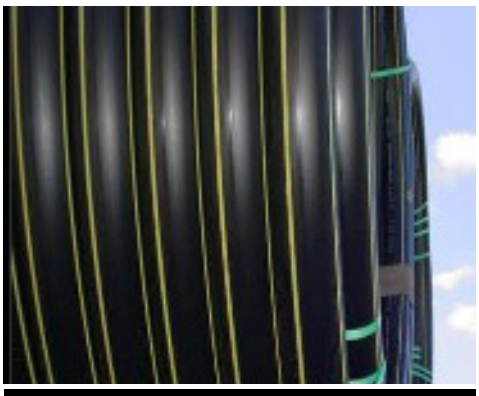
Performance Pipe Gas Distribution

DriscoPlex® 6500 MDPE
Gas Distribution Pipe



Yellowstripe® 8300
HDPE Gas Distribution Pipe

Blackstripe® 8400 Series
Yellow HDPE Gas Distribution Pipe

Performance Pipe
A Division of Chevron Phillips Chemical Company LP

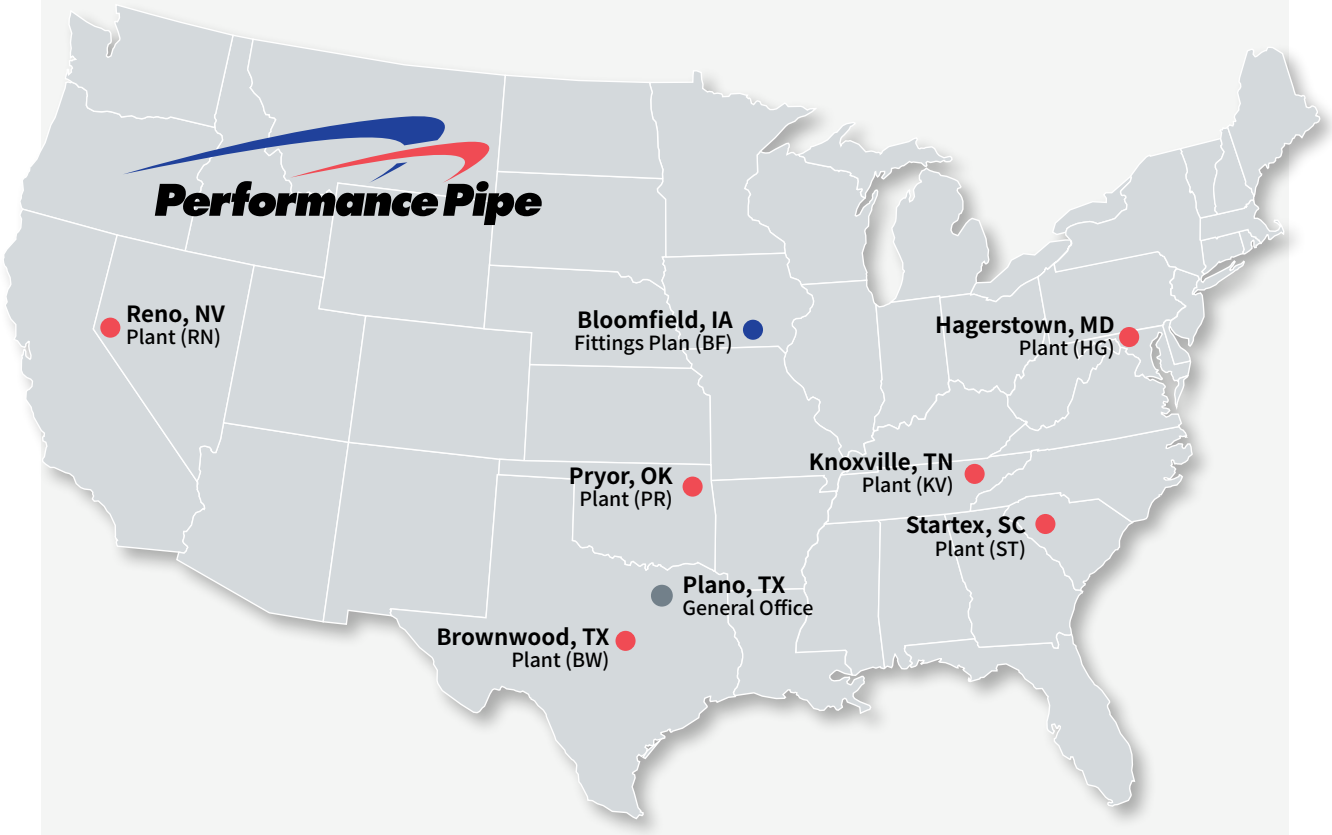
Performance Pipe is a name you can trust in gas distribution piping. We specialize in natural gas distribution, liquid propane gas (LPG), propane gas distribution, and yard gas products and fittings.

With more than fifty years of polyethylene pipe manufacturing experience, Performance Pipe has seven ISO 9001 certified manufacturing facilities strategically located across the United States.

The unmatched quality and performance of Performance Pipe polyethylene piping products is further enhanced and strengthened by more than five decades of quality polyolefin plastic resin production from our parent company Chevron Phillips Chemical Company LP.

As active members of the American Gas Association, ASTM International, Gas Piping Technology Committee, Plastics Pipe Institute, American Society of Mechanical Engineers, and American Petroleum Institute, we provide technical expertise and service to these organizations on an ongoing basis.

When you select Performance Pipe gas pipe and fittings, in addition to receiving quality products, you also gain access to our team of experts for technical support and assistance. Topics range from assistance in product applications and capabilities to installation and handling to testing and operating procedures. We are here to help. Our territory sales teams are dedicated to the gas distribution industry and to the service of Performance Pipe's gas distribution product customers.



Products

Performance Pipe's gas piping products are the material of choice for premium medium and high-density natural gas distribution, LPG, propane gas and yard gas piping systems. Performance Pipe's products are produced to meet or exceed the manufacturing and material requirements of ASTM D2513 Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing and Fittings, as required by 49 CFR Part 192, § 192.59. The pipes meet the requirements of ANSI/NFPA 58 Standard for the Storage and Handling of Liquefied Petroleum Gases.

Performance Pipe offers the following gas distribution products:

DriscoPlex® 6500 Series

MDPE Gas Distribution Pipe

The product is a solid yellow medium density polyethylene (MDPE) PE2708 pipe that meets ASTM D3350 Cell Classification of PE234373E and APWA/ULCC Color Code Standards.

Yellowstripe® 8300 Series

HDPE Gas Distribution Pipe

This high-density polyethylene (HDPE) PE4710 pipe is solid black pipe with four equidistant yellow stripes. The Yellowstripe® 8300 series pipe meets APWA/ULCC Color Code Standards and has an ASTM D3350 Cell Classification of PE445574C.

Blackstripe® 8400 Series

Yellow HDPE Gas Distribution Pipe

This high-density polyethylene (HDPE) PE4710 pipe is solid yellow pipe with three black stripes. This product offers the exceptionally high performance of PE4710 pipes while the yellow color greatly improves visibility and identification as gas piping. Blackstripe® 8400 Series Yellow HDPE pipe meets APWA/ULCC Color Code Standards and has an ASTM D3350 Cell Classification of PE445574E.

Fittings

Performance Pipe manufactures medium density and high-density molded butt, socket, and saddle fusion fittings. The fittings are manufactured to meet the same requirements as our pipe series where applicable.

Quality

Performance Pipe's polyethylene piping products for gas are unmatched in quality and performance. In addition to meeting the manufacturing and quality requirements of ASTM D2513 *Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing and Fittings*. Performance Pipe's gas products also meet our own internal quality assurance (QA) and quality control (QC) requirements. These internal QA/QC requirements meet or exceed those required by industry standards.

Each product line is continuously monitored throughout the manufacturing cycle to ensure that the product adheres to all internal quality control specifications and the manufacturing standard. Performance Pipe's quality management is certified in accordance with ISO 9001:2015. All seven of Performance Pipe's manufacturing facilities hold this certification, and individual plant certificates of conformance to ISO 9001:2015 are available upon request.

Sizes

Performance Pipe manufactures the DriscoPlex® 6500 Series MDPE pipe product in sizes ½" CTS through 12" IPS. For larger diameter gas applications (8" though 24") we recommend our high-density polyethylene (HDPE) pipe series: Yellowstripe® 8300 Series and Blackstripe® 8400 Series Yellow HDPE piping.

These products are available in 1/2" through 24" (16 mm through 630 mm) outside-diameter-controlled polyethylene pipe and tubing sizes. Specific sizes of pipe and fittings available for each product can be found on Performance Pipe's website at: www.performancepipe.com.

Available Certifications

Specific sizes of DriscoPlex® 6500 Series pipe, Yellowstripe® 8300 Series pipe, Blackstripe® 8400 Series Yellow HDPE pipe, and DriscoPlex® fittings are available with NSF certification to ASTM D2513, CSA (Canadian Gas Association) B137.4, and the UPC (Uniform Plumbing Code) for yard gas piping, LPG, and other after-meter applications.

Outdoor Storage

Performance Pipe polyethylene gas distribution piping products are protected from UV effects and outdoor exposure to ensure pipe performance requirements are maintained.

Yellow pipes, such as Blackstripe® 8400 Series Yellow HDPE and DriscoPlex® 6500 Series MDPE pipes are protected against outdoor exposure through additive formulations and are defined as Code E materials in accordance with ASTM D3350. Yellowstripe® 8300 Series HDPE pipe is defined as a Code C material and as such contains a minimum of 2-3 percent carbon black.

Accelerated laboratory weathering tests were conducted on the formulations, predicting the yellow pipe materials are sufficiently stabilized for at least three years against UV degradation from unprotected outdoor exposure.

Black (ASTM D3350 Code C) gas pipe materials are considered stabilized for at least ten years against UV degradation from unprotected outdoor exposure, per ASTM D2513.

Based on the tests conducted, Performance Pipe provides the following specific unprotected outdoor storage recommendations for Performance Pipe's gas distribution piping products.

- **DriscoPlex® 6500 Series MDPE Pipe** (yellow)–3 years
- **Blackstripe® 8400 Series Yellow HDPE Pipe** (yellow)–3 years
- **Yellowstripe® 8300 Series HDPE Pipe** (black)–10 years

Tracking and Traceability

Performance Pipe polyethylene gas distribution piping products are marked per ASTM D2513 and adhere to Department of Transportation regulations for plastic pipe (49 CFR Part 192, § 192.63). ASTM D2513 requires a 16-character code generated per ASTM F2897 to be legibly printed on pipe in both alpha-numeric and barcode form for tracking and traceability purposes. This 16-character code and corresponding barcode provides information that identifies Performance Pipe as the manufacturer, the specific production location, production run number, date, pipe or fitting type, and material grade.

Performance Characteristics

Cell Classification

ASTM D3350 *Standard Specification for Polyethylene Plastics Pipe and Fittings Materials* identifies polyethylene materials for pipe and fittings according to a cell classification system for six material properties considered important for polyethylene piping. The cell classifications for Performance Pipe's gas piping products are listed below. Additional information is provided in the product series Technical Data Sheets available at www.performancepipe.com.

TABLE 1: Cell Classifications

Performance Pipe Product Series	Material Designation Code	ASTM D3350 Cell Classification
DriscoPlex® 6500 Series MDPE Pipe	PE2708	234373E
Yellowstripe® 8300 Series HDPE Pipe	PE4710	445574C
Blackstripe® 8400 Series Yellow HDPE Pipe	PE4710	445574E

Long-Term Strength Classification – Hydrostatic Design Basis

The long-term strength of PE is determined by developing and analyzing stress versus time-to-rupture data in accordance with ASTM D2837 and the Plastics Pipe Institute (PPI) TR-3. The categorized result is the Hydrostatic Design Basis (HDB), which is used as the starting point for determining the design pressure rating for PE pipe. Performance Pipe's polyethylene piping products for gas distribution are listed with PPI in TR-4 and have recommended HDB ratings as seen in Table 3.

HDB by Temperature Interpolation

As with all thermoplastics, when operating temperature increases, pressure capacity decreases. Elevated temperature properties are used to determine product capabilities for applications where products will be exposed to elevated temperatures. The Hydrostatic Design Basis for polyethylene is typically established by testing at 73°F and 140°F. Intermediate HDB values are established per the interpolation protocol of PPI TR-3 D.2 *Policy for Determining Long-Term Strength (LTHS) By Temperature Interpolation*. HDB values as a function of temperature for Performance Pipe products are provided in Table 3.

Design Pressure

The following formula is used to compute the design pressures for 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.

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

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

Where:
P = Design Pressure in pounds per square inch gauge (psig).
S = Hydrostatic Design Basis psi, at pipeline operating temperature; See Table 3.
DF = Design Factor (specified in 49 CFR § 192.121); See Table 4.
DR = Standard Dimension Ratio

TABLE 2: Hydrostatic Design Basis (psi)

Performance Pipe Product Series	73°F PPI Listed Value	100°F Interpolated	120°F Interpolated	140°F PPI Listed Value
DriscoPlex® 6500 Series MDPE Pipe	1250	1000	1000	800
Yellowstripe® 8300 Series HDPE Pipe	1600	1250	1000	1000
Blackstripe® 8400 Series Yellow HDPE Pipe	1600	1250	1000	1000

TABLE 3: Design Service Factor by Application

Application	Design (service) Factor, DF
Gas distribution and transmission per 49 CFR Part 192, ≤24" pipe meeting minimum wall thickness requirements per § 192.121 and produced after January 22, 2019.	0.40
Gas distribution and transmission per 49 CFR Part 192, for pipe not meeting the requirements for a 0.40 DF per § 192.121	0.32

Design Pressure Ratings

The Pipeline and Hazardous Materials Safety Administration (PHMSA) is the U.S. Department of Transportation agency that oversees the Federal regulatory process for jurisdictional gas pipelines. Federal regulations for gas pipelines are in 49 CFR Part 192. § 192.121 allows the use of a design factor of 0.40 to calculate the design pressure rating for PE2708 and PE4710 pipes sizes 24" IPS and smaller meeting certain minimum wall thickness requirements and manufactured after January 22, 2019.

The following table uses the design factors as specified by § 192.121. 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).

TABLE 4: Maximum Design Pressure Ratings

DriscoPlex® 6500 Series Pipe (Design Factor 0.40) PE2708					
Size(s)	Dimension Ratio (DR) / Wall Thickness (WT) [inches]	73°F (23°C) (*PSIG*)	100°F (38°C) (*PSIG*)	120°F (48°C) (*PSIG*)	140°F (60°C) (*PSIG*)
½" CTS	0.090" WT	125 †	125 †	125 †	108
1" CTS	0.099" WT	97	77	77	62
½" IPS	DR 9.33	120	96	96	77
1 ¼" IPS	DR 10.0	111	89	89	71
¾" IPS – 12" IPS	DR 11.0	100	80	80	64
3" IPS – 12" IPS	DR 11.5	95	76	76	61
4" IPS – 12" IPS	DR 13.5	80	64	64	51

† 49 CFR Part § 192.121 limits design pressure to 125 psig for pipe ≤24" IPS

TABLE 5: Maximum Design Pressure Ratings

Yellowstripe® 8300 Series Pipe and Blackstripe® 8400 Series Yellow HDPE Pipe (Design Factor 0.40) PE4710					
Size(s)	Dimension Ratio (DR) / Wall Thickness (WT) [inches]	73°F (23°C) (*PSIG*)	100°F (38°C) (*PSIG*)	120°F (48°C) (*PSIG*)	140°F (60°C) (*PSIG*)
½" CTS	0.090" WT	125 †	125 †	125 †	125 †
1" CTS	0.090" WT	89 ‡	70 ‡	56 ‡	56 ‡
½" IPS	0.101" WT	125 †	99	79	79
1 ¼" IPS	DR 9.33	125 †	120	96	96
¾" IPS – 12" IPS	DR 11.0	125 †	100	80	80
3" IPS – 12" IPS	DR 13.5	102	80	64	64
4" IPS – 12" IPS	DR 17	80	63	50	50

† 49 CFR Part § 192.121 limits design pressure to 125 psig for pipe ≤24" IPS

‡ Uses a Design Factor of 0.32; does not meet the size or wall requirement of 49 CFR Part § 192.121 for 0.40.

Liquid Hydrocarbon Effect on Pressure Ratings

Dry gaseous hydrocarbons have no adverse effect on the expected service life. Liquid hydrocarbons such as gasoline and gas condensates will permeate the wall and reduce hydrostatic strength, but do not degrade the material. Polyethylene pipe to be exposed to liquid hydrocarbons may require a reduction of the pipe's design pressure rating. Contact Performance Pipe for additional details.

Rapid Crack Propagation Resistance

Under certain conditions of pressure, temperature and other parameters, an initiated crack in a pressurized PE pipe can travel long distances very rapidly. This mode of fracture is referred to as Rapid Crack Propagation (RCP). Today's polyethylene pipe materials have a very high resistance to RCP. RCP resistance is evaluated by one of two tests to determine the critical pressure (P_C) which can propagate a crack at the test conditions. ISO 13478 test directly measures the full scale critical pressure ($P_{C,FS}$). ISO 13477 Small Scale Steady State (S4) test uses smaller, constrained samples and the result is correlated to the full-scale value by a factor. Performance Pipe's gas piping products have been tested to ISO 13477 and/or ISO13478 with exceptional RCP resistance.

TABLE 6: Rapid Crack Propagation Resistance

Performance Pipe Product Series		RCP $P_{C,FS}$ Tested at 0°C (32°F) [bar (psi)]
MDPE	**DriscoPlex® 6500 Series MDPE Pipe**	>8.5 (>123)[1]
HDPE	**Yellowstripe® 8300 Series HDPE Pipe**	>45.7 (>663)[2]
	Blackstripe® 8400 Series Yellow HDPE Pipe	

[1] RCP properties for Performance Pipe MDPE gas distribution piping determined by full scale test on 8 inch DR11 pipe. See Technical Note PP 842-TN for other sizes.

[2] RCP properties for Performance Pipe HDPE gas distribution piping determined based on S4 test data and correlation factor in ISO 13477. See product series technical data sheet for additional information.

Gas 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 American Gas Association (AGA) *Plastic Pipe Manual for Gas Service* lists the permeability of PE2708 polyethylene pipe to methane, the primary constituent of natural gas, as 4.2 x10-3. Using the AGA factor, one mile of 2" SDR 11 PE2708 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 an exception; some hydrogen-enriched natural gas may require further consideration. Contact Performance Pipe Technical Services for more information.

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.” Performance Pipe gas distribution 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 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 PE2708 or PE4710 and meeting the appropriate requirements of ASTM D2513.
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 hydro static strength measurements should be made in accordance with ASTM D2837.
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 re-vaporization of any propane condensates will usually occur. Experience with propane liquids in polyethylene shows that there is no cumulative effect of intermittent, short duration exposure of propane condensate in polyethylene. For additional information, see PPI Technical Report TR-22. Exposure to liquefied propane condensates for extended periods may affect joining.

Mercaptans

Mercaptans are a group of organic compounds containing a Sulfur-Hydrogen bond that have a distinct odor in small concentrations. Natural gas is an odorless hydrocarbon. Natural gas carriers and distributors add mercaptans to natural gas to warn of leaks and to alert the presence of natural gas atmospheres. New plastic pipes have the tendency to absorb mercaptans, causing the odor to fade or become faint. The effect is not long term and after a period of time the distinctive odor of mercaptan is readily detected when released.

Mercaptan enriched natural gas has the possibility of inducing a phenomenon known as “odor fatigue.” The condition can cause nasal passages to become saturated with the smell of gas over time, making it difficult to continue to detect the mercaptan odor.

Cautions and Additional Guidance

Performance Pipe can be safely used in many applications. However, as with any product, its safe use depends on observing product precautions. Below is a non-exclusive list of some precautions that should be observed when using Performance Pipe's gas pipe and fittings. The Resources page on our website contains the Performance Pipe technical documents referenced below, as well as other technical publications, and links to key industry resources.

Heat Fusion Joining

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

Additionally, the U.S. Department of Transportation's Code of Federal Regulations have very specific requirements for qualifying heat fusion procedures, operators, and inspectors.

For more information on the cautions, process, or qualifications surrounding heat fusion joining see:
PP 750 Heat Fusion Joining Procedures and Qualification Guide

Static Electricity

High static electricity charges can be associated with polyethylene piping products. Improper use of squeeze-off equipment and other procedures in the presence of flammable or explosive gasses can be extremely dangerous.

For more information see:
Technical Note PP 801-TN Polyethylene Pipe Squeeze-Off and *PP 901 Performance Pipe Field Handbook*

Weight/Unloading/ Handling/Storage

Performance Pipe polyethylene piping products are a light-weight alternative to other piping products, but their size, weight, and properties still require the use of proper equipment and techniques.

For more information see:
PP 901 Performance Pipe Field Handbook

Coiled Pipe

Coiled polyethylene pipe may contain energy as in a spring. Uncontrolled release, i.e., cutting of straps, can result in dangerous uncontrolled forces. All safety precautions and the proper equipment is required.

For more information see:
PP 901 Performance Pipe Field Handbook and *Technical Note 807-TN Large Diameter Coiled PE Pipe*

Underground Installation

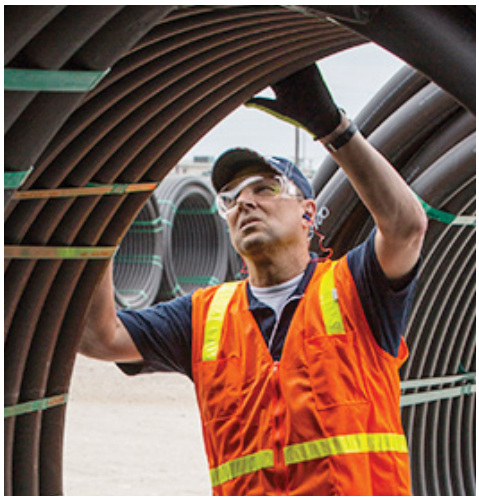
Below grade installation of polyethylene piping may sometimes require special considerations to protect the piping against shear and bending loads.

For more information see:
ASTM D2774, Underground Installation of Thermoplastic Pressure Piping and our *PP 901 Performance Pipe Field Handbook*

Leak Testing

When testing is required, fuel gas distribution systems should be tested in accordance with applicable codes, regulations, and distribution system operator procedures. Appropriate safety precautions must be taken. Take necessary actions such as pipe restraint against movement and eliminate hazards to personnel near lines being tested pipe in the event of catastrophic failure. Observe limitations of test pressure, temperature and test duration for all components of the piping section being tested.

Additional information on testing with air see:
ASTM F2786, Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Gaseous Testing Media Under Pressure (Pneumatic Leak Testing)




PERFORMANCE PIPE
care

For more information

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