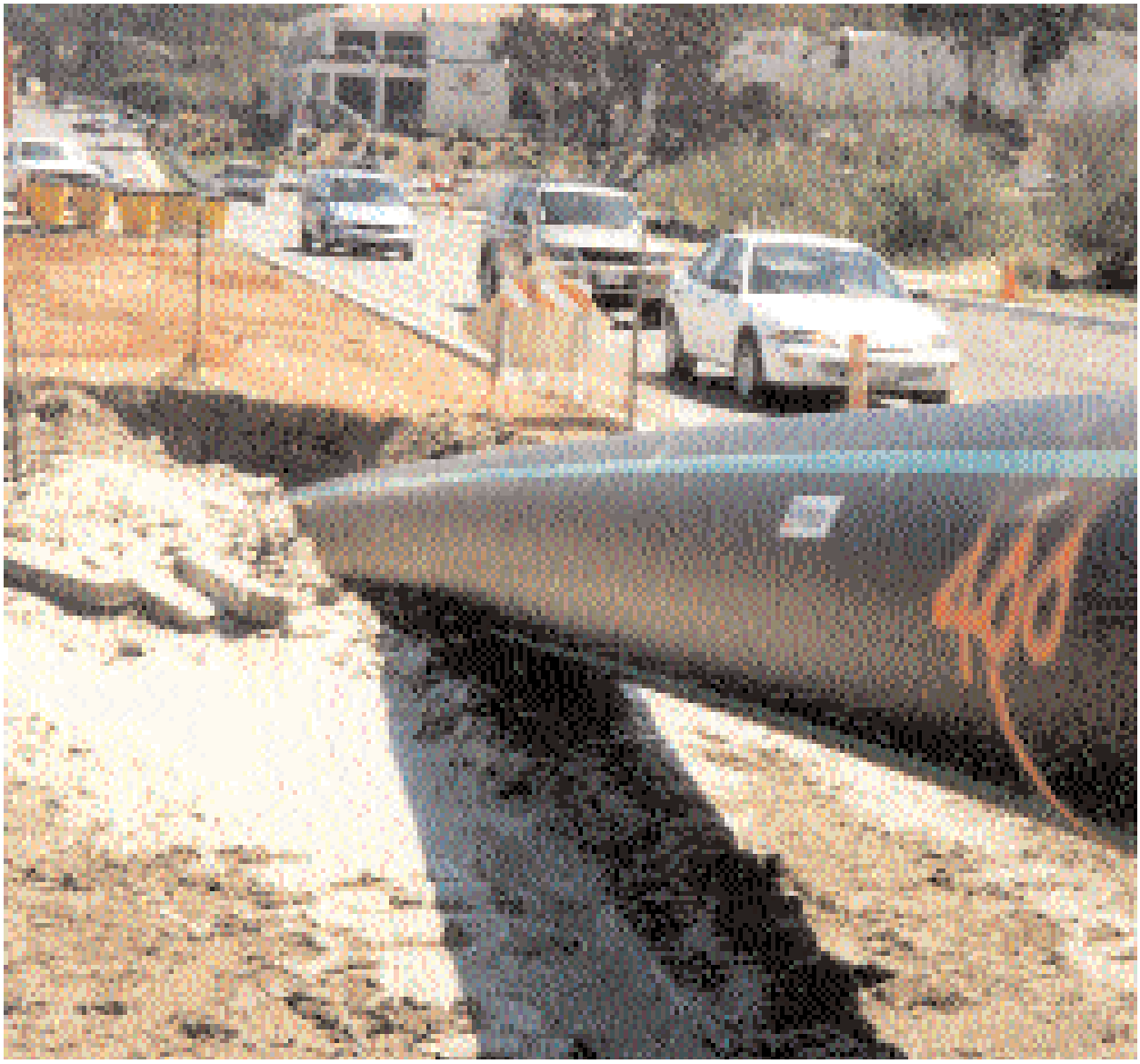
PERFORMANCE PIPE

A DIVISION OF CHEVRON PHILLIPS CHEMICAL COMPANY LP

Polyethylene Piping for Municipal & Industrial Sewer



Bulletin: PP 502

DRISCOPLEX™ Polyethylene Piping for Municipal & Industrial Sewer
Sewer Rehabilitation
Odor Control

DRISCOPLEX™ Polyethylene Piping for Municipal & Industrial Sewer Sewer Rehabilitation Odor Control

Performance Pipe

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

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

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

NOTICE - This publication is intended for use as a guide to support the designer of piping systems. It is not intended to be used as installation instructions, and should not be used in place of the advice of a professional engineer. It does not constitute a guarantee or warranty for piping installations. Performance Pipe has made every reasonable effort to ensure the accuracy of this publication, but it may not provide all necessary information, particularly with respect to special or unusual applications. This publication may be changed from time to time without notice. Contact Performance Pipe to determine if you have the most current edition.

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A Commitment to Performance and Quality

Municipal and industrial sewer and sewer rehabilitation applications demand high quality, high performance and durability to protect the environment, minimize costs, reduce maintenance and provide long-term, trouble-free service. Performance Pipe DriscoPlex™ piping products are manufactured from engineered polyethylene materials that provide a balance of properties for strength, toughness, flexibility, wear resistance, chemical resistance and durability. DriscoPlex™ piping products have excellent hydraulics for low resistance to fluid flows even at high flow velocities, and resilience for outstanding tolerance to pressure surge and water hammer. DriscoPlex™ piping products may be joined by many conventional methods, however the preferred joining method for most products is by heat fusion. Properly made heat fusion joints provide leak-tight connections that are as strong as the pipe itself.

DRISCOPLEX™ Polyethylene Piping Products

Municipal and industrial sewer applications require piping systems that are capable of handling hydrogen sulfide gas, shifting or hot soils, frequent pressure surges, chemicals that may be acidic or caustic and varying pH levels. DriscoPlex™ polyethylene piping products are manufactured from polyethylene materials that are engineered to provide balanced properties for strength, toughness, flexibility, wear resistance, chemical resistance and durability. In addition, DriscoPlex™ piping products help protect the environment, minimize costs, reduce maintenance and provide long-term, trouble-free service with excellent hydraulics, outstanding tolerance to pressure surge and water hammer, and heat fusion joints that provide zero-leak connections that are as strong as the pipe itself.

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Table 1 DRISCOPLEX™ Piping Products for Municipal and Industrial Sewer Applications

Typical Markets for Pipe and Fittings	DRISCOPLEX™ Piping Product	Typical Features	Previous Designations	
			Former Plexco Product	Former Driscopipe Product
Industrial Sewer, Municipal Sanitary Sewer	DRISCOPLEX™ 4200 pipe	1, 5, 6	GREENSTRIPE™ (IPS)	4200 GREENSHELL (IPS)
	DRISCOPLEX™ 4300 pipe	3, 4, 6	GREENSTRIPE™ (DIPS)	4300 GREENSHELL (DIPS)
	DRISCOPLEX™ 2000 SPIROLITE® pipe	7	SPIROLITE®	–
Treated/Reclaimed Water	DRISCOPLEX™ 4400 pipe	1, 5, 8	PURPLESTRIPE™ (IPS)	4400 LAVENDERSHELL (IPS)
	DRISCOPLEX™ 4500 pipe	3, 4, 8	PURPLESTRIPE™ (DIPS)	4500 LAVENDERSHELL (DIPS)
Sliplining	DRISCOPLEX™ 4600 pipe	1, 9, 11	PLEXVUE® (IPS)	–
	DRISCOPLEX™ 4700 pipe	3, 4, 9, 13	PLEXVUE® (DIPS)	–
	DRISCOPLEX™ 1200 pipe	1, 10, 11	–	1200 OPTICORE (IPS)
	DRISCOPLEX™ 1400 pipe	3, 10	–	1400 OPTICORE (DIPS)
Industrial & Specialty	DRISCOPLEX™ 1000 pipe	1, 15	EHMW	1000
Perforated Pipe	DRISCOPLEX™ 1900 pipe	1, 2	EHMW Perforated Pipe	–
Manholes, Structures, Tanks	DRISCOPLEX™ 2000 pipe	14	Manholes, Structures, Tanks	–
Industrial	DRISCOPLEX™ 8700 pipe	1, 12	EHMW	8700

NOTICE. *Capabilities vary from manufacturing plant to manufacturing plant. Contact Performance Pipe to determine the availability of specific products and the availability of particular stripe or shell colors, striping patterns, and IPS or DIPS sizing.*

Legend for Typical Features:

1. IPS sizing system.
2. Various perforation patterns are available.
3. DIPS sizing system.
4. The standard DIPS longitudinal color stripe pattern is three equally spaced pairs of color stripes extruded into the pipe OD.
6. Green color stripes standard. Green color shell available on special order.
7. RSC 40-160 in 18" – 120" ID sizes in open or closed profile.
8. Purple color stripes standard. Lavender color shell available on special order.
11. Custom wall thickness and diameter available on special order.
12. PE 3408/PE100 material.
13. Green color stripes standard.
14. Manholes, tanks and special structures made from DRISCOPLEX™ 2000 SPIROLITE® and DRISCOPLEX™ PE 3408 piping

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Table 2 Typical Markets, Applications and Uses for DRISCOPLEX™ M & I Sewer Piping Products

Market	Typical Applications and Uses
Municipal and Industrial	Temporary Bypass Pumping – River, Lake and Reservoir Crossings– Odor Control –– Outfalls and Diffusers –Chemical and Corrosive Wastes – Leachate Control Systems – Fabricated Fittings and Custom Fabrications – Manholes, Tanks, Structures, Catch Basins– Pipeline Rehabilitation
Perforated Pipe	Aeration Systems –Leachate Collection – Drainage and Waste Disposal Absorption Fields – Odor Control
Sanitary Sewer	Gravity Sanitary Sewer Mains – Sanitary Sewer Forced Mains – Odor Control – Temporary Bypass Pumping – Dewatering – Storm Drains – Directional Drilling – Chipper Systems
Treated/Reclaimed Water	Raw Water Systems – Outfalls and Diffusers
Liner Pipe	Pipeline Rehabilitation – Tight-Fitting Liners – Casing for Insulated Pipe
Manholes, Tanks, Structures	Municipal Sanitary Sewers – Industrial Sewers – Landfill Leachate Control Systems – Chemicals and Corrosive Wastes – Odor Control

DRISCOPLEX™ Piping Performance Characteristics

DriscoPlex™ OD-controlled polyethylene piping products for M & I sewer applications are manufactured to applicable ASTM and international standards in sizes from 1/2" through 54" (16 mm through 1400 mm). Depending upon size, fittings are molded or fabricated. DriscoPlex™ piping products are manufactured from engineered polyethylene piping materials.

- For long-term service in pressure piping applications, Performance Pipe™ PE 3408 piping materials are PPI Listed with HDB ratings of 1600 psi at 73ºF (11.03 MPa at 23ºC).
- Performance Pipe™ PE 3408 piping materials meet ASTM D 3350 as Grade PE34 with Cell Classifications 345464C (black) or 345464E (non-black & color).
- Performance Pipe™ PE 3408 piping materials are high-density, extra-high molecular weight.
- Join by butt fusion, saddle fusion, socket fusion, electrofusion and mechanical connections that are designed for PE pipe.

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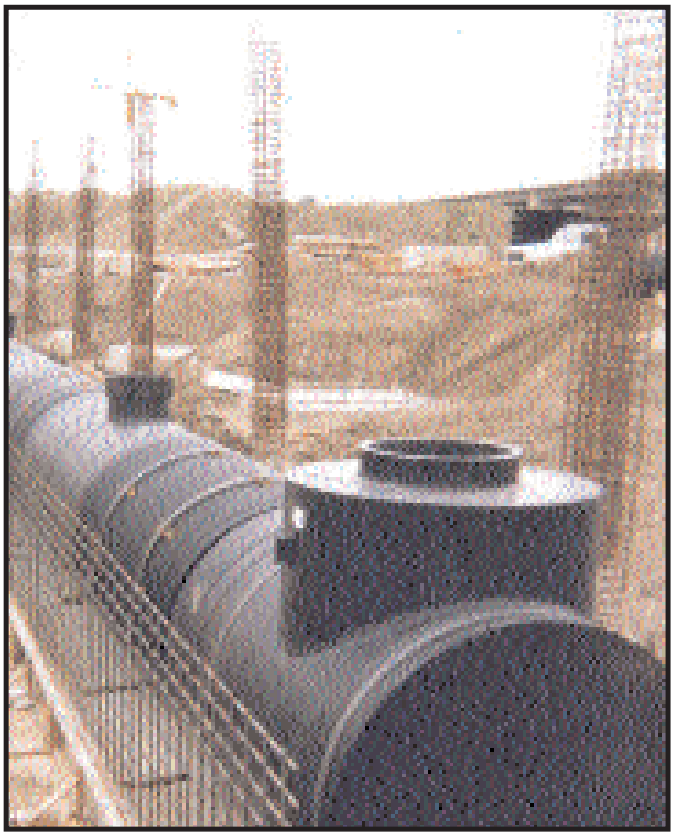
DriscoPlex™ 2000 SPIROLITE® pipe is manufactured to controlled inside diameter sizes from 18" through 120". The profile wall design of DriscoPlex™ 2000 SPIROLITE® pipe offers a truly cost competitive alternative to traditional piping systems for underground gravity flow and non-pressure applications. DriscoPlex™ 2000 SPIROLITE® piping is joined using an integral gasketed spigot and bell connection.



- DriscoPlex™ 2000 SPIROLITE® HDPE pipe materials meet ASTM D 3350 Grade PE34 and Cell Classification 335444C.
- Lightweight DriscoPlex™ 2000 SPIROLITE® pipe is manufactured in accordance with ASTM F 894 *Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain* in standard profile designs from RSC 40 through RSC 160.
- Gasketed-spigot-and-bell joints meet ASTM D 3212.

DriscoPlex™ 2000 Manholes are manufactured to customer specifications in accordance with ASTM F 1759 design requirements. Special deep burial constructions are available. DriscoPlex™ 2000 Tanks are available in horizontal and vertical designs. DriscoPlex™ 2000 Structures are manufactured to customer design and specifications. Manholes, tanks and structures are typically used for underground, non-pressure applications. Refer to *Bulletin: PP 516 DriscoPlex™ 2000 Series Spirolite® Pipe Brochure* for additional information.

Color and Color Coding

DriscoPlex™ 4600, DriscoPlex™ 4700, DriscoPlex™ 1200 and DriscoPlex™ 1400 are custom extruded to enhance light reflection for internal video inspection. DriscoPlex™ 4600 and DriscoPlex™ 4700 are made using a light-gray color material; DriscoPlex™ 1200 and DriscoPlex™ 1400 have a thin sheath of light-gray material extruded into the pipe ID.

Color-coding has become the preferred way to identify differences among piping services. For identification that is as permanent as the pipe, striped pipe has color stripes extruded into the pipe outer surface. Color shell pipe has a thin shell of color material extruded into the outer pipe surface. Colors are in accordance with the APWA/ULCC Uniform Color Code - green stripes or a green OD shell identify sewage; purple stripes or a lavender OD shell identify raw, treated or reclaimed water.

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For striped pipe, IPS or DIPS sizing systems are identified by the stripe pattern. The standard stripe pattern for IPS pipes is four equally spaced longitudinal color stripes extruded into the pipe OD. The standard stripe pattern for DIPS pipes is three equally spaced pairs of longitudinal stripes extruded into the pipe OD.

Installation Techniques

DriscoPlex™ piping for municipal and industrial sewer applications may be directly buried, planted, directionally drilled, submerged, or laid on the surface. Rehabilitation of existing lines with Performance Pipe™ HDPE can be achieved by sliplining, pipe bursting and various proprietary rehabilitation techniques. Additional information on piping design and installation is available in the *Performance Pipe Engineering Manual.*

Direct Burial

Butt fusing the pipe into long strings, and then placing the pipe in the trench achieves rapid open cut installation of DriscoPlex™ polyethylene piping. The trench need only be wide enough to place and compact backfill. See the *Performance Pipe Engineering Manual* for information about design requirements for buried piping. Pressure pipes should be installed in accordance with ASTM D 2774 *Standard Practice for Underground Installation of Thermoplastic Pressure Piping*, and non-pressure pipes in accordance with ASTM D 2321 *Standard Practice for underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications*. Depending upon the dimension ratio, DriscoPlex™ pipe may be cold-bent as tight as 20-40 times the pipe diameter, thus reducing or even eliminating the need for elbows at bends. (See the *Performance Pipe Engineering Manual for information*.)

Figure 1 Trench Construction and Terms

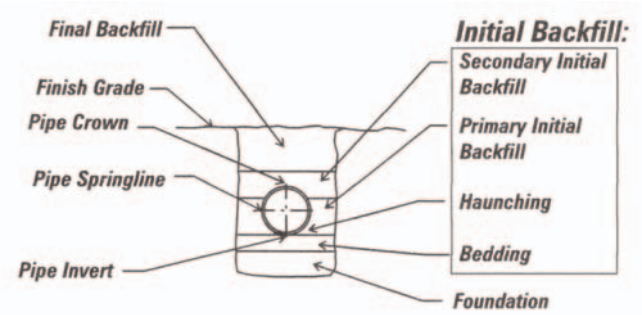

Table 3 Minimum Trench Width

Nominal Pipe OD, in	*Minimum Trench Width, in*	*Clearance Between Parallel Pipes, in*
< 3	12	4
3 – 16	Pipe OD + 12	6
> 16 – 34	Pipe OD + 18	9
> 34 – 63	Pipe OD + 24	12
> 63	Pipe OD + 36	18

Plowing, Planting

When Performance Pipe™ HDPE pipe is to be installed in right-of-ways along roads, or in open fields, plowing or planting may be utilized to increase installation productivity. These techniques are often used with smaller diameter pipes where the area and soils are suitable. DriscoPlex™ pipe is fed directly into a trench that is cut using equipment such as a plow, chain trencher, or wheel trencher. Trenching equipment that cuts a trench with a rounded bottom to match the pipe diameter contour can minimize trench width.

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Horizontal Directional Drilling

DriscoPlex™ polyethylene piping is a material of choice for trenchless installations such as horizontal directional drilling. Flexibility, fused joints that are as strong as the pipe and excellent tensile strength make it well suited for HDD applications. Horizontal directional drilling uses directional drilling techniques to guide a drill string along a borepath under obstacles such as rivers, lakes or highways. Horizontal directional drilling may be used to install a casing or to directly install long strings of OD controlled pipe. (HDD installation is not recommended for gasketed spigot and bell joint DriscoPlex™ 2000 SPIROLITE® pipe).

As the hole is bored, a steel drill string is extended behind a cutting head. Drilling mud is used to cool the cutter, to flush excavated soil from the borehole and to lubricate the borehole. At the end of the borepath, the drill string is angled upwards and through the surface. The cutting head is removed and a backreamer attached. The pipe string is attached to the backreamer through a weak-link device. As the drill string is withdrawn to the drilling rig, the backreamer enlarges the borehole and the pipe string is drawn in. As with any pipe pulling technique, the movement of the drill string and the pipe string must be monitored. The pulling load on the polyethylene pipe must not exceed the allowable tensile load, or safe pull strength, of the pipe. See Performance Pipe Technical Note PP-800-TN *Horizontal Directional Drilling (Guided Boring)* with DriscoPlex™ Pipe and ASTM F 1962 *Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings* for additional information.

Horizontal directional drilling is most often used where open cut installations are not feasible such as road and river crossings. For road or driveway crossings, this method can often be more economical than open cut because surface restoration is reduced and there is less traffic disruption. Recent advances in drilling and locating equipment combined with experienced drill operators have spawned the installation of gravity sewer lines via directional drilling.

Submerged

DriscoPlex™ piping can be installed as a submerged line. Its flexibility, butt-fused joints as strong as the pipe and corrosion resistance make it an excellent choice for submerged installations. DriscoPlex™ piping is lightweight and requires anti-flotation ballast, weights or anchors. Submerged crossings with DriscoPlex™ piping can often be an economical alternative to traditional pipe materials or other installation methods.

Sliplining

Often called the grandfather of trenchless technologies, sliplining has been performed since the 1960's. In sliplining rehabilitation, a smaller diameter DriscoPlex™ slipliner pipe is installed in the ID of the host pipe.

Table 4 Comparative Flows* for Slipliners

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Compared to open-cut replacement, sliplining rehabilitation can be very economical where the host pipe retains sufficient structural integrity, but fails to adequately contain internal fluids or exclude groundwater. Although the rehabilitated system has a smaller diameter than the original pipe, the exceptional flow characteristics of DriscoPlex™ piping typically provide comparable and occasionally even greater flow capacity. Table 4 provides comparative flows for clay and concrete pipes rehabilitated by sliplining with DriscoPlex™ piping.

Existing Sewer ID, in	Liner OD, in.	Liner DR 32.5			Liner DR 26			Liner DR 21			Liner DR 17		
		Liner ID, in.**	% flow vs. concrete	% flow vs. clay	Liner ID, in.**	% flow vs. concrete	% flow vs. clay	Liner ID, in.**	% flow vs. concrete	% flow vs. clay	Liner ID, in.**	% flow vs. concrete	% flow vs. clay
4	3.500	3.272	97.5%	84.5%	3.215	93.0%	80.6%	3.147	87.9%	76.2%	3.064	81.8%	70.9%
6	4.500	4.206	64.6%	56.0%	4.133	61.7%	53.5%	4.046	58.3%	50.5%	3.939	54.3%	47.0%
6	5.375	5.024	103.8%	90.0%	4.937	99.1%	85.9%	4.832	93.6%	81.1%	4.705	87.1%	75.5%
8	6.625	6.193	84.2%	73.0%	6.085	80.3%	69.6%	5.956	75.9%	65.8%	5.799	70.7%	61.2%
8	7.125	6.660	102.2%	88.6%	6.544	97.5%	84.5%	6.406	92.1%	79.9%	6.236	85.8%	74.4%
10	8.625	8.062	93.8%	81.3%	7.922	89.5%	77.6%	7.754	84.6%	73.3%	7.549	78.8%	68.3%
12	10.750	10.049	103.8%	90.0%	9.873	99.1%	85.9%	9.665	93.6%	81.1%	9.409	87.1%	75.5%
15	12.750	11.918	90.3%	78.2%	11.710	86.1%	74.6%	11.463	81.4%	70.5%	11.160	75.7%	65.6%
15	13.375	12.503	102.5%	88.9%	12.284	97.8%	84.8%	12.025	92.4%	80.1%	11.707	86.1%	74.6%
16	14.000	13.087	97.5%	84.5%	12.858	93.0%	80.6%	12.587	87.9%	76.2%	12.254	81.8%	70.9%
18	16.000	14.956	101.7%	88.1%	14.695	97.0%	84.1%	14.385	91.7%	79.4%	14.005	85.3%	74.0%
21	18.000	16.826	92.3%	80.0%	16.532	88.1%	76.3%	16.183	83.2%	72.1%	15.755	77.5%	67.1%
24	20.000	18.695	85.6%	74.2%	18.369	81.7%	70.8%	17.981	77.2%	66.9%	17.506	71.9%	62.3%
24	22.000	20.565	110.4%	95.7%	20.206	105.3%	91.3%	19.779	99.5%	86.2%	19.256	92.6%	80.3%
27	24.000	22.434	101.7%	88.1%	22.043	97.0%	84.1%	21.577	91.7%	79.4%	21.007	85.3%	74.0%
30	28.000	26.174	115.8%	100.4%	25.717	110.5%	95.8%	25.173	104.4%	90.5%	24.508	97.2%	84.2%
33	30.000	28.043	108.0%	93.6%	27.554	103.0%	89.3%	26.971	97.3%	84.3%	26.259	90.6%	78.5%
36	32.000	29.913	101.7%	88.1%	29.391	97.0%	84.1%	28.770	91.7%	79.4%	28.009	85.3%	74.0%
36	34.000	31.782	119.5%	103.6%	31.228	114.1%	98.9%	30.568	107.7%	93.4%	29.760	100.3%	86.9%
42	36.000	33.652	92.3%	80.0%	33.065	88.1%	76.3%	32.366	83.2%	72.1%	31.511	77.5%	67.1%
48	42.000	39.260	97.5%	84.5%	38.575	93.0%	80.6%	37.760	87.9%	76.2%	36.762	81.8%	70.9%
54	48.000	44.869	101.7%	88.1%	44.086	97.0%	84.1%	43.154	91.7%	79.4%	42.014	85.3%	74.0%
60	54.000	50.478	105.1%	91.1%	49.597	100.3%	86.9%	48.549	94.8%	82.1%	47.266	88.2%	76.5%

* Flow % = Q_P/Q_C x 100; n = 0.009 for PE; n = 0.015 for new concrete; n = 0.013 for new clay. ** Approximate ID calculated using minimum wall thickness + 6%.

Sliplining installations may be subject to thermal length changes and should be designed with a minimum of 10% clearance between the liner OD and the host pipe bore. Thin wall sewer liners may collapse if external hydrostatic load due to high water table or flood conditions is too high. Resistance to collapse from external hydrostatic load may determine the minimum wall thickness for the slipliner. See Table 5.

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Table 5 Maximum Recommended Water Height Above Slipliner

Service Temperature, °F	*DR*	*Height of Water Above Slipliner**	
		50 Years	*42 Days*
60	17	16.0 ft	24.9 ft
	21	8.2 ft	12.8 ft
	26	4.2 ft	6.5 ft
	32.5	2.1 ft	3.3 ft
73	17	15.1 ft	23.5 ft
	21	7.7 ft	12.0 ft
	26	4.0 ft	6.1 ft
	32.5	2.0 ft	3.1 ft

* Values are for a non-grouted slipliner with clearance to host pipe ID, and include a 2 to 1 safety factor and 3% ovality. See the *Performance Pipe Engineering Manual* for additional information. .

Figure 2 (on the following page) illustrates sanitary sewer sliplining. Before sliplining, the sewer must be cleaned and cleared of roots and debris. Video inspection can assist with the location of service connections, offsets and structural deterioration. In general, service connections; the pulling pit, badly deteriorated areas and significant offsets will require excavation. Manhole locations are commonly used as pulling pit locations. For more information, see ASTM F 585 *Standard Practice for Insertion of Flexible Polyethylene Pipe Into Existing Sewers* and the *Performance Pipe Engineering Manual*.

Pipe Bursting and Proprietary Trenchless Rehabilitation Techniques

In pipe bursting, a bursting head is attached to a polyethylene pipe string. When pulled into the host pipe, the bursting head breaks the host pipe into pieces, enlarges the hole and installs the new pipe. Pipe bursting can provide increased capacity where the host pipe can be used as a guide path to install a larger pipe. Since the original host pipe is destroyed during installation, the new pipe must be structurally designed for the necessary static and dynamic loads. Pipe bursting is limited to host pipes that can be fractured and appropriate soil conditions.

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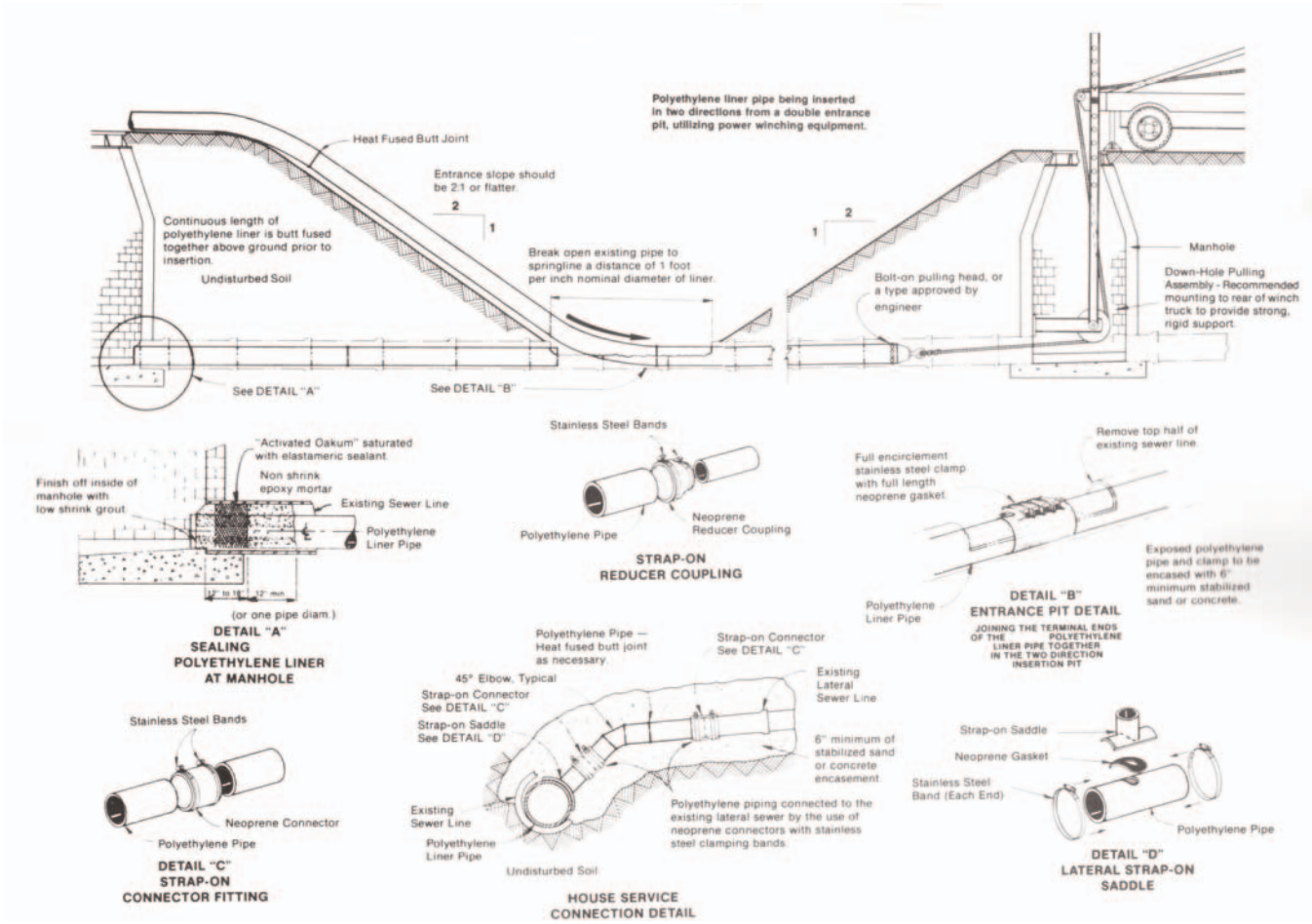
A number of proprietary techniques use polyethylene pipe to rehabilitate a deteriorated or partially deteriorated host pipe. Tight-fitting liner techniques generally employ a mechanical means to temporarily reduce the diameter of the liner by swaging, rolling-down, or deforming. The liner is pulled into the host pipe, and then expanded to fit closely to the host pipe inside diameter. The liner restores leak tightness, but the condition of the host pipe determines the structural integrity of the rehabilitated pipeline.

Figure 2 Sliplining Sewer Rehabilitation with DRISCOPLEX™ Polyethylene Pipe



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Fluid Flows

The inside surface of DriscoPlex™ polyethylene pipe is both hydraulically smooth and non-wetting. To estimate flows using the Manning equation, a Manning roughness coefficient of 0.009 is used for new and higher velocity applications. In low velocity sewer systems where sedimentation and deposition may occur over time and reduce flows, a Manning roughness coefficient of about 0.011 may be used. Occasional high velocity flows; however, can help restore original flow characteristics. Where velocities are above 2-3 ft per sec, sedimentation and deposition are unlikely and flow characteristics typically remain at original levels.

Pressure flows of water and water-like fluids may be estimated with the Hazen-Williams formula. Values of the Hazen-Williams C-factor range from 150 to 160 for DriscoPlex™ polyethylene pipe with values from 150 to 155 being used for conservative flow estimates. For fluid flow estimates using Darcy-Weisbach, Colebrook and Moody methods, an absolute roughness of 5×10^{-5} ft is recommended. See the *Performance Pipe Engineering Manual* for additional information on fluid flow.

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Cautions

Observe all local, state and federal codes and regulations, and general handling, installation, construction and operating safety precautions. The following are some additional precautions that should be observed when using Performance Pipe polyethylene piping products.

Fusion and Joining

During heat fusion, equipment and products can exceed 400°F (204°C). Take care 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.

Performance Pipe polyethylene piping products cannot be joined with adhesive or solvent cement. Pipe-thread joining and joining by hot air (gas) welding or extrusion welding techniques are not recommended for pressure service.

Liquid hydrocarbon permeation may occur when liquid hydrocarbons are present in the pipe, or where soil surrounding the pipe is contaminated with liquid hydrocarbons. Permeated polyethylene pipe should be joined using suitable mechanical connections because fusion joining to liquid hydrocarbon permeated pipes may result in a low strength joint. Mechanical fittings must be installed in accordance with the fitting manufacturer's instructions. Obtain these instructions from the fitting manufacturer. See *Performance Pipe Bulletin PP 750 and the Performance Pipe Engineering Manual.*

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Weight, Unloading and Handling

Although polyethylene piping is lightweight compared to some other piping products, significant weight may be involved. Move polyethylene piping with proper handling and lifting equipment. Use fabric slings. 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. Improper handling or abuse can damage piping and compromise system performance or cause injury or property damage. ***Obtain and observe the handling instructions provided by the delivery driver.***

Striking the pipe with an instrument such as a hammer may result in uncontrolled rebound. Store DriscoPlex™ products so that the potential for damage or injury is minimized. See the *Performance Pipe Engineering Manual.*

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Testing

When testing is required, 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

Where a polyethylene branch or service pipe is joined to a branch fitting and where pipes enter or exit casings or walls, structural support such as properly placed, compacted backfill and a protective sleeve should be used. Whether or not a protective sleeve is installed, the area surrounding the connection must be structurally supported by embedment in properly placed compacted backfill or other means to protect the polyethylene pipe against shear and bending loads. See the *Performance Pipe Engineering Manual and ASTM D 2774.*

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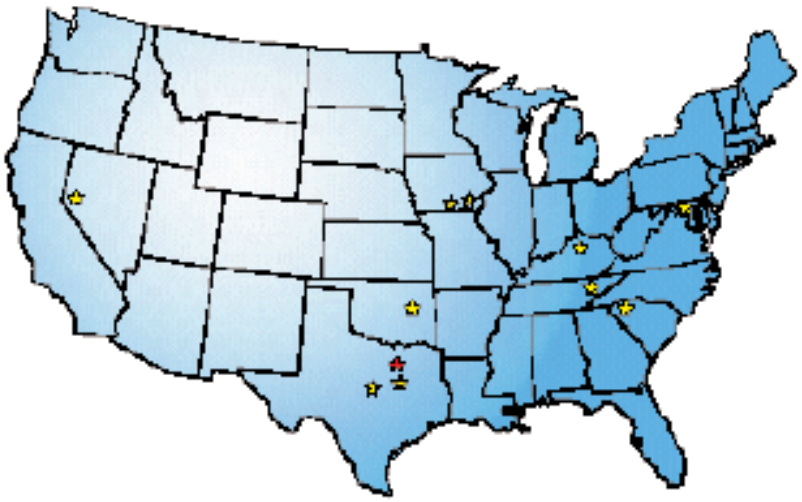
PERFORMANCE PIPE PLANTS



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PERFORMANCE PIPE
Product Literature

Technical Notes & Bulletins*:

Bulletin: PP 109	DriscoPlex™ PE 3408 Piping Systems Data Sheet
Bulletin: PP 110	DriscoPlex™ 2000 Series Spirolite® Pipe Data Sheet
Bulletin: PP 152	Municipal & Industrial Size and Dimension Sheet - IPS
Bulletin: PP 153	Municipal & Industrial Size and Dimension Sheet - DIPS
Bulletin: PP 501	Polyethylene Piping for Water Distribution and Transmission
Bulletin: PP 503	Polyethylene Piping Municipal and Industrial Applications
Bulletin: PP 109-DS	PE 3408 Data Sheet
Bulletin: PP 110-DS	Spirolite Data Sheet
Bulletin: PP 152	Municipal & Industrial Size and Dimension Sheet - IPS
Bulletin: PP 153	Municipal & Industrial Size and Dimension Sheet - DIPS
Bulletin: PP 750	Performance Pipe General Fusion Brochure
Bulletin: PP 900	Performance Pipe Engineering Manual

* Additional product literature will be available upon completion. Visit Performance Pipe on the web for the latest completed literature.