

Prime Conduit, Inc.

PVC Trenchless Raceway System

**FAQs - Frequently Asked
Questions**



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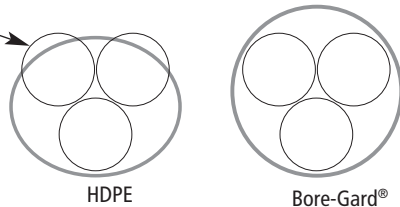
Negative Aspects of HDPE for Directional Drilling

Why choose Bore-Gard over 4" HDPE pipe for Directional Drilling?

HDPE is often wound on large reels that ovalize the pipe.

- Joining ends of HDPE pipe is difficult. The methods employed to join the ends range from metal couplings (the metal coupling's circular shape does not match the ovalized HDPE) to expensive fusing machinery.
- The ovality of HDPE pipe also reduces the number of inner ducts that can be placed inside the HDPE duct as seen below. In addition, when fusing two ends of conduit the ID is reduced due to an 1/8" high rib around the inside of the pipe. Both of these scenarios create obstructions for the cable or innerduct that is subsequently installed, shortening the distance per unit time of installation, raising installation cost.

Inner ducts do not fit



- Bore-Gard is made in straight PVC sections, not wrapped around a reel. Therefore, it does not become oval in cross section.
- Bore-Gard's joining system allows for a quick, water-tight joint. The joining of two sections of Bore-Gard takes about 15 seconds.
- Because Bore-Gard is made using standard Schedule 40 dimensions so it can be joined to standard Schedule 40 PVC fittings. This makes for simple connection to hand holes, man holes, and connecting to regular Schedule 40 pipe. This feature offers a fast, inexpensive joint.

The large, heavy reels of HDPE pipe are costly, difficult, and dangerous to handle.

- The reels containing HDPE pipe often weigh about 1,400 pounds, requiring special costly reel-handling trailers and equipment. When cutting the retaining bands that hold the HDPE on the reel, the conduit rapidly unwinds often causing injuries. Contractors have complained of broken noses and other bodily injuries from the HDPE reel bands.
- Connecting HDPE to the backreamer can also be very difficult because HDPE holds the circular shape of the reel. In order to connect to the backreamer, the conduit has to be laid flat. As many users know, trying to get large diameter HDPE to lie straight is almost impossible, especially in cold temperatures. To rectify this problem, many contractors hang the reel with a back hoe over the bore pit. Once the reel is in this position, the contractor will crawl under the reel and connect to the backreamer. If the chain holding the reel to the back hoe would ever break, the contractor would be seriously injured.
- HDPE comes in standard lengths on a reel. Typically, contractors will use 600' reels. When the quantity of HDPE remaining on a reel approaches 200 feet or less, the material is usually scrapped. The alternative is to use very time-consuming techniques previously discussed are used to join the remaining conduit to a new reel.
- Bore-Gard comes in straight 10 ft. and 20 ft. lengths that can be readily transported to and around the job site. As a result, there is virtually no scrap. Whatever materials are not used can simply be taken to future jobs.
- The rigid nature of Bore-Gard's PVC pipe does not create the potentially dangerous sprung energy when the product is banded, unlike HDPE on a reel.

HDPE necks down in diameter when the yield strength is reached.

- When pulled beyond the yield strength, because of its ductility, HDPE will stretch and reduce the inside diameter. A 4 inch nominal HDPE pipe can neck to a 2 inch diameter, significantly reducing the number of inner ducts that can be installed. The necking is only apparent when the inner ducts are subsequently installed. Many times the contractor who installs the ducts is not the same contractor that will install the inner ducts and copper or fiber cable.

The contractor who installs the cable may find that the space inside the conduit is not sufficient to install the specified number of cables or inner ducts. This leads to a logistical nightmare between the end users and the contractors installing the conduit and cable. It ultimately may result in a dig-up and replacement of the necked HDPE. Lastly, the reduced diameter ultimately increases the cost per unit length of the installation because fewer cables can be installed. This unnecessarily under-utilizes the conduit system.
- Bore-Gard rigid PVC pipe will not neck or stretch like HDPE. PVC is a much less ductile, more rigid material than HDPE. The yield point of the material is slightly lower than the ultimate failure point. This means that the pipe will break before it will demonstrate any noticeable necking. This is an advantage over HDPE because the PVC pipe failure will be obvious at the time the pipe is being installed, not a surprise later.

Negatives of Standard Schedule 40 PVC Conduit for Directional Drilling

Why choose Bore-Gard over Standard Schedule 40 PVC conduit?

- Standard Schedule 40 PVC pipe has to be glued together. For a secure joint that could be considered for installation via directional drilling, sufficient drying time is required. Because the quality and strength of the joint is so dependent on the gluing process, extra curing time is usually required. This can take up to 24 hours depending on the temperature and humidity, causing an unnecessary delay in the installation of the pipe.
- Bore-Gard offers a fast, strong, watertight joint without glue. No waiting is required. Just secure the locking ring in place and pull the pipe into the hole.
- Bore-Gard's engineered PVC compound offers superior strength characteristics when compared to standard Sch 40 PVC. Furthermore, the Bore-Gard coupling mechanism is 3 times stronger than the glued joint.

Pricing

Why is Bore-Gard priced higher than HDPE and Schedule 40 PVC?

- Bore-Gard is a highly engineered product designed to withstand the forces of directional drilling. Extensive lab and field testing was conducted to prove the design is structurally sound and will meet the necessary strength requirements. This results in minimizing time consumed by construction crews during installation on the job site.
- Extensive research was conducted on the manufacturing processes involved in producing Bore-Gard. Detailed process controls and packaging designs have been implemented to ensure integrity of the product from manufacturing to the arrival at a job site. Customers benefit from these efforts by getting a consistently high quality product in a timely manner.
- Each length of Bore-Gard incorporates a seal, locking ring, and a bell not offered in either HDPE or standard schedule 40 PVC pipe. The slightly higher product cost is soon recovered in reduced installation costs.

Sizes Available

What sizes is Bore-Gard offered?

Schedule 40 Bore-Gard is offered in 3, 4, 5, 6, and 8 inch diameters. Schedule 80 Bore-Gard is available in 2, 3, and 4 inch diameters. This maximizes the cable and inner duct fill of any boreable pipe product.

Maximum Distance

What is the maximum distance Bore-Gard can be directionally drilled?

- Bore-Gard 4 inch diameter pipe has been installed in bores ranging from 100 ft. to 1,000 ft. in length. There are many elements that contribute to a successful bore that largely dictate the distance a pipe can be pulled: soil conditions, bore path (number and qty of bend radii), fluid flow, water/drilling fluid makeup and chemistry, reamer diameter, pipe pull back rate, operator experience, equipment condition, duration of in-process down-time (which has a tendency to hydraulically lock the pipe in the bore), among others.
- An experienced drill rig operator will have the ability to pull considerably longer distances. A contractor in Georgia pulled a 4" Bore-Gard duct 1,500 feet. The longer the bore, the fewer manholes needed, the lower the overall installation cost.

Maximum Depth

How deep can Bore-Gard be installed?

- A seal rated for 75 psi that translates to more than 150 feet of water head. This is much deeper than many of the horizontal directional drilling jobs done today and offers excellent resistance to ingress of water during and after the pipe installation. This is achieved by the use of a unique triple-lobed low-profile rubber seal incorporated into the joint design.
- Bore-Gard is ETL Listed to UL651 (excluding 8") and has been tested to 80 psi per UL651's Pull Test (6.12.2.1) & Bend & Pull Test (6.12.2.2).
- The deepest bore to date was 65 feet under a canal and roadway. The 30-way duct bank was installed to supply the Indianapolis State Museum with power and fiber optic cables.

Agency Approvals

Is Bore-Gard ETL Listed?

Schedule 40 and 80 Bore-Gard is certified to UL651 by ETL (except 8"). The product will be marked the same as schedule 40 and 80 conduit. The ETL Listing allows the product to be used with electrical conductors as per NEC (National Electric Code) articles 352, 300.5, and 300.50. The ETL Control numbers are 51319 & 51320.

Is Bore-Gard CSA Certified?

Schedule 40 Bore-Gard is CSA Certified (except 8"). We are the first manufacturer of pipe to obtain this CSA Certification for directionally drilled pipe.

Type of Wiring?

What type of wiring is Bore-Gard approved for?

Bore-Gard is ETL Listed and conforms to UL651. It is approved and intended for use with 90°C (194°F) wiring per UL651 1.2 & 6.15 or optical fiber/communications cabling.

Alternate Uses of Bore-Gard

Can Bore-Gard be used as water pipe?

Bore-Gard is not recommended to be used as water pipe. Bore-Gard has not been designed, tested, or approved by any of the governing agencies for water piping.

Pull Test Rating

What is Bore-Gard's pull test rating?

Pull Test – Pressurized to 80 PSI

Bore-Gard has been rated to the following values based on laboratory testing to UL Test 6.12.2.1. The loads were recorded, averaged and a safety factor used for the final rating.

Size	Wall Type	Pull Test Value @ 80 PSI
3"	Schedule 40	7,500 lb _f
4"	Schedule 40	9,200 lb _f
5"	Schedule 40	11,800 lb _f
6"	Schedule 40	14,500 lb _f
8"	Schedule 40	18,500 lb _f
2"	Schedule 80	3,150 lb _f
3"	Schedule 80	9,800 lb _f
4"	Schedule 80	12,500 lb _f

Bending & Pull Test – Pressurized to 80 PSI and 65' Radius

Bore-Gard has been rated to the following values based on laboratory testing to UL Test 6.12.2.2. The loads were recorded, averaged and a safety factor used for the final rating.

Size	Wall Type	Pull Test Value @ 80 PSI
3"	Schedule 40	7,000 lb _f
4"	Schedule 40	8,700 lb _f
5"	Schedule 40	11,300 lb _f
6"	Schedule 40	14,000 lb _f
8"	Schedule 40	18,000 lb _f (60 psi & 72' radius)
2"	Schedule 80	3,000 lb _f
3"	Schedule 80	9,300 lb _f
4"	Schedule 80	12,000 lb _f

The Bend & Pull and Pull test results are recorded in lb_f (pounds-force). This is NOT equivalent to PSI (lb_f/in²). It is the responsibility of the customer to make that conversion (if needed) based on installation/equipment conditions.

What axial load will be experienced by Bore-Gard in actual conditions during Horizontal Directional Drilling?

An industry-first state-of-the-art computer was developed by Prime Conduit to measure the axial load on the pipe as it was pulled through the reamed hole. From the field data gathered, about 10 pounds per foot are applied to the Bore-Gard pipe. For example, for a 300 foot bore, an estimate of the axial load of 3,000 pounds will be reached. This is only an estimate.

Note: It is very important to note that for every job conditions that influence the axial and bending loads on Bore-Gard vary extensively. Actual loads can be lower or higher than the approximate value.

Bend Radius

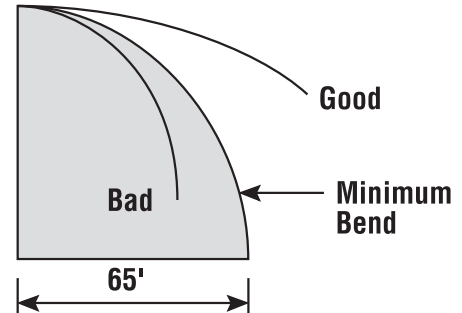
What is the minimum rated Bend Radius?

The minimum bend radius for Bore-Gard is 65 feet (8" Bore-Gard is 72 feet). This means that the pipe can be bent and axially loaded at this tightest bend radius. The more the pipe is bent, the greater the stress on it. The 65 foot

radius was dictated by the smallest diameter drill rods offered by directional drilling equipment manufacturers. The smallest drill rods have the tightest (smallest) bend radius and are usually offered on the smaller directional drilling rigs. Bore-Gard was designed to match this radius to meet the toughest bending conditions in the field.

Turns in a bore path should be made gradually. The drawing illustrates the 65' bend radius. To obtain a 90° turn you will require 65' of forward distance in any directional plane.

Note: Successful directional drilling, reaming and pipe installation are influenced by numerous factors including the reamed diameter, pull rate, fluid chemistry, fluid flow rate, drill rod diameter, soil conditions, equipment performance and condition, and operator experience. All manufacturers' equipment recommendations and training should be followed for successful drilling results.



Seal

What does the seal do?

- First, it seals out fluid during the installation process. As the pipe is being installed via horizontal directional drilling, water under pressure is pumped into the reamed hole for lubrication and removal of displaced soil. If these fluids enter the conduit system it would be contaminated, preventing inner ducts or cable from being installed which would render the pipe useless.
- After installation, the seal will indefinitely prevent ground water and other contaminants from entering the Bore Gard conduit system.
- If a rope or tape needs to be blown into Bore-Gard to pull inner ducts or cable, it needs to contain compressed air. Bore-Gard can contain air pressure of up to 75 psi with a safety factor of two at the tightest bend radius of 65 feet.
Note: Caution should always be exercised when pressurizing nonmetallic pipes with compressed air as the stored energy is very high and can potentially be dangerous.

What is the chemical resistance of the seal?

The seal has very good performance in resisting attack by common chemicals encountered in underground drilling applications.

What is the life expectancy of the seal?

As long as the seal is not physically damaged and does not come into contact with chemicals that it cannot resist, the seal should last indefinitely. This could be equated to 25 years or more.

Is the seal lubricated?

The seal is lubricated at the factory after it has been installed in the pipe. This helps lower the insertion force and helps make a better seal. The rubber material is also internally lubricated.

What happens if the seal is damaged during handling or installation?

Damage of the seal is unlikely due to its protected position deep inside the bell end of Bore-Gard. However, if the

seal is damaged from handling or installation, it can easily be replaced in the field. The seal must be accessible; the bell end of the pipe must be exposed. With your hand and/or a small blade screwdriver or pocket knife, reach into the bell and remove the seal from the groove, taking care not to score the seal groove in the bell. Install the new seal and lubricate it with excess lubricant from the inside of the bell next to the seal groove.

Helpful Hint: By removing seals and locking rings from the bell ends of Bore-Gard (when that end is not required for the installation), extra parts can be accumulated. These can be used in the event that replacements are needed for future installations.

Locking Ring

What happens if the locking ring is damaged during handling or installation?

- If the ring can be inserted into the locking ring groove completely, and there is no damage to the ring, it can be used. If the handle has been removed or damaged, and it can still be fully inserted, it can be used. If the ring cannot be inserted or used for any other apparent reason, replace it with another ring from another piece of pipe in order to complete the job.

Can or should the handle on the locking ring be cut off?

- We recommend the handle is not removed. It can be, but not recommended. The ring is shipped in place in the bell end of the pipe. The handle was designed to help remove the ring prior to assembly of the product and for any other post-installation purpose. For example, if during installation of the pipe the pulling eye disengaged from the lead end of the pipe, the pipe could be pulled out of the bore, disassembled, eye reattached and pipe reinstalled. In the event that the handle has been removed or reduced in size from dragging in the bore hole, a pair of needle nose pliers can be used to grab the ring and remove it.

Helpful Hint: If at times the locking ring is difficult to insert, rotating the spigot (male) end of the pipe clockwise as seen from the opposite (bell) end will help “pull” the locking ring into the joint.

Should the locking ring hole be covered before the pipe is pulled underground?

- There is no need to cover the hole. The hole is outside of the cavity that is sealed by the rubber seal. Some end users of the pipe feel more comfortable covering the hole with duct tape, but it is unnecessary and provides no value.

Can the locking ring be pulled out of the pipe during underground installation?

Once the pipe has axial tensile (pulling) load on it by the directional drilling rig, it will be very difficult for the locking ring to be removed. Furthermore, the rotation of the drilling rig helps prevent the locking ring from rotating out of the joint. The rotation actually aids in holding the ring in place.

Pulling Attachment to Bore-Gard

How do I attach to the lead end of Bore-Gard?

- There are several means to connect to Bore-Gard before pulling it into a reamed bore:
 1. An expandable steel pulling eye inside the pipe
 2. A steel mesh grip slipped over the outside of the pipe (also referred to as a “kellems grip” or “Chinese finger”)
 3. Self-made connection

Expandable steel pulling eye

The preferred method is to use an expandable steel pulling eye inside the pipe. Two manufacturers make this item: Condux and DCD.

Sealing of pulling Eye and Pipe

When using a pulling eye, it is important to ensure that the drilling fluid does not enter the pipe. For the current Condux design mentioned above, this requires using duct tape or equivalent to seal the pipe and the pulling eye. The DCD design has a sleeve designed to seal on the outside of the pipe.

Steel mesh grip

The mesh grip has been used for attaching to pipes for many years. It is reliable but requires more space and time to install. Condux makes a mesh grip that can be readily ordered by calling 800-533-2077.

Note: With the use of a steel mesh grip mentioned above, there is no provision for sealing out the drilling fluid. This must be provided by the end user (for which duct tape is often used).

Self-made pipe connection

Some contractors choose to make their own pulling fixtures instead of the designs mentioned above. This is not the recommended solution but is at the discretion of the end user.

How do I attach to more than one Bore-Gard pipe in a bundle?

When pulling more than one Bore-Gard pipe in the ground, a special attachment must be made to connect to the pulling eyes that are attached to each of the pipes. The contractor usually constructs the steel device from available steel components. At this time Prime Conduit does not offer such a device. Successful installations have been made with up to 30 Bore-Gard pipes in one bundle. There is no need to hold the pipes together in one bundle other than to direct it into the reamed hole. Once in the hole, the hole will keep the pipes together.

Safety

What safety concerns are there when installing Bore-Gard?

- One of the most important safety considerations is to not assemble or stand too close to the Bore-Gard pipe sections when the reamer is spinning and being pulled. If the swivel behind the reamer fails to freely spin as it is designed, it could rotate the pipe that could potentially injure those in the vicinity of the pipe. These are common precautions practiced by the directional drilling industry and are applicable when installing Bore-Gard.
- When filling the inside of Bore-Gard with compressed air for a blowing missile or mouse, caution should be exercised because of the stored energy inside the pipe.