U.S. Pipe Customer Service – Product FAQ's

Our Sales Engineering Staff and Technical Division are glad to provide you with answers to the most common questions related to our products. These questions are frequently presented by consulting and municipal engineers as well as installing contractors. This is in no way the total extent of information on these subjects, but should provide you with a quick jump start into what is required to purchase and service these products. For additional information, please visit our website or contact us directly.

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Section 1: Ductile Iron Pipe

1. What are the applications for Ductile Iron Pipe?

a) Water: Due to the high strength, ease of installation, reliability, and durability of Ductile Iron piping products, it is the ideal choice for the transmission and distribution of potable water. From the revenue aspect, potable water is a valuable commodity. Water lost between the treatment plant and the customer's meter is revenue lost. From the aspect of protecting the public health, it is vitally important to protect water quality from treatment to point of use. Both aspects are well served by Ductile Iron. With the exception of some special linings for sewer service, virtually all of the products marketed by U. S. Pipe and Foundry are approved by the National Sanitation Foundation for the conveyance of potable water.

b) Fire Protection: Historically, the primary purpose for developing a system to distribute water was for fighting fire. The concern for the protection of lives and property was paramount, even above that of providing water for drinking and sanitation. A fire protection system must be absolutely reliable and fully functional at all times. Factory Mutual is an insurance organization with a focus on risk management and the prevention of property loss. In that role, they are particularly interested in fire protection systems, most of which are 12" and smaller. Most of the products 12" and smaller marketed by U. S. Pipe and Foundry are approved by Factory Mutual for use in fire protection systems.

The National Fire Protection Association is a national organization that publishes codes and standards dedicated to fire safety and prevention. It is common for one such body to recognize and accept standards written by another organization, and to incorporate them into their own. Many of the NFPA Standards for fire protection systems incorporate the same American Water Works Association Standards to which U. S. Pipe and Foundry manufactures its products.

c) Waste Water: Ductile Iron pipe and fittings are ideally suited for wastewater systems, which fall into two categories: gravity and force main. An outwardly leaking sewer line can spread contaminated wastewater to the ground water system. An inwardly leaking sewer line can over burden the waste treatment plant, since every gallon flowing to the plant must be treated. It is important to specify and install a durable piping material with reliable joints. U. S. Pipe's TYTON JOINT® and TR FLEX® Pipe joints are bottle-tight, preventing both infiltration and exfiltration.

In a gravity system, wastewater flows down hill through the force of gravity. Gravity systems generally do not flow full, which can lead to septic sewage transformations that can lead to hydrogen sulfide gas being converted to concentrated sulfuric acid which is very aggressive toward cement mortar linings and ductile iron. In a properly designed and constructed gravity sewer, there will be adequate slope to provide a self-cleaning velocity (generally accepted at 2 ft/sec.). Under these conditions, a standard cement mortar lining will provide adequate corrosion protection for the pipeline. For less than optimum conditions, Protecto 401, a ceramic epoxy lining is recommended.

Gravity sewers must be installed on a slope for proper operation. As the length of the pipeline increases, the depth of bury increases, also. The strength of Ductile Iron enables it to withstand the external loads imposed by the earth at greater depths. As the gravity sewer increases in depth, it will reach a practical limit. At this point in the project, wastewater is collected at a pumping station. The discharge line from the pump station is then a forcemain, since the wastewater is pumped under pressure.

A sewer force main operates as a pressure line. It does not have to be installed to precise grade. For maximum hydraulic efficiency it should flow full at all times. This generally requires air relief valves at all high spots in the pipeline. When the pipe is kept full, there is no opportunity for hydrogen sulfide gas to collect which eliminates the possibility of septic sewage transformations. A standard cement mortar lining is usually adequate to protect the pipeline. Other linings, such as Protecto 401, are available if the designer so specifies.

d) Reclaimed Water: A reclaimed water pipeline conveys treated wastewater for beneficial re-use. Only products meeting the requirements for potable water should be specified for reclaimed water, since, ultimately, reclaimed water will likely end up in the potable water supply system.

e) Digester Gas: Ductile Iron pipe and fittings are not suitable for digester gas service and U. S. Pipe will not knowingly supply products for such a project. The American National Standards A21.52 and A21.14 governed the manufacture of Ductile Iron pipe and fittings (respectively) for gas service. These standards were withdrawn a number of years ago. Ductile Iron pipe for gas service was required to undergo special processing and testing. The equipment needed is no longer available at any of the U. S. Pipe facilities.

2. What is the difference between Pressure Class and Thickness Class pipe?

Pressure Class (PC) pipe matches the performance requirements of common and more standard pipeline projects while Thickness Class (TC) pipe are for extremely demanding conditions such as high pressure, deep bury, or special fabrications. Pressure Class and Thickness Class pipe are available in the following:

PC-150 – 30-64" TC- (50-56) – 6-54"
PC-200 – 24-64" TC- (51-56) – 4"
PC-250 – 14-64"
PC-300 – 14-64"
PC-350 – 4-64"

3. Is there a difference between Cast Iron pipe outside diameters and the outside diameter of Ductile Iron pipe?

Cast Iron (Gray) pipe was designed and manufactured with the internal diameter being constant, and the metal wall thickness varying to accommodate increasing pressure and earth cover conditions. This resulted in varying outside diameters for the same nominal sized pipe. The diameters have been classed, with Class A, Class B, Class C, and Class D being the most common. In some geographic areas, Cast Iron pipe in Classes E, F, G and H are also encountered. As the letter designation moves away from the letter A, the outside diameter of the Cast Iron pipe increases.

Taking advantage of the superior mechanical properties of Ductile Iron pipe, the outside diameter of Ductile Iron pipe is the same as the Cast Iron pipe Class B diameters. Ductile Iron pipe may be readily joined to Class B Cast Iron pipe without any special provisions, however when Class D or larger Cast Iron pipe is encountered, special sleeves are required to join the existing Cast Iron pipe to the new Ductile Iron.

When it is known that new Ductile Iron is being joined to an existing Cast Iron pipeline it is pertinent that the Cast Iron pipe be excavated at the connection point and the outside diameter be determined with a "Pi" Tape, a tape that is graduated to read the diameter of the object being measured directly. Should a "Pi" tape be unavailable, the diameter may be determined by measuring the circumference with a flat steel tape. In order to obtain correct diameters, it is mandatory that a flat steel tape be employed when making pipe diameter measurements.

4. What means of joint restraint are available?

A column of liquid moving through a pipeline has momentum or force that tends to separate the joints at changes in direction (bends and tees), stops (plugs, caps, or closed valves), and changes in size (reducers). Some means must be used to prevent joint separation to maintain the integrity of the pipeline.

Three such means are thrust blocks, tie rods, and restrained joints.

Thrust blocks are usually poured-in-place concrete. They must be engineered with full knowledge of the pipeline operating characteristics and of soil type and bearing strength. They must bear against virgin soil, because thrust forces in the pipeline are transmitted through the thrust block to the soil. Depending on these conditions, thrust blocks can be quite massive. The use of thrust blocks can delay completion of the project to allow the concrete to cure adequately before applying test pressure to the pipeline. If future construction disturbs the thrust block or the surrounding soil, joint restraint and the integrity of the pipeline can be jeopardized.

Tie rods usually involve some sort of fabricated steel harness on either side of the joint held together by tie-rods. This type of joint restraint is generally labor intensive. A tie-rod type of joint restraint must be adequately protected against weakening by corrosion, or else the joint restraint and integrity of the pipeline can be jeopardized.

Restrained joints are designed to hold the joint together against a rated pressure while the pipeline transfers the thrust force to the surrounding soil envelope. In order to calculate the footage of restrained pipeline necessary for the thrust force to be fully dissipated to the soil, it is necessary to know pipe diameter, maximum anticipated internal pressure, depth of cover, soil type, and trench construction type, as well as the configuration (e.g., bend angle) requiring restraint. The calculated restrained footage must be installed on each side of the fitting. Since polyethylene encasement for external corrosion protection reduces the friction between the pipeline and the surrounding soil, the calculated restrained footage is usually multiplied by a factor of 1.5 for pipelines where polyethylene encasement is to be installed.

For MJ Joints, U.S. Pipe offers the MJ FIELD LOK® restrained gasket system for excellent restraint, ease of installation, and corrosion protection since the restraint mechanism is inside the MJ Bell protected from the elements.

FIELD LOK 350® Gaskets are used in TYTON JOINT® Pipe and Fittings to provide instant, easily assembled joint restraint. They are rated for pressures up to 350 psi and are available in 4" through 36" sizes. Depending on size, they allow up to 5° joint deflection. Please refer to the submittal on our website for current technical data. On projects requiring joint deflection, the plain end should not be fully homed at assembly. This provides clearance to allow the joint to deflect. FIELD LOK 350® Gaskets are not recommended for above ground installations, on dynamic structures such as long bridge crossings, or for temporary installations. Since TYTON JOINT® plugs are usually used for temporary closures, they should not be used with FIELD LOK 350® Gaskets. It is not possible to disassemble a TYTON JOINT® Plug from a joint with a FIELD LOK 350® Gasket.

TR FLEX® Restrained Joint Pipe and Fittings are available in 4" through 64" sizes. Depending on size, they are suitable for up to 350 psi service and up to 5° deflection. TR FLEX® products are suitable for aboveground or buried service, bridge crossings, temporary installations, or shallow water crossings. A factory applied, circumferential weld bead bears against Ductile Iron locking segments that are inserted into one or more slots in the bell face to securely restrain the joint.

5. What types of restrained joints are available?

a) FIELD LOK 350® Gaskets: This joint is bolt-less and uses stainless steel locking segments that are vulcanized into the gasket. The locking segments grip the pipe instantly to create a restrained joint. This joint is quick and simple to assemble, simply push the pipe together and pull back to set the locking segments. The sizes available are 4-24" and pressure rated to 350psi. 4-24" are UL listed to 350psi. 4-16" are FM rated to 250psi and 18-24" FM rated to 200psi.

b) MJ FIELD LOK® Gaskets: This product is used with a standard mechanical joint bell (MJ). It is available for DIP and PVC pipe. It is installed in the same manner and time necessary to install a STD MJ accessory set! The restraint mechanism is similar to the FIELD LOK 350® gasket which includes stainless steel locking segments that are embedded in the MJ gasket. The PVC product uses a DI locking ring embedded in the MJ gasket. The sizes available for DI are 4-24", UL listed for 4"-16" at 350 psi and 250 psi for 18"-24". The PVC product is currently available in sizes 4"-12" and is rated at 2:1 safety factor based on the pressure rating of the pipe on which it is installed.

c) TR FLEX®: This joint is also bolt-less, it uses Ductile Iron locking segments that are inserted through a slot (or slots) in the bell face when the pipe is pushed into the bell and gasket. This joint provides a positive axial lock between the bell interior surface and a retainer weldment on the spigot end of the pipe. This joint is available in sizes 4-64". TR FLEX GRIPPER® Rings 4-36" can be used with field cut pipe (pipe with-out weldment) that is within the specified size range for that pipe size. For the rated working pressure of each joint, please refer to our latest product brochure or www.uspipe.com. For higher pressure ratings consult an U.S. Pipe salesman.

d) Flanged: Flanged joints are primarily used for plant work and above ground applications and are not recommended for below grade use unless isolated in a vault. Flanges are threaded on to CL-53 pipe. 125# flanges confirm to the ANSI/AWWA C115/A21.15 standard and are rated for water service to 250psi. U.S. Pipe rates 4-24" 125# flanges, used in conjunction with our FLANGE TYTE® Gasket, for a working pressure of 350psi.

e) Grooved: Grooved pipe joints are comprised of pipe with a groove machined at each end and connected with a circular housing that also holds the gasket. The housing is made up of halves or multiple segments that are bolted together. The coupling provides circumferential bearing against the face of the pipe groove to resist end-pull forces due to internal pressure. Grooved joints for Ductile Iron pipe are covered under the ANSI/AWWA C606 standard. The most common sizes are 4-24" with larger sizes available. Pressure ratings range from 500psi for 4" to 150psi for 24".

6. **What are the advantages of push on fittings?**

The advantages of using push-on fittings are the same as for push-on pipe. Push-on fittings like U. S. Pipe's TYTON JOINT® result in a more reliable joint with much less labor. The reliability of a mechanical joint is very dependent on the skill of the installer, who must ensure that even the bolts at the bottom of the joint in a muddy trench gets the same uniform torque as the others.

When joints must be restrained, the use of mechanical joint retainer glands or "torque-off" wedge type restrained glands require approximately twice as much labor to install as an unrestrained mechanical joint. Both require significantly more time and effort to install than U. S. Pipe's restrained push-on joints: the TYTON JOINT® with FIELD LOK 350® Gaskets and the TR FLEX® Joint.

Some contractors maintain that push-on fittings are more difficult to install than mechanical joint fittings. There is no question that the two joints require slightly different procedures to install. However, there is ample evidence to show that contractors who have become comfortable with the technique of installing push-on fittings spend more time laying pipe and less time chasing joint leaks.

7. **Which ANSI/AWWA apply to Ductile Iron pipe?**

Primarily the ANSI/AWWA C100 series are applicable to Ductile Iron pipe and fittings. Below is a list of the Standards by title:

C104/A21.4 ANSI Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
C105/A21.5 ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
C110/A21.10 ANSI Standard For Ductile-Iron or Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water
C111/A21.11 ANSI Standard to Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C115/A21.15 ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
C116/A21.16 ANSI Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and exterior Surfaces of Ductile-Iron and Gray-ron Fittings for Water Supply Service
C150/A21.50 ANSI Standard for Thickness Design of Ductile-Iron Pipe
C151/A21.51 ANSI Standard for Ductile-Iron, Centrifugally Cast, for Water
C153/A21.53 ANSI Standard for Ductile-Iron Compact Fittings, 3 In. Through 24 In. (76 mm Through 610 mm) and 54 In. Through 64 In. (1,400 mm Through 1,600 mm), for Water Service

In addition to the 100 series, the following also apply:

C600 Installation of Ductile-Iron Water Mains and Their Appurtenances
C606 Grooved and Shouldered Joints

C651 Disinfecting Water Mains

Further information may be found in the AWWA Manual M41, entitled Ductile-Iron Pipe and Fittings.

These Standards and Manuals are available from the American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235, Telephone (800) 926-7337, Fax (303) 347-0804, or via e-mail at info@awwa.asn.au.

8. **I am beginning the installation of a new pipeline. Which way do the bells have to go in relation to the flow?**

There are entities, which specify that pipe be installed with the bell end facing the direction of flow. This theory emanates from the pre-pressure joint era when common joint sealing materials were cement mortar and jute, asphalt and jute, just asphalt, and various other materials. The theory is predicated on the liquid flowing into the next pipe length prior to leaving the existing length.

Since the introduction of the TYTON JOINT® Pipe in 1956, it has been subjected to various tests. From this testing it has been determined the properly assembled joint will withstand a 14 psi vacuum, a 1,000 psi internal pressure, and a 430 psi external pressure without leakage. Given these results, it is obvious flow direction within the pipeline is not an installation factor.

9. **How much thermal expansion should I allow for on the various pipe joints?**

Ans: The linear expansion of ductile iron pipe as a result of thermal effects is very small. In fact, at 6.2 X 10-6 inches per inch per degree Fahrenheit, ductile iron expands less than concrete.

Because flange joints are bolted together in metal-to-metal contact, there might be some concern over linear expansion, with resultant growth of the pipeline. While a change in temperature of 30° F. could account for an expansion of less than a quarter inch per hundred feet of pipeline, it is a fact that most pipelines in buried service maintain a fairly constant temperature.

For rubber gasketed joints, such as TYTON JOINT®, TR FLEX®, and mechanical joint assembled in accordance with the manufacturer's instructions, there is enough clearance from the face of the plain end of the pipe to the back of the bell to account for significant thermal growth before beginning to make metal-to-metal contact. Except for very long runs of exposed piping, particularly if flow is intermittent, thermal expansion is usually not a concern.

10. **What is Dry and Pressure tapping? What is the maximum tap per pipe size? What about tapping polywrapped pipe?**

1) Dry---- USP does not recommend tapping a new line that has not been filled with water due to the potential damage to the cement lining. However, it is done successfully in the field with special carbide tipped drills and shell cutters, special provisions should be made to flush the cutting equipment with water to lessen the wear.
2) Pressure--A) The pressure at which a tap can be made is limited by the tapping machine equipment itself, most tapping machines for corporation stops have a pressure rating of 90-250 psi. ¾" corp. stops threaded into 6" ductile iron pipe at 175 psi have been tested to 500 psi with no leaks at the threads. B) 4-16" taps using U.S. Pipe's S-54 tapping machine and adapters with either mechanical joint or flange (with the FLANGE-TYTE® Gaskets) are rated to 350 psi.
3) Maximum tap per pipe size - - A) Per ANSI/AWWA C151/A21.5.51 APPENDIX A-Pipe Thickness Required for Different Tap Sizes per ANSI/ASME B1.20.1 for standard taper pipe threads with two, three and four threads. Table shown below is for two threads of engagement.

   PIPE SIZE (inch) MAXIMUM TAP SIZE (inch)
   3" -(1), 4" -(1 ¼), 6"- (1 ½), 8"- (2), 10"-(2 ½), 12"-(3), 14"-64" –(4)

   B) For branch connections using tapping saddles and tapping machines fitted with shell cutters, size on size taps are satisfactory with proper pipe support.

4) Polyethylene-wrapped Pipe
Direct service taps may be made through polyethylene encasement. The preferred method is to apply two of three wraps of adhesive tape completely around the wrapped pipe to cover the area where the tapping machine and chain will be mounted. The corporation stop is installed directly through the tape and wrap. Although this method is effective in eliminating damage to the polyethylene during the tapping operation the entire circumferential area should be inspected for damage and be repaired if needed.

11. Can Pressure Class Pipe be direct tapped? Corporation Stop manufacturers advise that four threads are required to retain the stop and provide water tightness.

In Appendix A of ANSI/AWWA C151/A21.51, entitled DUCTILE-IRON PIPE, CENTRIFUGALLY CAST, FOR WATER, is given the minimum metal wall thickness required for 2, 3, and 4 threads for different diameter threaded outlets and different diameter pipe. Information is given for both threads conforming to Standard ANSI/ASME B1.20.1 (a.k.a. National Pipe Thread (NPT), Iron Pipe Thread (IP), or Standard Taper Pipe Thread) and AWWA C800 (a.k.a. Mueller Thread, cc thread, Corp Stop Thread). To assure adequate metal thickness for a particular pipe diameter and Pressure or Thickness Class, it is necessary to subtract the casting tolerance found in the Table in Section 4.4.2 from the Nominal Metal Wall thickness found in Table 1 of ANSI/AWWA C151/A21.51.

Concerning the security of a two engaged threads engagement, the Ductile Iron Pipe Research Association (DIPRA) conducted a study of ¾-inch and 1-inch Corporation Stops direct tapped into 6-inch Pressure Class 350 pipe. The tests were conducted on pipe sections with less than nominal metal wall thickness. After multiple Corporation Stops were installed in each piece of pipe under city line pressure, the installations were observed for leakage through the threads. The water pressure was then raised to 1,000 psi in an effort to fail the 6-inch pipe and threaded connection. Leakage was not observed at the threaded connection. These tests were conducted with and without 3-mil thread sealing tape applied to the threads of the Corporation Stop. The installed Corporation Stops were then subjected to Pull-out and Cantilever Load Tests. In the Pull-out Tests, the Corporation Stop failed at loads in excess of 6,500 pounds-force. The pipe threads were undamaged in each of the three tests. In the Cantilever Load Tests, the Corporation Stops failed at bending moments in excess of 385 foot-pounds force. Again the threads in the ductile iron pipe wall were undamaged.

In summation, it can be clearly seen that work crews can direct tap service connections into Pressure Class Ductile Iron pipe under pressure effecting structurally secure, watertight seals. It is recommended that two layers of 3-mil thread sealant tape be applied to the Corporation Stop threads to achieve a watertight service connection utilizing a minimal tightening torque.

The results of this study have been published by the Ductile Iron Pipe Research Association under the title, DIRECT TAPPING OF 6-INCH PRESSURE CLASS 350 DUCTILE IRON PIPE and is available through the Web Site www.dipra.org

12. Is it practical to direct tap Ductile Iron fittings?

Yes it is. Ductile Iron pipe and fittings can readily be direct tapped for air release valves, sampling ports, service connections, etc. The concern is ensuring there is adequate thread engagement to provide both strength and a leak-free seal. Testing has shown that, with the use of a good thread sealant, as little as one full thread engagement will provide a leak-free tap. Following the conservative nature of the industry, it is recommended that two full threads engagement be the minimum selected.

The limiting factor in achieving adequate thread engagement for a given metal thickness is the relative curvature of the parent body as the size of the tap increases. There are tables in AWWA/ANSI C151/A21.51, which show the maximum size of tap that can be used on a given size of pipe and thickness to achieve 2, 3, or 4 thread engagement.

Fittings may be ordered with a boss cast at the location of the desired tap. The flat surface of the boss along with the increased metal thickness provide for multiple thread engagement of tap sizes larger than could be accommodated on the curved surface of the fitting.

13. After field cutting a ductile iron pipe, is it necessary to dress the cut end?

If the pipe has a standard cement-mortar lining, it is not necessary to do anything beyond what is required to prepare the cut end for installation. (If the plain end is to be installed in a mechanical joint, it is only necessary to remove any sharp burrs. If the plain end is to be installed in a push-on joint, the cut end must be re-beveled in accordance with manufacturer's instructions.)

If the pipe has a special polymeric lining, it is necessary to seal the cut end to prevent undercutting and disbonding by an aggressive fluid. The procedures for sealing cut ends are simple and readily accomplished in the field. Consult a U. S. Pipe representative for information on which repair materials and procedures should be used with a particular lining.

<u>Section 2: Handling Of Pipe</u>

1. Where can I find information on safe Ductile Iron handling when unloading from trucks and/or railroad cars?

In U. S. Pipe's guide Safe Packaging and Shipping (STD-550) and also the Installation Guide for Ductile Iron Pipe, published by the Ductile Iron Pipe Research Association (DIPRA). Copies can be obtained from your local U. S. Pipe Sales Representative.

2. What are some installation tips?

a - After assembly, pull out to engage
b - Prevent lateral movement on bridge crossings and piers
c - Choose other than rigid joints for underground installations
d - Gripper Rings are not recommended for use with fittings
e - Gripper Rings are not recommended for vertical bends
f - Be sure to insert locking segments in all locking segment openings
g - Use rubber retainers between all right and left hand locking segments – bend to fit
h - Right hand locking segments are painted red; left hand are black
i - FIELD LOK® Gaskets can be used in TR FLEX® Pipe bells up to 24" Diameter

3. How is pipe stored and stacked? How many tiers are recommended?

Ans: Pipe stored for an extended time prior to installation should be laid on heavy timbers to keep them off the ground to minimize dirt and debris entering the pipe. When pipe of different sizes and pressure classes are stored, they should be segregated, not inter-mixed.

Pipe are generally shipped from the manufacturer in safe, tight bundles secured by steel strapping. If pipe are to be stored loose (i.e., the bundles broken), the timbers separating tiers must have chocks securely nailed at the end of each tier. The timbers separating each tier should be large enough to prevent the bells of one tier from contacting bells of adjacent tiers.

The area selected for pipe storage should be adequately flat and solid to prevent pipe stacks from shifting and becoming unstable.

Please refer to U.S. Pipe's Reference Information Section of the Distributor Pricebook and Resource Guide for loading data.

Section 3: Joint Lubricant

1. **Is all pipe lubricant pretty much the same?**

We don't know. We don't use any one else's lubricant. It is a good practice to use the lubricant furnished by the manufacturer for use with his products. Lubricant is formulated to be nontoxic, does not support bacterial growth, has no deteriorating effects on the gasket material, and is water soluble so it readily flushes away prior to acceptance testing of the pipeline. It does not impart any taste or odor to the water in the pipeline and must meet the requirements of AWWA/ANSI C111/A21.11.

Because it is water soluble, it is sometimes difficult to maintain lubricant on wet surfaces such as a wet trench or stream crossing. Under these conditions, it is advisable to apply lubricant liberally – as much as three times as much as would normally be used.

WE DO NOT RECOMMEND THE USE OF SPRAY ON TYPE LUBRICANT.

2. **Why isn't TYTON JOINT® Lubricant available in larger containers, like 5 gallon pails?**

A key to the reliability of the seal is the cleanliness of the joint at the time of assembly. Larger sized buckets of lubricant are more likely to become contaminated at the jobsite and less likely to be discarded when they are. TYTON JOINT® Lubricant is available in pints, quarts, and gallons. The smaller containers are less likely to be contaminated with dirt, pebbles, or other foreign matter, which, if trapped between the pipe and gasket, could result in a joint leak.

Section 4: Accessories

1. **What is the material from which your gaskets are made?**

a. SBR – SBR (styrene butadiene rubber) is the elastomer specified in the American National Standard ANSI/AWWA C111/A21.11, entitled RUBBER-GASKET JOINTS FOR DUCTILE-IRON PIPE AND FITTINGS and therefore is the elastomer from which all of our standard gaskets are made. Other elastomers are available and allowed by the Standard for special applications.

b. Nitrile – Nitrile rubber or NBR is one of the specialty elastomers used in other than standard installations.

Nitrile is used in applications requiring resistance to hydrocarbons, fats, oils, greases, and chemicals.

c. EPDM – EPDM (Ethylene Propylene Diene Monomer) is best suited for fresh water, seawater, and sanitary sewage and hot water applications.

d. Neoprene – Neoprene is the generic name for polychloroprene elastomers manufactured by DuPont. Neoprene is recommended for fresh water, seawater, and sanitary sewage.

e. VITON® - VITON® is the registered trade name for the fluoroelastomer (FKM) manufactured by DuPont, however, it has become the generic term for FKM elastomers. FKM is used when resistance to hydrocarbons, acids, vegetable oils, and petroleum products is required. Due to its superb permeation resistance, FKM should particularly be specified if a potable water line is to traverse an area saturated with low molecular weight petroleum products.

2. **What is the availability of the various gasket materials? What are the comparative prices?**

SBR gaskets are readily available and are routinely shipped with each order. Gaskets made from other elastomers may require longer lead times and minimum order quantities. The comparative prices are shown below and are approximate as actually prices may vary by size quantity. All prices are as compared to our standard SBR and are listed from least to most expensive.

a. EPDM – 2.5 times the cost of SBR
b. Neoprene – 3.2 times the cost of SBR
c. Nitrile (NBR) – 3.3 times the cost of SBR
d. VITON® (FKM) – 62.0 times the cost of SBR

3. **Which is best for high temperature applications, and what is the maximum operating temperature?**

The Ductile Iron Research Association (DIPRA) in conjunction with the member companies has developed a fact sheet entitled Gasket Materials used for Ductile Iron Pipe in Water and Sewage Service. That should be used for general guidelines in specifying gaskets for different applications. Below is an excerpt from that fact sheet:

Elastomer Maximum Service Temperature, (° F)
Push-on joint gasket Mechanical Joint gasket

SBR 150° 120°
EPDM 250° 225°
Nitrile 150° 120°
Neoprene 200° 200°
VITON® (FKM) 300° 225°

3. **What is the correct procedure for installing gaskets? If it is so important to do correctly, why don't the gaskets come installed in the pipe?**

The procedure for installing gaskets is simple. However, a large part of the reliability of the seal depends on cleanliness of the joint at the time of installation. Considering the variety of conditions that may be encountered in transit or at the jobsite, it would not be possible to ensure joint cleanliness if the gaskets were pre-installed by the manufacturer. Pre-installation would also expose gaskets unnecessarily to ultraviolet exposure and even vandalism.

For mechanical joints, the gland should be slipped some distance back from the plain end of the pipe with the lip of the gland facing the bell. The inside diameter of the mechanical joint gasket is smaller than the outside diameter of the pipe. Brush the plain end of the pipe and the gasket with an approved pipe lubricant as supplied by the manufacturer. The gasket must then be stretched over the plain end of the pipe with the thinner side of the wedge facing the bell. The lubricant allows the gasket to slide more easily into the bell and become equalized as the gland compresses it to achieve a reliable seal.

The TYTON JOINT® and FIELD LOK 350® gaskets have a stiff rim called the heel bonded to a circular cross section called the bulb. After correct installation, the heel will fit into the first groove just inside the bell. The bulb will enter the bell first and will be compressed between the inside of the bell at the gasket seat and the outside of the pipe to achieve a seal. The gasket diameter is larger than the bell opening, so a technique must be followed to allow the gasket to be properly fitted inside the bell.

For smaller pipe, up to about 20", draw a loop of the gasket towards its center forming somewhat of a heart shape. While holding the loop with one hand, start fitting the gasket heel into the groove of the bell with the other. Gradually release the loop while pressing the gasket evenly into position around the inside circumference of the bell. It may be necessary to firmly seat the loop with the heel of the hand to ensure it is fully seated.

As pipe size increases, it will be necessary to use an increasing number of loops to facilitate gasket installation. In the largest sizes, it is not uncommon to have as many as eight loops, evenly spaced around the gasket. Regardless of pipe size, if the gasket has been properly installed, the leading edge of the rubber should be slightly below the smallest part of the bell opening all around the inside circumference. If any part of the gasket is sticking up, it must be worked until fully seated, or the gasket must be removed and re-installed.

Once the gasket is properly seated, continue with the assembly procedure to make up the joint.

4. **Can TYTON® and FIELD LOK 350® Gaskets be looped for ease of insertion?**

In order to install the shaped mass of rubber making up the gasket correctly in the gasket groove in the joint bell, it must be uniformly distributed around the interior of the bell circumference. In order to do this, the gasket must be looped as it is initially placed in the bell. As a rule of thumb:

4-inch through 12-inch gaskets require one loop. It is noted that in cooler weather, it may be easier to install the 10 and 12-inch gaskets using two loops place 180° apart across the joint.

14-inch through 20-inch gaskets generally require two loops at 180° apart. It is easiest to place them at the top and bottom of the joint, and to push the top loop into the gasket grooves first. This facilitates completing the gasket installation by enabling the use of one's foot and body weight to close the loop (push the gasket into the gasket grove).

24-inch through 36-inch gaskets will be easier placed by using four loops at approximately 90° apart. It is easiest to place the loops at the 12:00 O'clock, 3:00 O'clock, 6:00 O'clock and 9:00 O'clock positions. Closing the loops is easiest to begin at the 12:00 O'clock position, then the 3:00 O'clock and 9 O'clock positions ending at the 6:00 O'clock position where the foot and body weight can be employed.

42-inch and 48-inch gaskets are more easily placed with six loops approximately placed at the 12:00, 2:00, 4:00, 6:00, 8:00, and 10:00 O'clock positions. Again, begin closing the loops at the top working towards the bottom.

54-inch through 64-inch gaskets are installed easiest with eight loops. The loops should be placed at the approximate 12:00, 1:30, 3:00, 4:30, 6:00, 7:30, 9:00, 10:30, and 12:00 O'clock positions. Closing the loops is easiest beginning at the top and working down towards the bottom.

In cooler weather, it is easier to install the gasket after it has been warmed by storing the gaskets in warm environments or placing them in a warm water bath.

Absolutely under no circumstances should lubricant be placed in the gasket groove in the bell, or on the gasket prior to installation in the bell.

Section 5: Linings and Coatings

1. **What kind of lining and coating are used on Ductile Iron pipe installed in the aeration system of a Waste Water Treatment Plant?**

   One application that has been very successful for Ductile Iron pipe is to convey air from the blowers to the Aeration Chambers in a Waste Water Treatment Plant. Because blowers are used to provide the air movement, and not compressors, and the system is open ended so pressures don't build up, this is an acceptable application.

   However there are problems that have to be accommodated:
   The operating temperature of these systems is in the order of 180° to 200° F. We do not have any coatings or linings that will hold up when subjected to these temperatures on a continuous operating basis. For this reason, the pipe supplied is unlined. Additionally, due to the temperature, EPDM gaskets are required.

   It has been determined that some soils testing not corrosive to Ductile Iron pipe will have a decrease in resistivity making them corrosive to Ductile Iron pipe. In these cases, an insulating coating should be considered for the pipe exterior surfaces.

2. **I have Fusion Bonded Epoxy (FBE) coated fittings and METROSEAL® 250 Valves in an industrial water system. What is the (safe) maximum operating temperature of the water?**

   FBE coated valves, fittings, TYTON JOINT® Pipe with standard seal coat cement linings and the SBR rubber encapsulated gate can be subjected to a continuous immersion water temperature of 150° F (max). It should be noted that Mechanical Joint Gaskets (MJ) are rated for 120° F, another reason to get away from MJ joints.

3. **Which linings are available? (Please find your complimentary Linings/Coatings Ruler in this book)**

   1) Cement-Mortar w/asphaltic seal coat-This lining is standard. (ACL)
   2) Cement-Mortar without asphaltic seal coat.
   3) Double Cement-Mortar w/asphaltic seal coat. (BCL)
   4) Double Cement-Mortar without asphaltic seal coat.
   5) PROTECTO™ 401-For corrosive sewer applications. Not for potable water use.
   6) UNLINED (for some applications that do not desire a lining)

4. **What is the maximum velocity recommended for cement-lined Ductile Iron pipe?**
Although there are differing opinions on this subject, a conservative maximum velocity for design purposes is 7 fps (feet per second). The AWWA (American Water Works Association) standard for thickness design of ductile iron pipe is C-150. The exercise for calculating the required thickness based on internal pressure includes a 100 psi allowance for surge pressure and a 2:1 safety factor. The surge pressure allowance is based on a 50 psi pressure rise for each foot of extinguished velocity and the fact that most domestic water systems operate at approximately 2 fps.

Ductile Iron pipe may be rated as high as 350 psi service. A pipeline operating at 7 fps velocity could account for a 350 psi pressure surge (7fps X 50 psi/fps). Adding a potential surge pressure equal to the pressure rating of the pipe encroaches significantly on the safety factor. Exceeding 7 fps velocity could produce potentially damaging surge pressure.

5. **Can Ductile Iron products be glass lined?**

Yes, Ductile Iron products can be successfully glass lined. Glass lined pipe and fittings have been specified and utilized as a deterrent to interior build up and clogging of problematic sludge and scum piping systems in waste water and sewage treament facilities for over 40 years. Not only is the excellent nonstick characteristic effective in combating the build up of grease, sludge and scum, but has been found to be the only deterrent to Struvite and Vivionite build up as well.

Section 6: Internal and External Protection

1. **What if external corrosion protection is a concern?**

If external corrosion protection is a concern, the Ductile Iron Pipe Industry recommends the use of loose-film polyethylene encasement, purchased and installed in accordance with the American Water Works Association Standard C105, as the most cost effective means of mitigating external corrosion under the broadest range of conditions.

The subject of external corrosion on underground metallic pipelines has been written about extensively, with many "experts" extolling the absolute necessity for elaborate corrosion control systems. While the debate goes on, two facts are often overlooked:

1. Extensive soil surveys conducted by a multitude of agencies throughout the country indicate only about 10% of the soils in the United States are aggressive toward ductile iron products.

2. Loose film polyethylene encasement has over forty-five years service history in quietly protecting the investment in millions of feet of cast and ductile iron pipe.

Sometimes called "Polywrap," loose film polyethylene is inexpensive, easy to install, does not degrade in service and therefore, requires no maintenance.

There may be conditions so severe that measures other that Polywrap should be considered. When in doubt, ask your U. S. Pipe representative to arrange a free consultation with a DIPRA (Ductile Iron Pipe Research

Association) Engineer. DIPRA Regional Engineers are Corrosion Specialists certified by NACE-International (formerly the National Association of Corrosion Engineers).

2. **How do I know if I have a corrosive soil environment?**

Certain soils can be identified as potentially corrosive without testing. These environments include, but are not limited to: coal, cinders, muck, peat, mine wastes and landfill areas high in foreign materials. Environments in areas of known stray electrical current should also be considered potentially corrosive. For installations in other areas, soil testing conducted in accordance with APPENDIX A of American Water Works Association (AWWA) C105 Standard is recommended. Evaluation of soil corrosivity for Ductile Iron pipe is described in detail in APPENDIX A of AWWA C105 Standard. The test method analyzes for 1) resistivity, 2) pH, 3) Redox potential, 4) Sulfides, 5) Moisture content, 6) Soil description, 7) Potential for stray current, and 8) Experience with existing installations in the area.

3. **What is a safe Ph range?**

There is no safe pH range. Other factors must be considered. For example, in the area of external corrosion, soils with a pH of 0.0 to 4.0 are acidic and serve well as a corrosive electrolyte. Soils with a pH of 8.5 to 14.0 are generally high in dissolved salts, yielding a corrosive soil with low resistivity. Soils with a near neutral pH of 6.5 to 7.5 and low redox conditions are optimum for sulfate reduction by bacteria, which can cause corrosion. In terms of the pH range of effluents inside the pipe, chemicals with a broad range of pH's can attack iron, cement lining, asphalt sealcoat, and/or rubber gaskets. In addition to pH, factors such as the specific chemical or chemicals being conveyed, concentration, temperature, flow rate, etc. are needed to determine the suitability of the pipe, lining, and gasket materials for a specific type of service.

3. **What about salt water installations?**

a) External – The corrosion rate of Ductile Iron pipe in sea water depends upon a number of factors including: whether or not the pipe is buried beneath the ocean floor, whether the sea water is continuously flowing or moving, depth beneath the surface which influences oxygen concentration, whether or not the pipe is continuously submerged or at tidal levels, and a number of other factors. Even though the corrosion rate of Ductile Iron in seawater is relatively low (i.e. from approximately 2 to 20 mils per year), a special bonded coating such as coal tar epoxy or polyurethane is normally recommended for these applications. In some installations, polyethylene encasement has been utilized for pipe buried beneath the ocean floor.

b) Internal – As stated above, the corrosion rate of Ductile Iron in seawater is relatively low (between approximately 2 and 20 mils per year depending upon operating conditions). For extra protection in seawater, a four to ten mil thick coating of epoxy is normally recommended for exposed iron in the joints (i.e. on the extreme spigot end of the pipe and in portions of the bell). Type V sulfate resistant cement, double thickness in accordance with American Water Works Association (AWWA) C104 Standard, is also recommended for this type of service.

Should polyethylene be wrapped around valves, fittings and fire hydrant buries?

If these products are buried in corrosive soils as defined by Appendix A of American Water Works Association (AWWA) C105 Standard, then the answer is yes. Encasing these products is discussed in Sections 4.4.3 and 4.4.4 of AWWA C105 standard.

4. **Should I worry about stray current in the vicinity of Ductile Iron pipe installations?**

   Because Ductile Iron Pipe have a rubber gasket joint every 18 to 20 feet, a Ductile Iron pipeline is normally considered electrically discontinuous and, as such, discourages pickup and discharge of stray electrical currents. Considering the many millions of feet of Ductile Iron pipe in the ground, reported instances of stray current corrosion are rare. However, stray current problems can occur in areas with a high current density in the soil. These areas can occur at or near cathodic protection anode beds, electric railroads and mine transportation equipment, industrial equipment, and some electrical grounding systems.

   Polyethylene encasement has been shown to be effective at protecting Ductile Iron pipelines at most levels of stray current encountered in the ground. When Ductile Iron pipelines are exposed to the special high-density stray current areas described above, the pipeline should be rerouted or the anode bed relocated. If neither of these options is feasible, the Ductile Iron pipe in this area should be electrically bonded together, electrically isolated from adjacent pipe, polyethylene encased, and appropriate test leads and "current drain" installed. The Ductile Iron Pipe Research Association is available upon request to investigate installations in areas with potentially high-density stray currents.

5. **How can I check possible corrosive soil conditions? How do I get a soil survey?**

   Certain soils can be identified as potentially corrosive without testing. These environments include, but are not limited to: coal, cinders, muck, peat, mine wastes, and landfill areas high in foreign materials. Environments in areas of known stray electrical current should also be considered potentially corrosive. For installations in other areas, soil testing conducted in accordance with APPENDIX A of American Water Works Association (AWWA) C105 Standard is recommended.

   If you believe you need a soil survey, please contact DIPRA (Ductile Iron Pipe Research Association) directly.

8. **What ANSI/AWWA Standards cover Polyethylene External Protection? How is the corrosivity of soil evaluated?**

   Polyethylene Encasement is described in ANSI/AWWA C105/A21.5-99 Standard (American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems). Some recommendations regarding installation of Polyethylene Encasement are also given in ANSI/AWWA C600 –99 (AWWA Standard for Installation of Ductile-Iron Water Mains and their Appurtenances).

   Evaluation of soil corrosivity for Ductile Iron Pipe is described in detail in APPENDIX A of AWWA C105 Standard. The test method analyzes for 1) resistivity, 2) pH, 3) Redox potential, 4) Sulfides, 5) Moisture content, 6) Soil description, 7) Potential for stray current, and 8) Experience with existing installations in the area.

9. **I am designing a new pipeline that is going to be buried in soil with a pH range of 6.4 to 7.4. What will be needed for corrosion protection of Ductile Iron pipe?**

   Soils with a pH range of 6.5 to 7.5 provide an optimum condition for sulfate reduction. Before any decision is made for a corrosion inhibiting system for Ductile Iron pipe, a soil survey and evaluation should be performed in accordance with Appendix A of the American National Standard ANSI/AWWA C105/A21.5, entitled POLYETHYLENE ENCASEMENT FOR DUCTILE-IRON PIPE SYSTEMS. Such a survey may be arranged through the Ductile Iron Pipe Research Association (DIPRA).