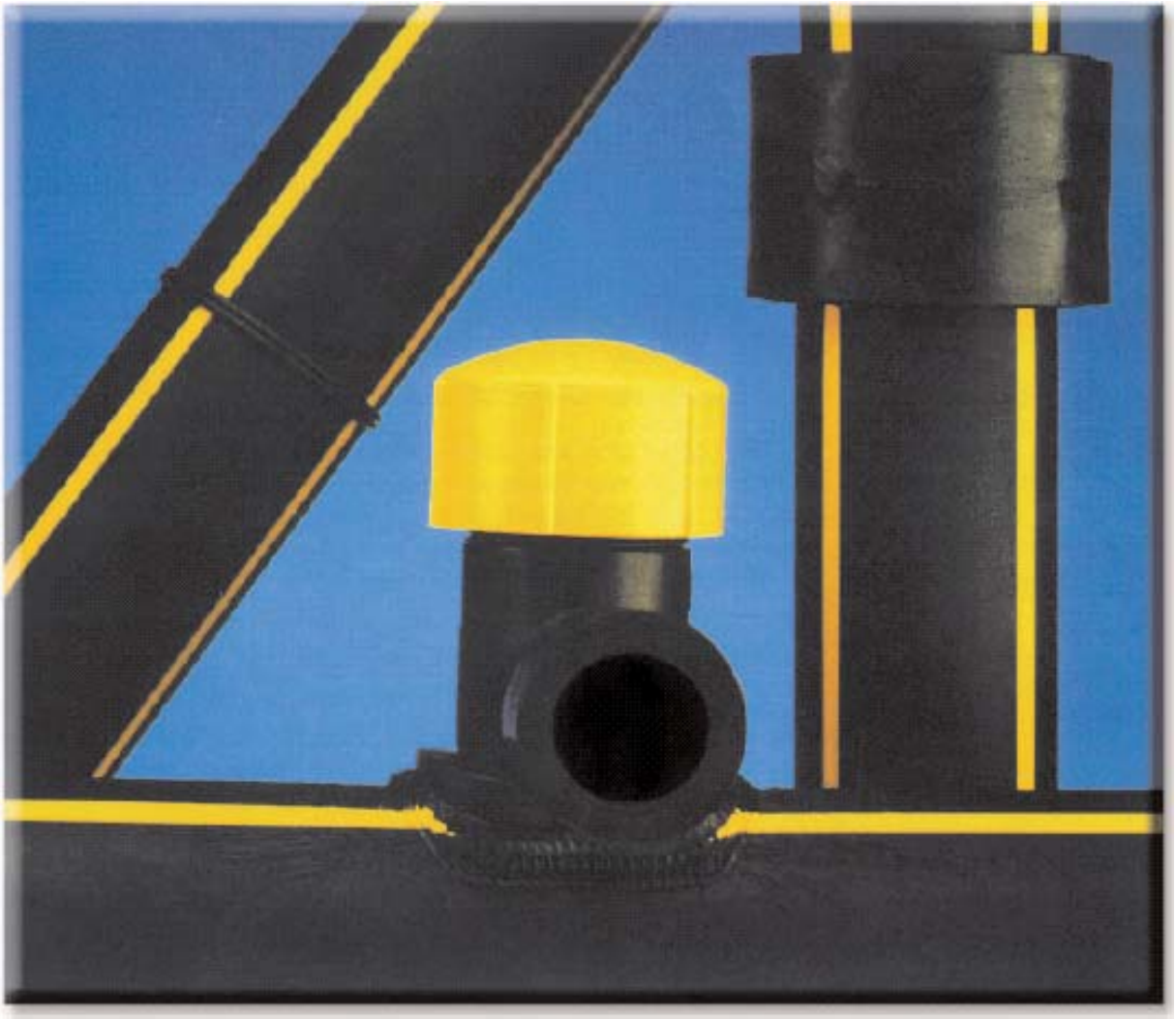
PERFORMANCE PIPE

A DIVISION OF CHEVRON PHILLIPS CHEMICAL COMPANY LP

# YELLOWSTRIPE® 8300 SERIES POLYETHYLENE PIPING

## PRODUCED FROM PE3408/4710 PE100 MATERIAL



Bulletin: PP 303

YELLOWSTRIPE® 8300 Series Piping Products for
LPG and Propane Gas Distribution
Natural Gas Distribution

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# Performance Pipe

PERFORMANCE PIPE is the functional successor to the operations of Plexco[1] and Driscopipe[2]. On July 1, 2000, Chevron Chemical Company and Phillips Chemical Company announced the combination of their worldwide chemicals businesses into a joint venture, 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 piping system experience, with pipe and fitting manufacturing facilities throughout the United States and in Mexico.

To enhance the outstanding quality and performance of Performance Pipe polyethylene piping, Chevron Phillips Chemical Company LP further strengthens Performance Pipe with over four decades of quality products.

# A Commitment to Quality and Performance

### *YELLOWSTRIPE® 8300*

Performance Pipe YELLOWSTRIPE® 8300 gas piping is a product of choice for premium high-density polyethylene gas piping systems. YELLOWSTRIPE® 8300 gas pipe is produced from exceptionally high performance material which meets all the requirements for PPI listing as a PE3408/4710 PE100 product. The pipe is manufactured in accordance with the latest published editions of ASTM D 2513 or applicable international standards. YELLOWSTRIPE® 8300 gas piping is available in ½" through 24" (16 mm through 630 mm) extruded polyethylene pipe and tubing, and molded butt, socket, and saddle fusion fittings for domestic and international gas applications.

### *Research and Testing*

Performance Pipe maintains ongoing testing and product improvement programs to ensure the highest quality polyethylene piping. 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.

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




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### *Training and Technical Service*

Performance Pipe offers recommendations and technical assistance for YELLOWSTRIPE® 8300 gas piping. Joining procedures, training materials, and on-location training in socket, saddle and butt fusion joining are available, as well as technical assistance in product capabilities, installation recommendations, and testing and operating procedures. Contact your Performance Pipe Territory Manager or Performance Pipe Distributor for information and assistance.

### *APWA/ULCC Color Code*

Performance Pipe YELLOWSTRIPE® 8300 gas pipe is produced with four, equally spaced longitudinal yellow stripes extruded into 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.

## Cautions

Polyethylene piping has been safely used in thousands of installations. However, there are general precautions that should be observed when using any product. Below is a summary list of some of the precautions that should be observed when using YELLOWSTRIPE® 8300. Further precautions are found within Performance Pipe literature.

### *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 when gas is flowing at high velocities; such as, 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, compromise system performance result in injury or property damage. In addition, personal injury may result. ***Obtain and observe the handling instructions provided by the delivery driver.*** Polyethylene piping 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. ***Obtain and observe the handling instructions provided by the delivery driver.***

### *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. 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.

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* and ASTM D 2774, *Underground Installation of Thermoplastic Pressure Piping.*

### *Liquid Hydrocarbon Permeation*

When present, liquid hydrocarbons may permeate (solvate) polyethylene pipe. Liquid hydrocarbon permeation may occur when liquid hydrocarbons are present in the pipe when soil surrounding the pipe is 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 affect on different polyethylene pipe resins is essentially the same. Heat fusion joining to permeated pipes may result in a low strength joint and is not recommended.

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

***CAUTION - Once polyethylene pipe has been 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.*


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### *Locating*

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. 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)).

- 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)).

- 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)).

- 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 Performance Pipe Bulletin PP-750 *Performance Pipe Fusion Joining Procedures* when making heat fusion joints with YELLOWSTRIPE® 8300 piping. Contact your Performance Pipe Territory Manager, www.performancepipe.com, 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. ***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.


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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*** - YELLOWSTRIPE® 8300 piping is manufactured from premium high performance bimodal polyethylene compound that is classified according to ASTM D 3350, *Standard Specification for Polyethylene Plastics Pipe and Fittings Materials*. The cell classification number for Performance PipeYELLOWSTRIPE® 8300 material is 445576C.

***Long-Term Strength (HDB)*** - Performance Pipe YELLOWSTRIPE® 8300 polyethylene piping compound is listed with the Plastics Pipe Institute as PE4710 and as PE100. 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.

In addition to ASTM D 2837 and PPI HDB requirements, YELLOWSTRIPE® 8300 piping 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 a MRS of 10.0 MPa (1450 PSI) at 20°C (68°F). Thus, it is a fully qualified PE 4710 and PE100 product and is listed as such in PPI TR4.

***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 many years, environmental stress crack resistance (ESCR) tests, such as ASTM D 1693, have been used to characterize resistance to cracking from long-term stress. But exceptional materials such as YELLOWSTRIPE® 8300 piping rarely fail ESCR tests. For these superior materials, ESCR tests are incapable of quantifying long-term resistance to SCG.

In recent years, new SCG tests have been developed. Predominant among these new tests is ASTM F 1473, the "PENT" test (for PEnnsylvania Notch Tensile test). Developed at the University of Pennsylvania, a razor-notched specimen is tested to failure under constant tensile load and elevated temperature. Research has shown that this stringent test is an excellent indicator of SCG performance, and further, that there may be an empirical correlation between PENT performance and long-term service.

Under ASTM F 1473, Standard Test Method to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins, typical performance of the resin used to produce YELLOWSTRIPE® 8300 pipe 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 lasted 50 times longer 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 service life.


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***RCP** Resistance* - In recent years, rapid crack propagation, RCP, research has 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).* At a specified temperature, these tests are used to determine a critical pressure above which RCP may occur. The full-scale test is used with large diameter (greater than 250 mm (9.8 in)) pipes and the S4 test with small diameter sample pipes having wall thickness greater than 15 mm (0.59 in).

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 when tested according to ISO 13477 (S4 Test) and converted to the full scale critical pressure. YELLOWSTRIPE® 8300 materials and pipes meet or exceed these requirements.

## *ASTM Test Values*

The chart below shows material physical properties, ASTM test methods for the property, and nominal values for YELLOWSTRIPE® 8300 PE3408/4710 PE100 polyethylene materials.

| Property | Unit | Test Procedure | Typical Value |
|---|---|---|---|
| PPI Listing Designations [1] | -- | PPI TR4 | PE 3408[2]<br>PE 4710[2]<br>PE 100 |
| Cell Classification | --- | ASTM D 3350-05 | 445576C[3] |
| Density | gm/cc | ASTM D 1505 | 0.961 (black) |
| Melt Flow, MI (2.16 Kg/190°C) | gm/10min | ASTM D 1238 | 0.11 |
| Melt Flow, MI (21.6 Kg/190°C) | gm/10min | ASTM D 1238 | 8.00 |
| Thermal Expansion/Contraction | in/in/°F | ASTM D 696 | $1x10^{-4}$ |
| Flexural Modulus @ 2% strain | psi | ASTM D 790 | 140,000 |
| Tensile Strength @ Yield | psi | ASTM D 638 | > 3500 |
| Slow Crack Growth (PENT) | hours | ASTM F 1473 | > 5000 |
| Color; UV Stabilizer | % | ASTM D-3350 | >2 |
| 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 | 1600 |
| Hydrostatic Design Basis @ 140°F (60°C) | psi | ASTM D 2837 | 1000 |
| Minimum Required Strength (MRS) @ 20°C (68°F) | MPa (psi) | ISO 9080 | >10 (145) |
| Rapid Crack Propagation (RCP) [4]<br>Critical Pressure (Pc), 0° C<br>Critical Temperature (Tc), 5 bar | bar (psi)<br>°C (°F) | ISO 13477<br>ISO 13477 | > 12 bar (>174 psi)<br>< -17°C (< 2° F) |

1. YELLOWSTRIPE® 8300 pipe material is listed in PPI TR-4 for use in natural gas distribution.
2. Meets new requirements for PE4710 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 marked 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 8" DR 11 pipes. No failures occurred. Pc calculated in accordance with ISO 13477 Annex C correlation.
5. 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 $4.2 \times 10^{-3}$. Using the AGA factor, one mile of SDR 11 HDPE pipe carrying 100% methane at 60 psi would lose less than 0.27 ft3 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.

Liquid hydrocarbons will permeate (solvate) polyethylene pipe after several months' exposure. Liquid hydrocarbon permeated polyethylene may have slightly reduced long-term strength; therefore pressure rating may be reduced. At higher temperatures, liquid hydrocarbon permeation may cause some swelling. Liquid hydrocarbon permeation should be considered when the fluid in the pipe has a liquid hydrocarbon concentration, or where soil surrounding the pipe is contaminated with liquid hydrocarbons, or where liquid hydrocarbon condensates can form in gas pipelines. At low temperatures and higher pressures, heavier hydrocarbon gases such as propane or butane may condense and liquefy in the pipe. Such condensates are known to permeate polyethylene pipe. All types of hydrocarbons (aromatic, paraffinic, etc.) have a similar effect, and the relative effect on different polyethylene pipe resins is essentially the same. Liquid hydrocarbon permeation will affect joining. **See above Cautions on Liquid Hydrocarbon Permeation.**

### *Design Pressure*

The following formula is used to compute the Design Pressures for YELLOWSTRIPE® 8300 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;

| *Hydrostatic Design Basis or Long Term Hydrostatic Strength*, S | |
|---|---|
| Temperature | S, psi (MPa) |
| 73°F (23°C)<br>100°F (38°C)<br>120°F (49°C)<br>140°F (60°C) | 1600 (11.03)‡<br>1340 (9.24)†<br>1164 (8.03)†<br>1000 (6.90)‡ |
| ‡ HDB per ASTM D 2837 & PPI TR-3. † Interpolated in accordance with PPI TN-18. | |

DR = Dimension Ratio

$$\text{DR} = \frac{\text{Pipe Nominal Outside Diameter}}{\text{Pipe Minimum Wall Thickness}}$$

f = Design (Service) Factor

| *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 |

## *Operating Pressures (psig)*

The following chart provides maximum allowable operating pressures (MAOP) and recommended maximum design pressure rating (PR) for YELLOWSTRIPE® 8300 pipes for gas distribution service at the indicated operating temperatures. YELLOWSTRIPE® 8300 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 U.S 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 while YELLOWSTRIPE® 8300 pipe is produced from PE4710/3408PE100 pressure rated materials, the PE4710 and PE100 rating methods are currently not recognized in the applicable DOT Federal Code. Neither is the rating method included in the current edition of ASTM D2513. Therefore, the PE3408 design basis is binding.

| ***MAOP & Maximum Design Pressure Rating (PR)‡ for Dry Natural Gas Service – YELLOWSTRIPE® 8300 Pipes*** | | | | |
|---|---|---|---|---|
| *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 | **125**† (171) | **125**† (143) | **124**† (124) | **107**† (107) |
| 7.3 | **125**† (163) | **125**† (136) | **118**† (118) | **102**† (102) |
| 9.0 | **125**† (128) | **107**† (107) | **93** (93) | **80** (80) |
| 9.3 | **123**† (123) | **103**† (103) | **90** (90) | **77** (77) |
| 11.0 | **102**† (102) | **86** (86) | **74** (74) | **64** (64) |
| 12.5 | **89** (89) | **75** (75) | **65** (65) | **56** (56) |
| 13.5 | **82** (82) | **69** (69) | **60** (60) | **51** (51) |

‡ Class 1, 2, 3, and 4 locations per U.S. federal regulations using 0.32 Design (Service) Factor. For pressure ratings at 0.40 design factor (Canada only), multiply by 1.25; for pressure ratings at 0.25 design factor, multiply by 0.78. † Where the pipe can be rated at 125 psig or higher, U.S. Federal regulations limit gas pressures in plastic pipe to 123 psi maximum unless a waiver for higher pressure has been granted.


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### *Cold Bending Radius*

The allowable cold bending radius for YELLOWSTRIPE®® 8300 pipe is dependent upon the pipe OD, DR and the presence of fittings in the bend.

| *DR* | *Allowable Cold Bending Radius* |
|---|---|
| 9 or less<br>> 9 to 13.5 | 20 times pipe OD<br>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 free PlexCalc® program for personal computers.

### *Outdoor Storage*

The recommended maximum for unprotected outdoor storage of YELLOWSTRIPE® 8300 is twenty years.

## 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." YELLOWSTRIPE® 8300 piping products meet the requirements of ANSI/NFPA 58 *Standard for the Storage and Handling of Liquefied Petroleum Gases.*

The Plastics Pipe Institute has made the following "Use Recommendation" for polyethylene piping systems for commercial propane systems:

### *PPI Use Recommendation (Technical Report TR-22)*

The 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, these use recommendations cover only commercial propane vapor in detail.

1. The polyethylene plastic pipe, tubing and fittings should be only those specific types designated as PE 2406 or PE 3408 and meeting the appropriate requirements of ASTM D 2513.
2. 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.
3. 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.

***It is also recommended that operating pressures 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 liquified 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 YELLOWSTRIPE® 8300 PE 3408/4710 PE100 *polyethylene gas piping may be used in propane gas service when used in accordance with the above recommendations.*


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A Division of Chevron Phillips Chemical Company LP

## CONTACT INFORMATION:

**PERFORMANCE PIPE,** a division of
Chevron Phillips Chemical Company LP
PO Box 269006
Plano, TX 75026-9006

To secure product information
or technical assistance:

Phone: 800-527-0662
Fax: 972-599-7348
www.performancepipe.com

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PERFORMANCE PIPE
Product Literature

Technical Notes & Bulletins*:

| | |
|---|---|
| PP 156 | DRISCOPLEX® 6500 Series Piping Systems Size & Dimension Sheet |
| PP 157 | DRISCOPLEX® 6800 Series Piping Systems Size & Dimension Sheet |
| PP 158 | DRISCOPIPE® 8100 Series Piping Systems Size & Dimension Sheet |
| PP 159 | YELLOWSTRIPE® 8300 Series Piping Systems Size & Dimension Sheet |
| PP 300 | PE 2406 MDPE Pipe & Tubing - DRISCOPLEX® 6500 Series Piping Systems |
| PP 301 | PE 3408 HDPE Pipe & Tubing - DRISCOPLEX® 6800 Series Piping Systems |
| PP 302 | DRISCOPIPE® 8100 Series Polyethylene Piping |
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| PP 752 | Socket Fusion Tip Card |
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| 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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* Additional product literature will be available upon completion. Visit Performance Pipe on the web for the latest completed literature.