

Water and Wastewater Frequently Asked Questions

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Design

- ☐ What are the safe maximum and minimum burial depths for HDPE pipe?

Answer:

1. Safe burial depths vary and should be calculated. In lieu of calculations AWWA says that for an embedment soil with an E' of 1000 psi and no surface water, HDPE pipes with DR's ranging from 7.3 to 21 can be safely buried from a depth of 2 ft to 25 ft where no traffic load is present and from 3 ft to 25 ft where H²O live load is present.
2. Most pipes can be buried to deeper depths. Equations for calculating burial depth may be found in Chapter 6 of the [PPI Handbook of Polyethylene Pipe](#).

- ☐ Where can I find design manuals for HDPE pipe?

Answer: Design information for HDPE pipe is located on the [Download Page](#) of Performance Pipe's website. You will find links to Technical Notes, the *Engineering Manual*, and the *Field Handbook*. There is also a link to the *Plastics Pipe Institute's Handbook of Polyethylene Pipe*. Other resources include *AWWA Manual M-55* and various ASCE publications including *MOP 108 Pipeline Design for Horizontal Directional Drilling* and *MOP 112 Pipe Bursting Project*.

- ☐ Where can I find a table of dimensions including inside diameter, outside diameter, and wall thickness for PE pipe?

Answer: This information is given in the Size and Dimension Sheets, found in the [Submittals](#) section of our website.

- ☐ Do I need expansion joints for HDPE pipe?

Answer: Generally there are better ways to handle temperature change in an above grade or aerial pipeline than using expansion joints. See Technical Note [PP814, "Thermal Effects"](#). If an expansion joint is used, the joint should be specifically manufactured for use with HDPE pipe. Use of an improper expansion joint such as one designed for steel pipe could damage the PE pipe.

- ☐ Does Performance Pipe have a pipe calculation program?

Answer: Yes. PlexCalc[®] II will do many of the calculations that are in the Performance Pipe Engineering Manual and the PPI Handbook of Polyethylene Pipe. Use the [Questions and Feedback form](#) to order our literature on CD-Rom. The CD contains PlexCalc[®] II.

- ☐ Where do I find the pressure rating for PE pipe?

Answer: Pressure ratings are given in [PP401, Pressure Ratings for Municipal and Industrial Pipes](#) as well as on Size and Dimension Sheets for each specific product.

- ☐ Is thermal expansion or contraction a concern for HDPE pipelines?

Answer: Normally it is not a concern for buried municipal water or sewer pipelines. Soil will provide sufficient restraint against movement. However, thermal effects must be considered for above grade or

aerial pipelines. The unrestrained expansion/contraction coefficient for PE pipes is approximately 1×10^{-5} in/in/oF. See Technical Note [PP814 Thermal Effects](#) for more information.

Engineering Properties

- Does PE pipe tuberculate like DI pipe?

Answer: No. PE pipe does not tuberculate. Tuberculation is caused by ferrous seeking bacteria in iron, cast iron, or ductile iron pipes. PE is immune to this attack.

- How does PE pipe's capacity for recurring surge pressures (fatigue) compare to other pipes?

Answer: PE has exceptional capacity for handling recurring surge pressure. For instance, AWWA standards demonstrate that PE has resistance up to 150% of its pressure class under recurring surge pressure. Additionally, in a report on the cyclical fatigue strength of PVC and HDPE, Marshall and Brogden found that at a cyclical stress range of 10 Mpa (1450 psi), HDPE pipe reached 10,000,000 million cycles before failure.

- How do the hydraulic wear characteristics of PE pipe compare to steel?

Answer: An Army Corps of Engineers study reported that PE pipe wore at a rate of 3 to 5 times less than steel pipe in sand slurry. Best results are obtained with PE when the flow is turbulent to keep particles suspended. See Chapter 6 of the [PPI Handbook of PE Pipe](#) for slurry applications.

- How does the impact strength of PE compare with other pipes?

Answer:

- PE is a ductile material and has exceptional impact strength. As an example, AWWA publishes an Izod Impact resistance value of 10-12 ft-lbf/in for HDPE and of 0.65 ft-lbf/in. for PVC. PE superior impact strength provides a piping system that is near impervious to impact damage and to damage from improper tapping.
- In the real world, engineers understand that pipes must be tough and resist impact and handling damage. PE pipes are field tested and proven to be impact tough.

- Where can I find engineering properties such as the modulus and tensile strength for PE pipes?

Answer: Engineering data for HDPE and PE pipes may be found in Chapter 3 of the [Plastics Pipe Institute's Handbook of Polyethylene Pipe](#) which may be found at www.plasticpipe.org. Engineering information may also be found in the various Performance Pipe Technical Notes. Look on the [Download Page](#) for a link to Technical Notes.

General

- Why is a fusion joint better than a gasket joint?

Answer: A fusion joined pipeline may be thought of as a continuous pipeline without joints. On the other hand, gasket joints are a source of leakage and lost water in many water systems. Leaks may occur if the gasket is improperly installed, if dirt or grit sticks to the gasket, if the gasket is not properly lubricated, if negative pressure (vacuum) occurs in the pipeline, if ground movement or subtrench consolidation occurs, if significant thermal change occurs, or if gaskets are blown out due to surge pressures. Fused joints are generally considered superior to gasket joints for leak prevention.

- Is PE pipe a green solution for piping?

Answer: Yes. It is safe when manufactured, used, or incinerated. It helps preserve water and electricity as there is no water loss through its fused joints. No toxins are released during the creation or disposal of PE pipe.

- What does the acronym HDPE stand for?

Answer: HDPE stands for high density polyethylene.

- How does using PE pipe save money?

Answer: Aside from the low cost of PE pipe, long term savings may be realized due to PE pipe's fusion

joints and corrosion resistance. Leakage rates for fused PE systems are far lower than for gasket jointed DI or PVC systems. PE pipe is resistant to corrosion. It will not undergo tuberculation and is unaffected by "hot" soils or electrogalvanic corrosion, thus PE pipes last longer in the ground. Additional savings may be realized by trenchless installation. Go to www.PEpipe.org for more information.

- ☐ What do the terms DR and SDR mean?

Answer: DR stands for dimension ratio, which is the average outside diameter of a PE pipe divided by its minimum wall thickness. A standard dimension ratio (SDR) is a specific DR based on an ANSI preferred number series. The use of SDR's enables manufacturers to produce pipe to a set of standardized DR's. SDR's include 9, 11, 13.5, 17, 21, 26, and 32.5. All SDR's are DR's, but the converse is not true.

- ☐ Will trenchless installation save money over open cut trenching?

Answer: Yes. Every day more utilities realize the advantages of trenchless technology. More trenchless projects are being installed than in the past because of cost savings. Savings result from quicker installations, faster permitting and design time, fewer disruptions to business and residents, less damage to parks and trees, and less disturbance to road beds (and subsequent road repair).

Hydraulics

- ☐ What is the maximum flow velocity for HDPE?

Answer: In a pumped system, the maximum operating velocity is limited by the surge pressure capacity of the pipe. The Plastics Pipe Institute's Handbook of Polyethylene Pipe states that "if surge is not a consideration, water flow velocities exceeding 25 feet per second may be acceptable."

- ☐ What is the safe peak pressure (surge plus pumping) for HDPE?

Answer: AWWA C906 defines two types of surge pressure, recurring and occasional. The safe peak pressure or allowed total pressure for HDPE pipe is 1.5 times the pipe's pressure rating for recurring surge and 2.0 times the pipe's pressure rating for occasional surge. For instance a DR17 pipe which has a pressure rating of 100 psi can safely handle total pressure during recurring surge of 150 psi and total pressure during an occasional surge of 200 psi.

- ☐ How does surge pressure in HDPE pipe compare with DI or PVC pipe?

Answer: Surge pressures in HDPE pipe are significantly lower than in DI pipe and lower than PVC pipe due to the lower value of dynamic modulus for HDPE. For example, in a typical 8" line a velocity change of 5 fps would cause a 51 psi surge in HDPE DR17 pipe, a 87 psi surge in PVC DR18 pipe, and a 262 psi surge in DI Class 350 lined pipe. Lower surge pressures often mean longer life for pumps and valves in an HDPE pipeline, as well as lower pressure class pipes.

- ☐ Does the fusion bead affect flow?

Answer: No. The Hazen Williams C factor of 155 was determined with pipe that was fused together and thus contained inner fusion beads.

- ☐ How does the Hazen-Williams C factor for HDPE compare with DI pipe?

Answer: The C factor for HDPE butted fused pipe was found experimentally to be about 155. A conservative design value is 150. DI manufacturers publish an initial value of 140 for cement lined DI pipe. Many engineers assume that this value will be reduced over the life of a pipeline due to corrosion and use design values of 120 or 100. Such a reduction is not required for HDPE pipe. AWWA M-55 states that "No allowance for corrosion and therefore, no subsequent lowering of the flow capacity need be considered when using PE pipe."

Installation

- ☐ Can I pour concrete safely around HDPE pipe?

Answer: Yes.

- ☐ Does HDPE pipe require cathodic protection? Can it be installed in "hot" soils that attack metal pipe?

Answer: HDPE pipe does not undergo galvanic corrosion; therefore, it may be safely installed in hot soils

that would attack metal pipes without any cathodic protection.

- ☐ Are there hazardous vapors or fumes that come off of HDPE pipe when it is cut?

Answer: There are no hazardous fumes associated with the cutting of HDPE pipe.

- ☐ What is the bending radius of HDPE pipe?

Answer:

1. PE pipes can be safely bent to a radius about 1/10th that of the same size PVC pipe. See Performance Pipe Technical Note PP819, "Field Bending of DriscoPlex® Pipe".
2. HDPE pipe can be cold bent to the dimensions shown below for a long term application based on the pipe DR. (The pipes may be bent to a tighter radius during installation see Technical Note PP819)

Pipe DR	Minimum Long Term Cold Bending Radius
9 or less	20 times pipe OD
11 and 13.5	25 times pipe OD
15.5, 17, and 21	27 times pipe OD
26	34 times pipe OD
32.5	42 times pipe OD
41	52 times pipe OD
Fitting or flange present in bend	100 times pipe OD

- ☐ Can I install HDPE pipe with the same embedment used for PVC and DI pipe?

Answer: Yes. The same embedment materials are generally suitable; however, the specific parameters of the application may influence this somewhat. For instance, very high DR pipes in shallow cover subjected to a live load may require a higher level of compaction for the embedment material than required by a lower DR PE pipe or stiffer pipe.

- ☐ Are thrust blocks required with buried HDPE pipe?

Answer: No. When transitioning from an HDPE pipeline into a DI or PVC pipeline with unrestrained gasket joints, it is necessary to provide restraint. See Performance Pipe Technical Note [PP813 Mechanical Restraint and Poisson Effect](#) for details.

- ☐ How do I stack and store pipe on the job site?

Answer: See [Performance Pipe's Field Handbook](#) found under Engineering Information on the [Download Page](#). Information is also given in the [PPI Handbook of Polyethylene Pipe](#), Chapter 2.

- ☐ Will a surface scratch hurt my pipe?

Answer: AWWA M-55 states that "minor scratches or scuffing will not impair serviceability" and that "pipe with gouges or cuts in excess of 10 percent of the product wall should not normally be used."

- ☐ Where can I find the safe pull strength for HDPE pipe?

Answer: See Performance Pipe Technical Note [PP803, "Pull-in Applications"](#).

- ☐ What is the recommended test pressure and test procedure for HDPE pipe?

Answer: See Performance Pipe Technical Note [PP802, "Leak Testing"](#).

Joining

- ☐ Are heat fused pipe joints safe?

Answer:

1. Yes. Polyethylene pipe has been heat fused for almost fifty years in a wide range of service applications. The window of conditions that are acceptable for good quality fusion joints is broad, and the long term performance is documented in actual field applications as well as in long term testing. PE pipe joints are standardized through ASTM fusion procedures as well as recognized in AWWA, PPI, ASME, and other industry standards.
2. There are new technologies that attempt to mimic the advantages of PE fused joints for other pipe materials. However, these materials do not have the history, the proven performance, and the industry peer reviewed standardization of PE pipe fusion joints.

- ☐ Can solvent cement or adhesive be used to join HDPE pipe?

Answer: No. Heat fusion (which includes butt fusion, socket fusion, and electrofusion) and mechanical joints are the only permitted methods for joining HDPE pipe.

- ☐ How many joints can I make in a day?

Answer: Fusion time depends on the pipe size and DR as well as field conditions. Larger diameter and heavier wall pipes take longer to fuse as more time is required to heat and cool the pipe. For instance, 6" DR11 pipe might take 10 to 12 minutes including the time to allow the joint to cool under pressure.

- ☐ Where do I get the equipment to fuse HDPE pipes?

Answer: Manufacturers of fusion equipment include McElroy Manufacturing, Connectra Fusion Technologies, Ritmo America, and Wegner Welding. The equipment is readily available through distributors.

- ☐ Can I fuse and install HDPE pipe in sub-zero weather?

Answer: Yes. You have to protect the joint during cold weather fusion from wind, moisture, and blowing snow so that the heater plate uniformly heats the end of the pipes. Guidelines for cold weather fusion are given in [PP750, Heat Fusion Joining Procedures and Qualification Guide](#) found on the [Download Page](#).

- ☐ Where do I find information on fusing HDPE pipe?

Answer: ASTM F2620 addresses heat fusion of HDPE pipes. Also, see Performance Pipe [PP750, Heat Fusion Joining Procedures and Qualification Guide](#) for information on fusing DriscoPlex® pipe products. Fusion information on Performance Pipe historical products such as Driscopipe® and Plexco® pipe can be found on the [Download Page](#).

Manufacturing

- ☐ What fittings are available from Performance Pipe?

Answer: A complete line of molded PE fittings including tees and MJ adapters up to 8" IPS and molded PE flange adapters up to 18" are available from Performance Pipe. For more information, see our [Fittings](#) page. Additional fittings and sizes are available through other PE suppliers.

- ☐ Why are there two material codes (PE3408/3608 or PE3408/4710) printed on the side of my pipe?

Answer: In 2005, ASTM allowed the introduction of new codes for PE pipes. Prior to that time HDPE had a material designation code of PE3408. Under the new system, material with a PE3408 code is classified either as PE3608 or PE4710. To facilitate a smooth transition manufacturers are allowed to dual mark pipe as PE3408/3608 or PE3408/4710. For details on this transition, see Technical Note [PP816 PE3608 and PE4710 Materials Designation Codes and Pipe Pressure Ratings](#).

- ☐ What diameter pipe is available on a coil?

Answer: PE coils are available in diameter sizes up to 6". Typical coil lengths are 500 ft. and 1000ft. Availability varies with pipe diameter.

Mechanical

- ❑ Can I pig HDPE pipe?

Answer: Yes, a soft pig should be used.

- ❑ Can HDPE pipe be hot or cold tapped to install service connections with fittings presently available?

Answer: HDPE pipe can be cold or hot/wet (under pressure) tapped using piping products presently available. Saddle fusion tapping tees, electrofusion tapping tees, Fuse-A-Corps, and branch-saddles are readily available in the industry. There are also bolt-on mechanical connections qualified for use with HDPE pipelines as well.

- ❑ Can HDPE pipe be threaded?

Answer: No. Tapped threads are not recommended for use on PE. The industry standards for service taps to HDPE mains recommend the use of saddle fusion tapping tees, electrofusion tapping tees, Fuse-A-corps, branch-saddles, and certain metal mechanical clamps.

- ❑ If HDPE pipe is punctured, how is it repaired?

Answer:

1. When external third-party damage does occur, there are several repair methods. Punctures in PE pipe may be repaired using electrofusion repair saddles or mechanical repair clamps.
2. If the damage is sufficiently extensive that a pipe section must be removed, the pipe section may be replaced with a spool piece of the pipe connected on each end to the exiting pipe using mechanical fittings, electrofusion couplings, or flanged connections. Refer to the [PPI Handbook on HDPE Pipe Repair and Maintenance](#).

- ❑ What are some applications where an insert stiffener is required?

Answer: Insert stiffeners are normally used when inserting HDPE pipe into a PVC bell or DI MJ bell. The stiffener ensures compression of the gasket to the PE pipe. Stiffeners are also typically used in FM MJ adapters and in some large diameter MJ adapters. Check with the MJ adapter manufacturer for their specific recommendations.

- ❑ What type of equipment is used to insert stiffeners into large diameter HDPE pipe?

Answer: PE is considered to be a re-roundable pipe and the cold ring clamps of a McElroy fusion machine may be used to re-round larger pipe. When desired, expandable stiffeners are available. They can be inserted into the pipe and then expanded with a triangular wedge. Romac makes these for pipes up to 12". Cascade Waterworks sells these up to 20" DIPS.

- ❑ Can I use a butterfly valve on HDPE pipe?

Answer: Yes. For PE pipe, connections to butterfly valves are usually made with Beveled Flange Adapters. This prevents interference between the valve and the inside diameter of the pipe.

- ❑ How do I repair HDPE pipe if the ditch is full of water?

Answer: If the ditch can be dewatered and the pipe dried off, fusion repair may be used. Otherwise, a mechanical repair is recommended.

- ❑ Can a full body tapping saddle be used with HDPE pipe?

Answer:

Generally speaking, many saddle manufacturers have saddles/sleeves specifically made for use with HDPE pipe, and they are typically the same as those used with PVC pipe and sometimes the same as those used with ductile iron pipe. Service saddles often include double straps or extra wide straps and Belleville (spring) washers for use with HDPE pipe so that the tension on the strap remains constant once the nuts are properly torqued. As for tapping sleeves, some manufacturers such as JCM indicate that as long as it is a full sleeve in accordance with AWWA C110/111, it can be used on HDPE pipe. Check with

the manufacturer for specific information.

☒ How do I transition from PE pipe to DI valves or pipe?

Answer: The most common method is to use a PE MJ adapter to connect the PE pipe end in a DI MJ bell using the bolt and gland kit supplied by the PE MJ manufacturer. See Technical Note [PP812 MJ Adapter Connections](#) for more information. Connections may also be made using a flange adapter which is essentially a HDPE Van Stone style flange with a backup ring. See Technical Note [PP811 PE Flange Adapter](#) for details. DIPS sizes of HDPE pipe may be inserted directly into an MJ bell with a restraint ring and stiffener for the HDPE pipe. When jointing HDPE pipe to a DI pipeline either the DI joints must be restrained or the transition connection must be anchored. See Technical Note [PP813 Mechanical Restraints and Poisson Effects](#).

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