCOPIPE® 8100 gas pipe is produced from exceptional high performance Marlex® H516, a bimodal material that meets all the requirements for PPI listing as a PE4710-PE100 product. The pipe is manufactured in accordance with the latest published editions of ASTM D 2513 and meets all of the applicable requirements of Plastic Pipe Institute's PPI TR-4. DRISCOPIPE® 8100 is available in 1/2" through 24" (16 mm through 630 mm) outside diameter controlled polyethylene pipe and tubing, molded butt, and saddle fusion fittings for domestic and international gas applications. The pipe is unique in that it is a co-extruded product having an integral yellow shell material on the outer surface and black material comprising the remainder of the pipe. Both materials are the same Marlex® H516 high performance resin. The yellow shell provides the following additional benefits:

- Yellow shell conforms to APWA Uniform Color Code to designate natural gas.
- Yellow shell helps reflect solar heat, a feature that helps the pipe stay cooler than other black HDPE gas pipe and, therefore, enables it to retain its higher strength ambient temperature properties.
- Yellow shell provides improved high visibility fusions. The black on yellow fusion bead makes it easier to inspect the quality of fusion joints.
- Yellow shell provides improved ability to detect damage - scratches or gouges that penetrate the shell are easily seen as the black internal material becomes exposed. For sizes 1-1/4" and smaller, damage that shows the black is likely to exceed 10% of the wall thickness.

Driscopipe® 8100 has a proven track record in gas distribution application since it was first introduced in 1997.

[1] Formerly - Plexco, a Division of Chevron Chemical Company
[2] Formerly - Phillips Driscopipe, A Division of Phillips Petroleum Company

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Research and Testing

Performance Pipe maintains ongoing testing and product improvement programs to ensure the highest quality polyethylene pipe and fittings. A complete quality assurance program assures continuing product quality, and new products and product improvements are thoroughly tested before release. Both incoming materials and outgoing products are evaluated to ensure that all Performance Pipe products meet our own exacting standards as well as current industry standards and governmental standards and regulations.

APWA/ULCC Color Code

Performance Pipe DRISCOPIPE® 8100 gas pipe is produced with a yellow shell on the pipe OD as permanent, highly visible identification of gas service and in compliance with APWA/ULCC standards for color-coding of gas distribution lines.

Outdoor Storage

The recommended maximum time for unprotected outdoor storage of DRISCOPIPE® 8100 is four years.

Cautions

Polyethylene piping has been safely used in thousands of applications. However, there are general precautions that should be observed when using any product. In this respect, polyethylene piping is no different. Below is a list of some of the precautions that should be observed when using DRISCOPIPE® 8100.

Fusion

During the heat fusion process the equipment and products can reach temperatures in excess of 450°F (231°C). Caution should be taken to prevent burns.

Do not bend pipes into alignment against open butt fusion machine clamps. The pipe may spring out and cause injury or damage.

Static Electricity

High static electric charges can develop on polyethylene piping products, especially during squeeze-off, when repairing a leak, purging, making a connection, etc. **Where a flammable gas atmosphere and static electric charges may be present, observe all Company (pipeline operator, utility, contractor, etc.) safety procedures for controlling and discharging static electricity and all requirements for personal protection.**

Weight, Unloading and Handling

Although polyethylene pipe is not as heavy as some other piping products, significant weight may be involved. Care should be exercised when handling and working around polyethylene pipe.

Polyethylene piping is a tough, robust material, but it is not immune to damage. Improper handling or abuse can damage piping and compromise system quality or performance or cause injury or damage. **Obtain and observe the handling instructions provided by the delivery driver.** Polyethylene piping

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should be moved with proper handling and lifting equipment. Use fabric slings. Lift truck forks should be padded and should extend completely across under the load. Do not use chains or wire ropes. Do not roll or drop pipe off the truck, or drag piping over sharp rocks or other abrasive objects. Store piping so that the potential for mechanical damage is minimized. See the *Performance Pipe Engineering Manual* for additional information on handling and storage.

While polyethylene piping has excellent impact resistance, striking the pipe with an instrument such as a hammer may result in uncontrolled rebound.

Coils

Coiled PE pipe is restrained with straps to contain spring-like energy within the coil. Cutting or breaking straps can result in uncontrolled release. Take all necessary safety precautions and use appropriate equipment.

Testing

Fuel gas distribution systems should be tested in accordance with applicable codes and regulations and distribution system operator procedures. Observe all safety measures, restrain pipe against movement in the event of catastrophic failure, and observe limitations of temperature, test pressure, test duration, and making repairs. See Performance Pipe Technical Note *PP-802 Leak Testing PE Piping Systems.*

Protection Against shear and Bending Loads

Measures such as properly placed, compacted backfill, protective sleeves and structural support are necessary to protect plastic pipe against shear and bending loads. Connections should be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main pipe, and where pipes enter or exit casings or walls. Properly placed, compacted backfill and a protective sleeve or a structural support are generally used together, but whether or not a protective sleeve or a structural support is installed, the area surrounding the connection must be embedded in properly placed, compacted backfill to protect the polyethylene pipe against shear and bending loads.

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For additional information about protecting against shear and bending loads at service or branch connections and where PE pipe penetrates a structure or enters or exits a casing, see the Performance Pipe Engineering Manual (Performance Pipe publication PP-150), and ASTM D 2774, *Underground Installation of Thermoplastic Pressure Piping.*

Liquid Hydrocarbon Permeation

When present, liquid hydrocarbons may permeate polyethylene pipe. Liquid hydrocarbon permeation may occur when liquid hydrocarbons are present in the pipe, when soil surrounding the pipe is heavily contaminated with liquid hydrocarbons or when liquid hydrocarbon condensates form in gas pipelines. All types of liquid hydrocarbons (aromatic, paraffinic, etc.) have a similar effect, and the relative effect on different polyethylene pipe resins is essentially the same. Heat fusion joining to liquid hydrocarbon permeated pipes may result in a low strength joint.

Liquid hydrocarbon contamination is indicated by a rough, sandpaper-like, bubbly, or pockmarked surface when a fusion heating iron is removed from the pipe surface, and may be indicated by discoloration or by a hydrocarbon fuel odor. See the Performance Pipe Engineering Manual for additional information on permeation and chemical resistance.

CAUTION - When polyethylene pipe is permeated with liquid hydrocarbons, heat fusion or electrofusion joining is not recommended because liquid hydrocarbons can leach out during heating and contaminate the joint. Liquid hydrocarbon permeated polyethylene pipe should be joined using suitable mechanical connection methods.

Mechanical fittings must be installed in accordance with the fitting manufacturer's instructions. Obtain these instructions from the fitting manufacturer.

Locating

Most polyethylene materials are not detectable with standard magnetic locating equipment. To aid in the detection of underground PE piping, measures such as tracer wires, identification and detection tapes, line markers, electronic marker systems, acoustic pipe tracing, and "call before you dig" line location measures may be used. When installing PE piping, the method or methods for future pipeline detection should be considered. Where posted signs are used, the signs should indicate that the pipeline is polyethylene to alert locating personnel that the pipeline may not be detectable with standard locating equipment. Gas utilities in the area should always be contacted before the start of any underground installation work such as excavation, trenching, directional boring, etc.

Joining

- D.O.T. Regulations require that each joint in a gas piping system must be made in accordance with written procedures that have been proved by test or experience to produce strong gastight joints (49 CFR, Part 192, §192.273(b)).
- D.O.T. Regulations require that written procedures for butt fusion, saddle fusion, and socket fusion joining of polyethylene gas piping must be qualified before use by subjecting specimen joints to required test procedures (CFR 49, Part 192, §192.283(a)).
- D.O.T. Regulations require that all persons who make joints in polyethylene gas piping must be qualified under the operator's written procedures (CFR 49, Part 192, & §192.285(a)).
- D.O.T. Regulations require that the gas system operator must ensure that all persons who make or inspect joints are qualified (CFR 49, Part 192, §192.285(d) & §192.287).

Performance Pipe recommends using PPI's (Plastic Pipe Institute's) generic fusion procedure as defined in PPI TR-33/2005 "(Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe)" or Performance Pipe PP-750 Performance Pipe Fusion Joining Procedures when making heat fusion joints with DRISCOPIPE® 8100 piping. Contact your Performance Pipe Territory Manager or Distributor for a copy. When used to join Performance Pipe polyethylene gas piping, Performance Pipe fusion joining procedures are qualified in accordance with U.S. Department of Transportation Regulations.

CAUTION - Performance Pipe polyethylene piping products cannot be joined with adhesives or solvent cement. Pipe-thread joining and joining by hot air (gas) welding or extrusion welding techniques are not recommended for pressure service. Molded butt-outlet fittings are intended for butt fusion and may not be suitable for joining with mechanical stab fittings or mechanical fittings that require ID stiffeners.

Squeeze-Off

See above Cautions on Static Electricity. Squeeze-off (pinch-off) is used to control flow in PE pipe by flattening the pipe between parallel bars. Squeeze-off is used for routine and emergency situations, but **do not squeeze-off more than once at the same point on the pipe.** For repeated flow control, throttling, or partial flow restriction, install a valve or an appropriate flow control device.
Complete flow stoppage will not occur in all cases. For larger pipes, particularly at higher pressures, some seepage is likely. If seepage is not permissible, the pipe should be vented in-between two squeeze-offs.

Use squeeze-off procedures meeting ASTM F 1041 and tools meeting ASTM F 1563 with Performance Pipe polyethylene pipe. The combination of pipe, tool and squeeze-off procedure should be qualified in accordance with ASTM F 1734. Correct tool closure stops and closing and opening rates are key elements to squeezing-off without damaging the pipe. Tool closure stops must be correct for the pipe size and wall thickness (SDR). It is necessary to close slowly and release slowly, with slow release being more important. See Performance Pipe Technical Note PP-801 *Squeeze-Off.*

Performance Characteristics

Polyethylene Material Properties

Cell Classification-DRISCOPIPE® 8100 piping is manufactured from premium high-density polyethylene compound that is classified according to ASTM D 3350, *Standard Specification for Polyethylene Plastics Pipe and Fittings Materials*. The exceptional properties of Performance Pipe's DRISCOPIPE® 8100 material qualifies it for cell classification 445576.

Long-Term Strength (HDB)-Performance Pipe DRISCOPIPE® 8100 polyethylene compound is listed with the Plastics Pipe Institute as a PE100 and it also has PPI recommended Hydrostatic Design Basis (HDB) ratings of 1600 psi at 73°F (11.03 MPa at 23°C) and 1000 psi at 140°F (6.89 MPa at 23°C). Elevated temperature properties can be used to determine product capabilities for applications where products will be exposed to elevated temperatures.

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Thus DRISCOPIPE® 8100 meets ISO 9080 *Thermoplastics Piping for the Transport of Fluids - Methods of Extrapolation of Hydrostatic Stress Rupture Data to Determine the Long-Term Hydrostatic Strength of Thermoplastics Pipe Materials* requirements with an MRS of 10.0 MPa (1450 PSI) at 20°C (68°F).and is a fully qualified PE100.

Slow Crack Growth (SCG) Resistance-Resistance to slow crack growth is a critical performance requirement because long-term stress can cause cracks to grow slowly through the material. Polyethylene gas pipe is under long-term stress from internal pressure and earthloading. Thus gas distribution service requires materials that have superior long-term resistance to stress cracking and slow crack growth (SCG).

For today's superior materials, historical ESCR tests are incapable of indicating the material's long-term resistance to SCG. Therefore, new SCG tests have been developed. Predominant among these new tests is ASTM F 1473, the "PENT" test (for Pennsylvania Notch Test). Developed at the University of Pennsylvania, a razor-notched specimen is tested to failure under constant tensile load and elevated temperature.

Under ASTM F 1473, Standard Test Method to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins, typical performance for the resin used to produce DRISCOPIPE® 8100 pipe resin is greater than 5000 hours before failure. ASTM D 2513 requires that PE materials average at least 100 hours before failure when tested per ASTM F 1473. Thus, the performance of the material in this test is 50 times better than required by the standard Actual system field performance will be determined by a variety of factors such as its application, operating conditions, and other unknown factors that may impact the pipe over its expected long service life.

RCP Resistance-In recent years, rapid crack propagation, RCP, investigations have been conducted on polyethylene materials and pipes used for gas distribution piping. ISO, the International Standards Organization, has developed two standards for characterizing RCP resistance,

- ISO 13478 *Thermoplastics Pipes for the Conveyance of Fluids - Determination of Resistance to Rapid Crack Propagation - Full-Scale Test (FST)* and
- ISO 13477 *Thermoplastics Pipes for the Conveyance of Fluids - Determination of Resistance to Rapid Crack Propagation - Small-Scale Steady State Test (S4 Test).*

These tests are used to determine a critical pressure and temperature where RCP may occur.

Although ASTM D 2513 does not currently have an RCP requirement, ISO 4437 *Buried Polyethylene Pipes for the Supply of Gaseous Fuels - Metric Series - Specifications*, specifies that the critical pressure for gas distribution pipes must exceed 1.5 times the maximum operating pressure at 0°C (32°F) when tested according to ISO 13478 (FST) or 0.42 times the maximum operating pressure at 0°C (32°F) when tested according to ISO 13477 (S4 Test). DRISCOPIPE® 8100 materials and pipes comfortably exceed these requirements.

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ASTM Test Values

The table below shows material physical properties, ASTM test methods for the property, and nominal values for DRISCOPIPE® 8100 polyethylene materials. (Note - Per ASTM D 748, the brittleness temperature is less than 180°F (118°C), therefore, DRISCOPIPE® 8100 pipe and fittings may be used at operating temperatures down to or below -40°F (-40°C)).

Property	Unit	Test Procedure	Typical Value
PPI Listing Designations (1)		PPI TR4	PE 3408 (2) PE 4710 (2) PE 100
Cell Classification		ASTM D-3350-05	445576C (3)
Density	g/cm ^{3}	ASTM D-1505	0.961 (black)
Melt Flow, MI (2.16 Kg/190°C)	g/10 mins	ASTM D-1238	0.11
Melt Flow, MI (21.6 Kg/190°C)	g/10 mins	ASTM D 1238	8.00
Thermal Expansion/Contraction	in/in/°F	ASTM D 696	1x10 $^{-4}$
Flexural Modulus	psi	ASTM D-790	140,000
Tensile Strength @ Yield	psi	ASTM D-638	>3,700
Slow Crack Growth (PENT)	hours	ASTM F-1473	>5,000
Color; UV Stabilizer		ASTM D-3350	Yellow shell UV stabilized for up to 4 years unprotected outdoor storage.
Color; UV Stabilizer	%	ASTM D-3350	>2 on base pipe.
Elastic Modulus	psi	ASTM D-638	200,000
Brittleness Temperature	°F (°C)	ASTM D-746	< -180 (< -118)
Vicat Softening Temperature	°F	ASTM D-1525	255
Hardness	Shore D	ASTM D-2240	65
Hydrostatic Design Basis @ 73°F (23°C)	psi	ASTM D 2837	1,600
Hydrostatic Design Basis @ 140°F (60°C)	psi	ASTM D 2837	1,000
Minimum Required Strength (MRS) @ 20°C (68°F)	Mpa (psi)	ISO 9080	>10 (>145)
Rapid Crack Propagation (RCP) Critical Pressure (Pc), 0° C (4) Critical Temperature (Tc), 5bar (5)	 bar (psi) 0°C (°F)	 ISO 13478 ISO 13477	 >30 bar (>435 psi) <-24°C (<-11°F)

(1) Driscopipe® 8100 pipe material is listed in PPI TR-4 for use in natural gas distribution.

(2) Meets new requirements for PE 4710 material. 49 CFR Part 192 references older versions of the standard that do not yet recognize the new requirements and carry the PE3408 designation. The pipe will be dual or triple market (PE3408/PE4710 -PE100) as long as required by 49 CFR Part 192.

(3) Previous versions of ASTM D 3350 would have assigned a cell classification of 345564C or 345566C.

(4) Determination made on 12" DR 11 pipes. Pc calculated in accordance with ISO 13478.

(5) Determination made on 8" DR11 pipes. No failures occurred. Calculated in accordance with ISO 13477 Annex C correlation.

NOTICE -This chart provides typical physical property information for polyethylene resins used to manufacture Performance Pipe polyethylene piping products. It is intended for comparing polyethylene pipe resins. It is not a product specification, and it does not establish minimum or maximum values for manufacturing tolerances for resins or for piping products. Some of the values were obtained from tests of specimens taken from molded plaques and can vary from these typical values. Performance Pipe has made every reasonable effort to ensure the accuracy of this chart, but this chart may not provide all necessary information, particularly with respect to special or unusual applications.

Permeability and Permeation

Plastics are permeable to gases to varying degrees. Although the constituents of natural gas can permeate through polyethylene, the volume of gas lost through permeation is generally so low as to have an insignificant effect on the handling of natural gas in a piping system. The *A.G.A. Plastic Pipe Manual for Gas Service* lists the permeability of polyethylene pipe to methane, the primary constituent of natural gas, as 4.2×10^{-3}. Using the AGA factor, one mile of SDR 11 HDPE pipe carrying 100% methane at 60 psi would lose less than 0.27 ft^3 per day.

Other constituents of natural gas are typically heavier than methane, thus less permeable through polyethylene. Hydrogen is the exception, however, the concentration of hydrogen in most natural gas is so low that the actual amount of hydrogen permeation would be insignificant.

See above Cautions on Liquid Hydrocarbon Permeation.

Design Pressure

The following formula is used to compute the Design Pressures for DRISCOPIPE 8100® polyethylene piping systems for natural gas service at operating temperatures up to but not over 140°F (60°C). For operating temperatures below 73°F (23°C), use 73°F (23°C) Design Pressures.

$$P = \frac{2S}{(DR - 1)} \times f$$

where: P -- Design Pressure in pounds per square inch gauge (psig);
S -- Long Term Hydrostatic Strength (Hydrostatic Design Basis) stress, psi, at pipeline operating temperature;
DR = Pipe Nominal Outside Diameter / Pipe Minimum Wall Thickness
f = Design (Service) Factor

***Hydrostatic Design Basis or Long Term Hydrostatic Strength*, S**	
Temperature	**S, psi (MPa)**
73°F (23°C) **100°F (38°C)** **120°F (49°C)** **140°F (60°C)**	**1600 (11.03)‡** **1250 (8.62)†** **1000 (6.90)†** **1000 (6.90)‡**
‡ HDB per ASTM D 2837 & PPI TR-3. † Interpolated in accordance with PPI TR3-2005	

Application	***Design (Service) Factor, f***
Gas distribution and transmission per CFR 49 Part 192, §192.121	**0.32**
Gas distribution and transmission in Canada per CSA Z662-96	**0.40**
Gas distribution or transmission piping that is permeated by solvating chemicals such as liquid hydrocarbons or liquefied gas condensate	**0.25**

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Operating Pressures (psig)

The following chart provides maximum allowable operating pressures (MAOP) and recommended maximum design pressure rating (PR) for DRISCOPIPE® 8100 pipes for gas distribution service at the indicated operating temperatures. DRISCOPIPE® 8100 pipes with the same DR but different outside diameters have the same Design (Working) Pressure Ratings. Pipe minimum wall thickness is determined by dividing the pipe average outside diameter (O.D.) by the DR number.

Pressure ratings are calculated in accordance with applicable federal codes. A check should be made to determine if these pressures apply under the state and/or local codes governing the specific application. Use 73°F (23°C) pressure ratings for operating temperatures below 73°F (23°C). It should be noted that the PE 100 rating method is currently not recognized in the applicable DOT Federal Code. Neither is that rating method included in the current edition of ASTM D2513. Therefore, until these documents are changed to allow the use of designs based on PE 100 rated materials, the standard design protocol applicable to PE 3408 / 4710 is still binding.

MAOP & Maximum Design Pressure Rating (PR)‡ for Dry Natural Gas Service – DRISCOPIPE® 8100				
Service Temp	*73°F / 23°C*	*100°F / 38°C*	*120°F / 48°C*	*140°F / 60°C*
Pipe DR	***MAOP** (Max Design PR), psig*	***MAOP** (Max Design PR), psig*	***MAOP** (Max Design PR), psig*	***MAOP** (Max Design PR), psig*
7.0, 7.3, 9.0	**125**	**100**	**80**	**80**
9.3	**109**	**96**	**77**	**77**
11.0	**102**	**80**	**64**	**64**
11.5	**98**	**76**	**61**	**61**
13.5	**82**	**64**	**51**	**51**
15.5	**71**	**55**	**44**	**44**
‡ Class 1, 2, 3, and 4 locations per U.S. federal regulations 49 CFR Part 192.123(e) allows and limits design pressure of 125psig provided the pressure is calculated in accordance with 49CFR Part 192.121. Pressure calculated in accordance with formula provided in 49CFR Part 192.121, using Hydrostatic Design Strength values interpolated in accordance with PPI TR-3.				

Cold Bending Radius

The allowable cold bending radius for DRISCOPIPE® 8100 pipe is dependent upon the pipe OD, DR and the presence of fittings in the bend.

DR	*Allowable Cold Bending Radius*
9 or less > 9 to 13.5	20 times pipe OD 25 times pipe OD
Fitting or flange present in bend	100 times pipe OD

Fluid Flow

Formulas for high pressure and low pressure gas flow in polyethylene pipe are presented in the Performance Pipe Engineering Manual, and in Performance Pipe's PlexCalc® program for personal computers.

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Propane (LPG) Gas Service

The Office of Pipeline Safety Advisory Bulletin No. 73-4, dated April 1973, states, "It is the operator's responsibility to assure the integrity of the plastic pipe selected for use in the piping system, and this should be based on a favorable recommendation from the manufacturer. Therefore, the Federal minimum safety standards do permit the use of plastic in a properly engineered underground system of LPG distribution conforming to the limitations of these regulations." DRISCOPIPE® 8100 piping products meet the requirements of ANSI/NFPA 58 *Standard for the Storage and Handling of Liquefied Petroleum Gases.*

The Plastics Pipe Institute has issued a "Use Recommendation" for polyethylene piping systems for commercial propane systems, PPI Technical Report TR-22.

PPI Use Recommendation (Technical Report TR-22)

The PPI use recommendation states that information collected indicates that polyethylene plastic piping is satisfactory for transporting LPG and its major component, propane gas. This information also indicates that pressure design parameters based on propane gas should be adequate and reasonable. However, until more information is available, this covers only commercial propane vapor.

Additionally the recommendation states that:

1. A Hydrostatic Design Basis of 1000 psi should be used in the design of polyethylene pipe systems for propane gas distribution at pipe temperatures of 73°F or lower. The long-term hydrostatic strength measurements should be made in accordance with ASTM D 2837.

2. Polyethylene should be used only in underground propane gas distribution systems designed to operate at internal pressures and temperatures such that condensation will not occur.

3. Operating pressures should be limited to 30 psig or less.

In cases where condensation does occur in a propane system or propane enriched system and the presence of condensation is of relatively short duration, there is no indication of loss of physical integrity or observable change in polyethylene pipe. Under actual operating conditions, in a properly designed system, the pressures and temperatures are such that revaporization of any propane condensates will usually occur . Also, experience with propane liquids on polyethylene shows that there is no cumulative effect of intermittent short duration exposure of propane condensate on polyethylene.

For additional information, see PPI Technical Report TR-22. Exposure to liquefied propane condensates for extended periods may affect joining. See *Liquid Hydrocarbon Permeation and Permeability and Permeation* earlier in this publication, and the *Performance Pipe Engineering Manual* for additional information.

Performance Pipe DRISCOPIPE® 8100 polyethylene gas piping may be used in propane gas service when used in accordance with the above recommendations.

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PERFORMANCE PIPE
Product Literature

Technical Notes & Bulletins*:

PP 158	DRISCOPIPE® 8100 Series Piping Systems Size & Dimension Sheet
PP 306	Model Specifications - DRISCOPIPE® 8100 Series Piping Systems
PP 801-TN	Squeeze-Off
PP 802-TN	Leak Testing
PP 807-TN	Large Diameter Coiled Pipe
PP 808A-TN	Tapping Tee & Purge Point Cap Tightening - Flat Ring Gasket
PP 808B-TN	Tapping Tee & Purge Point Cap Tightening - O-Ring
PP 809-TN	Protective Sleeves and Tapping the Main

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