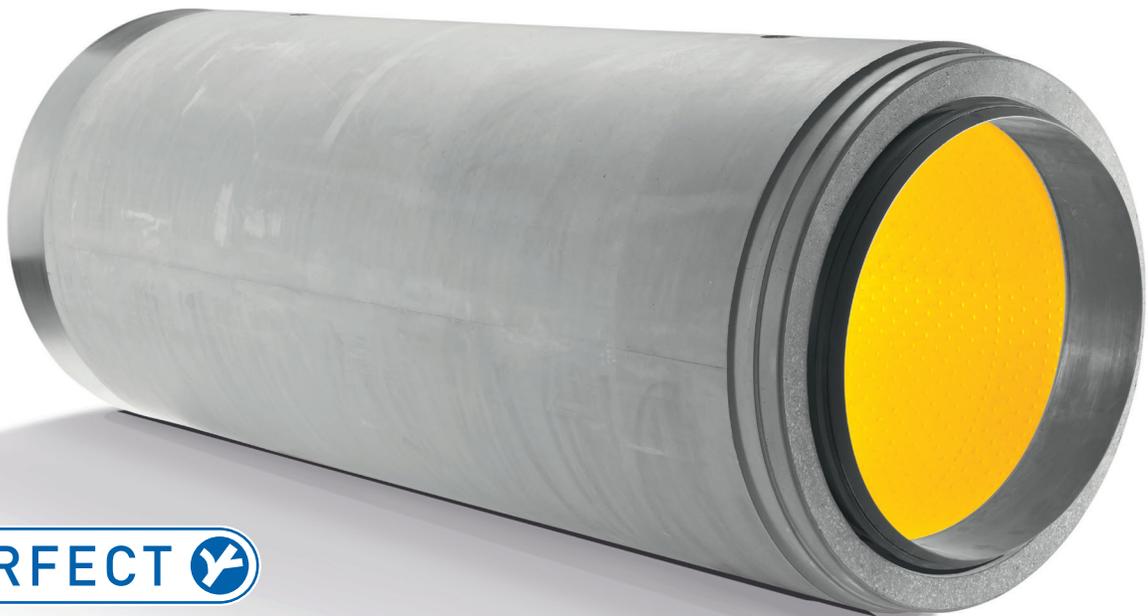




Geneva Pipe and Precast

A Northwest Pipe Company

Perfect Pipe Product Guide HDPE-Lined Reinforced Concrete Pipe



PERFECT 

SANITARY SEWER APPLICATIONS

- Direct Bury
- Trenchless
- High Loading
- High Ground Water

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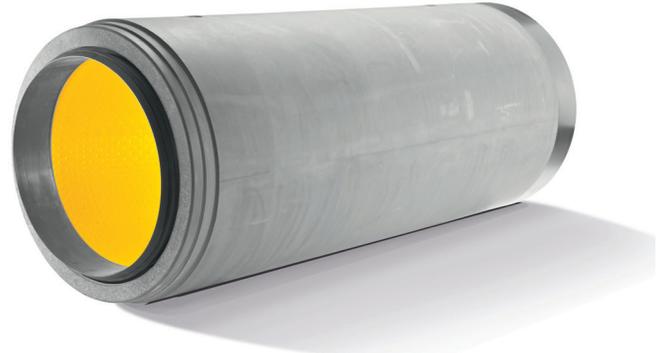
Section 1: Product Description

Perfect Pipe is a Reinforced Concrete Pipe (RCP) lined with a High-Density Polyethylene (HDPE) plastic lining that protects concrete from microbial induced corrosion in municipal wastewater systems. The pipe lay length is 9.84 feet (3 meters) and can be installed quicker than conventional 8-foot-length RCP. The pipe joints are connected by an internal joint coupler which eliminates the need for field welding. Small gaps on the outside of the internal joint coupler are fitted with two EPDM (ethylene propylene diene monomer) tilting edge gaskets which have been tested in excess of 35 psi external pressure.

Perfect Pipe for Standard Installation



Perfect Pipe for Trenchless Installation



Product Features & Benefits

CONCRETE PIPE

- Strength
- Structure
- Durability
- Sustainability

HDPE LINER

- Chemical resistant
- Smooth surface for maximum hydraulics
- Prevents interior build up for lower maintenance and operational costs

WATERTIGHT JOINT

- Factory installed Joints eliminate field error
- Quick install time with no field welding
- Tested to in excess of 35 psi

INSTALL APPLICATIONS

- Direct Bury
- Trenchless
- High Loading
- High Ground Water
- Use in conjunction with any pipe system

MAINTENANCE

- Low maintenance for long-term savings
- 100+ year design life
- Corrosion and abrasion resistant interior after decades of use
- No age-related decline in pressure
- Easy inspection with a bright view and clear joint location

Section 2: Application

Perfect Pipe is intended for use as gravity pipe in sanitary sewer collection systems to prevent microbial induced concrete corrosion and improve hydraulics. While Perfect Pipe is a sustainable solution for all sanitary sewer collection systems, Perfect Pipe provides exceptional value in the following applications:

- **Direct Bury:** The concrete-HDPE composite design of Perfect Pipe makes it an ideal solution for any sanitary sewer direct bury project. The smooth HDPE liner improves hydraulic flow, provides protection against system corrosion, and prevents sliming or build ups to reduce maintenance and operation costs. The reinforced concrete provides an ideal structure allowing for minimized installation costs as compared to flexible pipe alternatives. Furthermore, the bell-spigot joint design of Perfect Pipe enables a simple installation process comparable to conventional RCP installation.
- **Trenchless Installations:** Available with a consistent outer diameter and a steel bell band, Perfect Pipe is the solution for sanitary sewer jacking or microtunneling installations. We manufacture Perfect Pipe using a wet-cast, self-consolidating concrete (SCC) process to achieve high compressive strength and tight tolerances which support successful installation on the most challenging trenchless projects. A steel bell band provides additional concrete surface area to disperse the jacking forces. Perfect Pipe used for trenchless installation requires a pipe design that is specific to the project and installation equipment.
- **High Loading Conditions:** Perfect Pipe's reinforced concrete structure resists higher loading conditions than flexible pipe alternatives. Deep bury or shallow fill conditions result in high loading scenarios for underground infrastructure. In these cases, it is critical to select a product that can withstand the project loading.
- **High Groundwater Conditions:** Perfect Pipe is an optimum solution when a sewer pipe must be installed below the groundwater table. Its construction prevents groundwater infiltration and inflow which can result in higher costs of water treatment downstream. The internal joint coupler and EPDM tilting edge gaskets used in Perfect Pipe have been tested in excess of 35 psi external pressure or approximately 80 feet of head. In addition to the increased resistance to external pressures when compared to conventional RCP, Perfect Pipe resists flotation much better than conventional flexible pipe due to the robust concrete exterior.

Section 3: Sizing and Availability

Perfect Pipe is available in nominal sizes ranging from 12" up to 60" diameter. See Table 1 for the full range of sizes available as well as details on design characteristics. Larger diameter lined pipe is available with field welded joints. Please contact your Geneva Pipe and Precast Sales Representative for more information on larger diameter lined pipe or for inquiries on Perfect Pipe sizing for trenchless applications.

Table 1: Perfect Pipe Sizing Availability and Design Characteristics

Nominal Pipe Size (inch)	Inner Diameter (mm)	Total Flow Area (feet ²)	Achievable Curve Radius (based on standard lay length and allowable joint deflection)		
			(°)	(inch/foot)	Radius (feet)
12	(300)	0.76	2.4	0.49	234
15	(400)	1.35	1.8	0.37	313
21	(500)	2.11	1.5	0.30	375
24	(600)	3.04	1.2	0.24	470
27	(700)	4.14	1.0	0.21	564
30	(800)	5.41	0.9	0.18	626
36	(900)	6.84	0.8	0.16	705
40	(1000)	8.45	0.72	0.15	784
42	(1100)	10.22	0.65	0.13	867
48	(1200)	12.17	0.60	0.12	940
52	(1300)	14.28	0.53	0.11	995
56	(1400)	16.56	0.48	0.10	1030
60	(1500)	19.02	0.45	0.09	1075

Section 4: Design

DESIGN LIFE

Reinforced concrete pipe is a durable choice for long term value in stormwater applications. The Army Corps of Engineers recommends a design life of 70 to 100 years for conventional precast reinforced concrete pipe. However many installations have exceeded 100 years in service life. Whether buried or exposed, RCP is immune to most elements; it won't burn, rust, tear, buckle, or deflect. However, when exposed to sanitary sewer conditions, conventional RCP is susceptible to microbial induced corrosion which can greatly reduce its service life.

Perfect Pipe goes beyond the long design life of a conventional RCP by lining the inside of the pipe with HDPE, providing full protection against corrosion in sewer applications. Perfect Pipe is expected to have a design life that meets or exceeds 100 years under normal sanitary sewer conditions.

PIPELINE ALIGNMENT

While Perfect Pipe is available in straight pipe sections only, the joint design can accommodate angular deflection to allow for subtle curves in pipe alignment. Table 1 provides the radius of curvature and offset for each pipe size available. A lined manhole supplied by Geneva Pipe and Precast can accommodate any larger pipe alignment adjustments.

SELECTION OF PIPE STRENGTH CLASS

RCP manufactured by Geneva Pipe and Precast meets the manufacturing requirements of American Society for Testing and Materials (ASTM) Specification C76. Within this specification, five separate pipe strength classes, Class I, II, III, IV, and V, are defined with Class V designed to meet the highest loads. It is important to specify the proper pipe strength class necessary to meet the project-specific loading requirements. If too low of pipe class is specified, the pipe could be overloaded and may not provide the anticipated service life. If too high of pipe class is specified, then the project cost may be unnecessarily inflated. It is also important to note that Geneva Pipe and Precast only produces pipe classes III through V.

To select the correct pipe class needed for your project, please refer to the LRFD Fill Height Tables developed by the American Concrete Pipe Association (ACPA). These tables tabulate the required classes of pipe based on the height of fill over top of the pipe, the size of pipe, the bedding type, and constants such as 120 pcf of soil load, AASHTO HL-93 traffic load and a positive projecting embankment condition. For assistance in specifying the correct pipe class needed for your project or for project requirements that result in a "Special Design" or fall outside of the limits provided in the LRFD Fill Height Tables, please contact our engineering team for support on the pipe structural design.

HYDRAULICS

One of the key benefits of Perfect Pipe is that it provides optimal flow characteristics when compared to conventional concrete pipe due to the smooth surface of the HDPE liner. The Manning's n value for HDPE is reported as low as 0.009. It is common practice to consider larger values of Manning's n for long term conditions to account for sliming or build ups that occur over time or changes in pipe grade due to settlement or deflection of flexible HDPE pipe. However, the concrete structure surrounding the HDPE liner of Perfect Pipe eliminates any potential for pipe deflection which helps ensure that long term flow is not restricted. For hydraulic calculations, refer to Table 1.

MANHOLE CONNECTIONS

For a completely lined system, Geneva Pipe and Precast recommends that Perfect Pipe be paired with our Perfect Lined Manhole. Perfect Pipe is designed to be connected to manholes on the spigot end of the pipe utilizing the internal joint coupler. Geneva Pipe and Precast offers a Double Spigot Perfect Pipe for each manhole connection to allow for both sides of the manhole to have a spigot connection. Details of the Double Spigot Perfect Pipe can be seen in the Perfect Pipe Drawings at the end of this document.

SERVICE LATERAL CONNECTIONS

Laterals are connected to Perfect Pipe by core drilling a hole through the reinforced concrete and HDPE liner and inserting a FABEKUN® Junction with a 6-inch (160 mm) or 8-inch (200 mm) integrated adjustable socket as shown in Figure 1. The FABEKUN® Junction is firmly anchored into the drilled hole in the concrete pipe and sealed to the liner by an O-ring that is compressed against the liner as the fitting is tightened. The three-dimensional seal adapts perfectly to the internal curvature of Perfect Pipe and the integrated adjustable socket allows the lateral pipe to swivel within a range of 0° to 13° to provide flexibility during installation and to accommodate different settlement behavior of the Perfect Pipe and the lateral pipe.



Figure 1: FABEKUN® Junction Perfect Pipe Lateral Connection

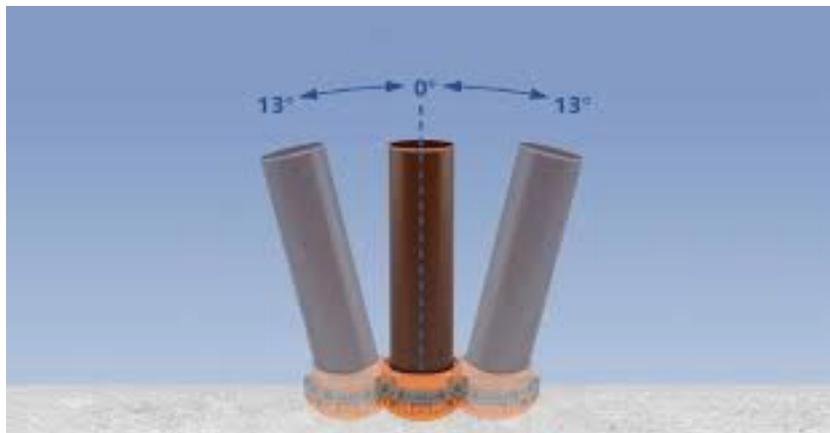


Figure 2: Lateral 0° - 13° Swivel Range

Section 5: Materials, Components, and Manufacturing

Perfect Pipe is made up of a number of different materials and components. Each material and component used in Perfect Pipe, along with the manufacturing process used to fabricate the final pipe product, are described in this section.

MATERIALS AND COMPONENTS

Reinforced Self-Consolidating Concrete

Reinforced Self-Consolidating Concrete (SCC) provides the structural component of Perfect Pipe. SCC is a highly flowable, non-segregating concrete that can flow in the formwork and through the reinforcement under its own weight and without any mechanical consolidation. The highly flowable nature of SCC allows for the concrete to fill all voids between the anchors of the HDPE liner to enable a secure connection between the liner and the concrete. Most RCP is made with a dry cast concrete mix which is defined as a very low or zero-slump concrete that requires intense vibration to consolidate the concrete, enabling immediate removal of the forms from the product. Dry cast concrete provides benefits such as a faster production rate and optimal use of plant footprint. However, dry cast concrete is not ideal for anchoring liners because the vibratory compaction can leave small voids around the anchors which may result in a less secure connection and the potential for future delamination.

HDPE Lining

The HDPE lining, with anchors on one side and a smooth finish on the other is anchored into the concrete on the interior of the pipe to provide protection against microbial induced corrosion and to improve system hydraulics.

Internal Joint Coupler

The internal joint coupler is installed into a preformed recess in the HDPE liner at the end of the pipe. The purpose of the coupler is to provide an even transition across each joint on the interior of the pipe to promote smooth, laminar flow. The connector also facilitates the gas and watertight seal necessary in a sanitary sewer environment by compressing the pipe gaskets against the HDPE liner.

EPDM Tilting Edge Gaskets

Two EPDM tilting edge gaskets are installed in raceways at each end of the connector. The gaskets are designed to have a double sealing edge to protect against both infiltration and exfiltration.

Load Transmission Ring

A load transmission ring is installed on the concrete spigot of each pipe to evenly distribute the pressures of the homing pipe and to prevent damage of the concrete joint. The load transmission ring is not intended for resisting hydrostatic pressures. All hydrostatic pressures are resisted by the EPDM tilting edge gaskets.

MANUFACTURING PROCESS

Step 1: Prepare the Liner

The HDPE lining is measured and cut to a length equivalent to the interior circumference of the pipe size. An extrusion weld performed by a certified welder is utilized to connect the two opposite ends of the liner and develop a cylindrical tube shape. The liner is then heated to expand each end where the internal joint coupler will be installed before it is placed on a tall standing pipe form core.

Step 2: Cast the Pipe Using Self Consolidating Concrete

Reinforced concrete is cast monolithically using wet-cast, self-consolidating concrete (SCC) embedded with welded wire reinforcement per ASTM C76 and ASTM A1064. In this step, the SCC is poured around the liner in the pipe form to fully encapsulate all anchors and create a secure connection between the concrete and the liner.

Step 3: Install the Load Transmission Ring, Internal Joint Coupler, and Gaskets

Once the concrete has cured, the pipe is removed from the form and the load transmission ring, internal joint coupler and gaskets are installed. Equipped with the two EPDM gaskets, the coupler is pressed into the recess of the HDPE liner in the bell section of the pipe which fully engages one of the gaskets. The other gasket will be engaged during pipe installation. Finally, the load transmission ring is installed on the concrete spigot before the product is stored or shipped to the job site.

The installation of all components and gaskets at our facility is another major benefit of Perfect Pipe; it decreases the time needed for installation by reducing the work required by the contractor on site. We install all gaskets at our plant following the manufacturer's recommendation which reduces risk of improper gasket installation in the field.

Section 6: Testing and Quality Control

As an NPCA certified and UDOT Gold Class manufacturer, quality control is a main focus of Geneva Pipe and Precast. All products are manufactured in a controlled environment with every step of the process carefully measured and verified. The following inspections are carried out for each product manufactured by our team.

PRE-POUR INSPECTIONS

Prior to pouring the concrete into the form, our Quality Control team performs a variety of verifications to ensure the equipment, materials, and product components are correctly prepared and ready to be poured. Below are just some of the items that are checked before pouring the concrete into the form.

- **Equipment:** Production equipment is inspected to ensure adequate condition, dimensions, cleanliness, and proper setup.
- **Product Components:** Components such as lift inserts, spacers, or other embedded items are checked to verify proper type, quantity, and placement.
- **Reinforcement:** Wire size, type, placement, and spacing is inspected to ensure proper steel area and clear cover is provided per the manufacturing specification or product design.
- **Raw Materials:** The concrete mix is sampled and checked using a variety of tests including but not limited to slump flow, visual stability index (VSI), and air percentage. Concrete cylinders are also poured to test post-cure properties of the concrete such as 1-day, 7-day, and 28-day compressive strengths.

POST-POUR INSPECTIONS

Additional inspections of each product are carried out after the concrete has been poured, cured, and stripped from the form. Listed below are some of the items that are checked after the concrete product has cured.

- **Concrete Strength:** The concrete cylinders mentioned in the pre-pour inspection section are tested for compressive strength at day 1, 7 and 28 after pouring to ensure concrete has gained sufficient strength prior to stripping, handling, and mobilization.
- **Visual Quality:** Each product is examined visually to ensure quality of finish and that any deficiencies are within specified acceptance criteria in relevant standards. If product does not meet specified acceptance criteria, it may be rejected. Cause for rejections could include cracks larger than 0.01", spalling, segregation or excessive bug holes, exposed steel or other quality issues that may affect the long-term performance of the product. Minor defects that do not impair the use or life of the product may be repaired in a manner that meets the requirements of the owner or relevant specifications.
- **Geometry:** Products are measured to ensure that geometry is within the permissible variations of relevant standards. Go/No-Go gauges may be used to verify geometry. Products are always checked and confirmed against specified tolerance requirements.
- **Components and Appurtenances:** Product appurtenances such as lifting devices, plates, and inserts are checked to verify that they have been embedded into the concrete satisfactorily.

PERFECT PIPE TESTING

In addition to the Pre- and Post-Pour inspections mentioned above, which we carry out for all of our manufactured products, Perfect Pipe requires some additional quality control measures.

Three-Edge Bearing Test

The three-edge bearing (TEB) test is a destructive load test to determine the strength of a concrete pipe. In a TEB test, the pipe is loaded to the specified design strength D-load for that particular class of pipe to produce a 0.01-inch crack. The D-load for each pipe class can be seen in Table 3. This test is performed at a minimum of once per year for each size (and class) of pipe, or as described in table 4, whichever is greater.

Table 3: Reinforced Pipe Classes for 0.01-inch Crack per ASTM C76

Pipe Class	Required Load (lbs./ft./ft.)
Class I	≤ 800
Class II	≤ 1000
Class III	≤ 1350
Class IV	≤ 2000
Class V	≤ 3000
Special Design	> 3000

Table 4: Test Frequency per Pipe Size and Class

Pipe Size	Pipe Class	Test Frequency
12" – 15"	Class V and below	1 / 1000 pieces
18" – 36"	Class IV and below	1 / 800 pieces
18" – 36"	Class V	1 / 400 pieces
42" – 60"	Class III and below	1 / 400 pieces
42" – 60"	Class IV and V	1 / 200 pieces

Internal Hydrostatic Test

Each joint design manufactured by Geneva Pipe and Precast is verified through a hydrostatic test per ASTM C497 and ASTM C443 to ensure that the pipe meets the hydrostatic requirements stated in the specification for the installed pipe joint. This test is conducted by connecting two or more pipe together and sealing off the open ends. The pipe are filled with water to the specified pressure and held for 10 minutes. Once the hydrostatic pressure has been achieved, the joint between the pipes is visually inspected to ensure that no water leakage has occurred.

Spark Test

A spark test per ASTM D6365 is conducted on all factory made plastic welds in Perfect Pipe to ensure that the plastic HDPE is completely sealed. This test allows us to verify that the concrete portion of the pipe is completely protected by the plastic liner prior to shipping so that no corrosive gases can reach the concrete in an installed sewer condition.

THIRD-PARTY TESTING

In addition to the testing described above, Perfect Pipe has had a number of tests completed by third-party organizations over time. Below are some of the key third-party performance tests conducted.

External Hydrostatic Test

The Perfect Pipe joint has been tested for hydrostatic resistance to infiltration water pressure through an external joint test. As shown in Figure 3, two pipes were homed and strapped together. A small hole was drilled through the bell of the pipe to apply external water pressure on the EPDM tilting edge gaskets while a secondary gasket was used instead of the load distribution ring to ensure no outward water leakage through the pipe joint. Water pressure was applied and reached an ultimate capacity of 50 psi for 10 minutes and a working capacity of 36 psi for 20 hours.

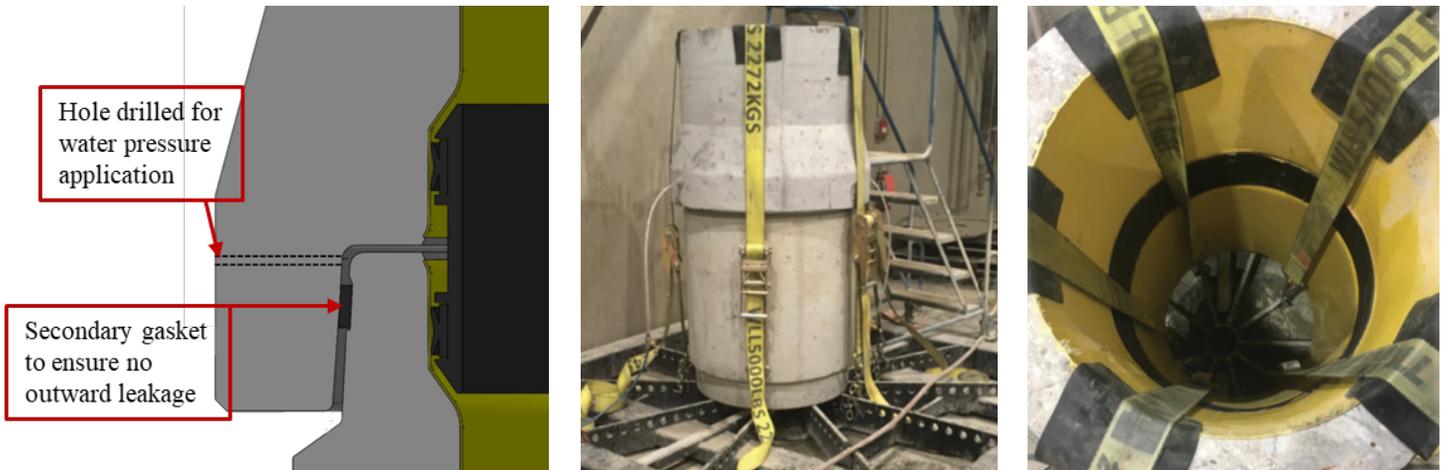


Figure 3: Infiltration Hydrostatic Test

Chemical Resistance

The HDPE liner has been tested and passed for chemical resistance by various third party organizations. The liner samples were tested for weight change and other physical properties before and after exposure to chemical solutions and passed the performance requirements with excellent results.

Abrasion Resistance

The HDPE liner has superior abrasion resistance when compared to other pipe materials. The HDPE liner was tested for abrasion resistance following the Darmstadt test method in which the liner is placed in a 3-foot-long tipping channel with a sand-gravel-water mixture applied over top of the liner. Both ends of the tipping channel were alternately tilted over 22.5° lengthwise, in order to slide the gravel mixture over the liner. This movement was repeated for 200,000 cycles and the depth of abrasion on the liner was measured. The HDPE liner depth of abrasion had a mean and maximum measurement of 0.0087 and 0.014 inches, respectively.

Pullout Resistance

Following ASTM D7853, the HDPE liner anchored into the self-consolidating concrete was tested for hydraulic pullout resistance. A hole was drilled and water pressure was applied between the concrete and the liner until the liner detached from the concrete. Water pressure was held at 30 psi for 200 hours and then increased 5 psi of pressure every hour until failure. Figure 4 shows the apparatus used to conduct the test along with the quality of the concrete at failure.



Figure 4: Hydraulic Pullout Resistance of HDPE liner

High-Pressure Jet Resistance

Perfect Pipe has also been tested for resistance of the cast in HDPE liner to a high pressure water jet for maintenance and line cleaning. Seven 12” nominal diameter pipes connected with the internal coupler and EPDM gaskets at a total length of 68 feet were tested. In this test, an eight-jet omni-directional nozzle emitted 74 gallons of water per minute at a pressure of 1500 – 1700 psi for 60 cleaning cycles of a consistent forward and backward movement through the entire pipe train. The pipe train was visually inspected with no detectable changes or damage after the test.

Section 7: Installation Recommendations

Mobilizing, handling, and installation of Perfect Pipe is similar to that of conventional RCP. Please refer to ASTM C1479 along with the Concrete Pipe and Box Culvert Installation manual created by ACPA for a complete guide and full details on proper installation of concrete pipe. Additional recommendations for the proper mobilization, handling, and installation of Perfect Pipe are provided below.

MOBILIZATION AND HANDLING

On-Site Handling

Perfect Pipe shall be handled with reasonable care. The contractor must take all necessary precautions to ensure the recommended handling methods outlined in this guide are followed. When moving pipe, avoid allowing the pipe to make contact with another pipe or other hard surfaces such as the trench box. All Perfect Pipe sections are equipped with two dog bone lifters. When moving or lifting the pipe, always use both lifters with a maximum sling angle not exceeding 60 degrees. Do not lift pipe from the pipe barrel. Recommended handling equipment includes crane or excavators. Transporting the pipe shall be done in a manner that prevents excessive impact or dynamic loads. When lifting or handling, making contact with the inside of the pipe is prohibited. Lifting with a front-end loader or forklift from the interior of the pipe will cause damage to the liner and may compromise the performance of the pipe. Do not drag pipe on the ground. Do not roll pipe over the ground.

Receiving Visual Inspection

Perfect Pipe undergoes a strict quality control process as specified in Testing and Quality Control section of this document. Pipe is delivered to the jobsite with a label to indicate product size, class, and manufacturing date. Contractor shall visually inspect the product for any potential deficiency listed below which can occur during handling and mobilization.

- Ensure coupler is not missing or damaged
- Ensure gasket is provided on the coupler and not damaged
- Check for any concrete damage such as chips, spalls, or cracks
- Check the liner to ensure there is no damage
- Ensure load transmission ring is provided on the spigot end of the pipe

Report any product damage or deficiencies to a Geneva Pipe and Precast representative and set product aside.

On-Site Storage

Perfect Pipe shall be stored in a location such that they are protected from traffic and construction equipment. Pipe shall be stored on a flat surface, preferably on a layer of aggregates. The pipe shall be wedged to avoid direct contact against adjacent pipe. Stacking pipe on the job site is not recommended. Contact a Geneva Pipe and Precast representative for information on UV exposure limits or to provide a stacking plan if required due to limited site area.

Installing Perfect Pipe

The installation of Perfect Pipe is very similar to the installation of standard RCP. Therefore, it is recommended to follow ASTM C1479 Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations along with ACPA's Concrete Pipe and Box Culvert Installation. Additional installation recommendations are provided in the following sections.

Pre-Installation

Contractor shall review all of the information in this Product Guide prior to the installation. For additional training or guidance in Perfect Pipe installation, please contact a Geneva Pipe and Precast representative. Project-specific product installation trainings can be provided upon request.

Preparation

Before final placement, contractor shall:

- Re-inspect the pipe in accordance with Receiving Visual Inspection recommendations above
- Ensure the Internal Joint Coupler and the inside of the bell and spigot are free of foreign objects such as dirt, soil, ice, snow, etc.
- Ensure the load transmission ring is resting in the recess of the pipe spigot
- Lubricate the exposed EPDM Tilting Edge Gasket, the full exterior of the coupler and inside of the spigot utilizing the product-specific lubricant provided

Installation

Perfect Pipe shall be lowered into position slowly. Contractor can home the pipe using one of the following methods:

- Assist with pry bar and piece of 2x4 wood. Place the piece of wood closer to the ground and flat against the bell of the pipe such that it makes contact with both sides of the pipe bell. Keeping the pipe suspended with the lifting sling, use pry bar leverage on the ground to transfer pressure to the pipe through the wood to push the pipe in.
- Use a lifting sling to pull the pipe. Connect the lifting pin near the joint that needs to be homed and then pull in.

Do not use any other equipment such as bucket of the excavator to push the pipe in place. This will damage the joint.

Joint Validation

After the pipe has been connected, the joint should be inspected to ensure that the pipes were homed properly. Unlike conventional RCP, the joint gap on the interior of the pipe cannot be inspected to ensure tolerances are met since the interior joint gap is covered by the internal joint coupler. Therefore, the joint must be measured for accuracy on the exterior of the pipe. Geneva Pipe and Precast will provide an exterior joint gap measurement tool specific for the pipe size being inspected. If a joint measurement tool was not provided, please contact your Geneva Pipe and Precast representative. Additional joint measurement tools can be provided upon request.

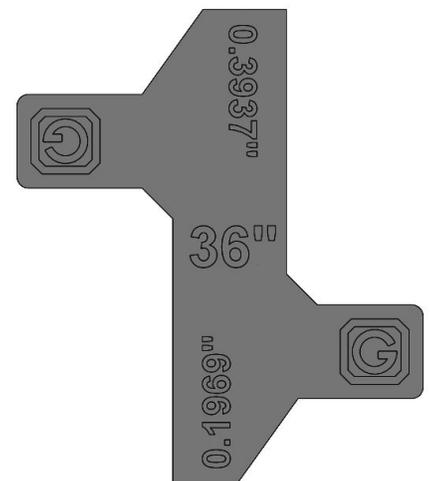


Figure 5: Perfect Pipe Go-No Go Measurement Tool

Perfect Pipe is designed to have a minimum joint gap of 0.197" (5 mm), and a maximum permissible joint gap of 0.394" (10 mm). This gap will allow a hydrostatic performance of 35 psi. A diagram of the joint measurement tool is provided in Figure 5. One side of the tool is sized to measure the minimum design joint gap and the other is to measure maximum permissible joint gap. Figures 6 and 7 show how the joint measurement tool is intended to be used and provides examples of an acceptable joint gap and an unacceptable joint gap, respectively.

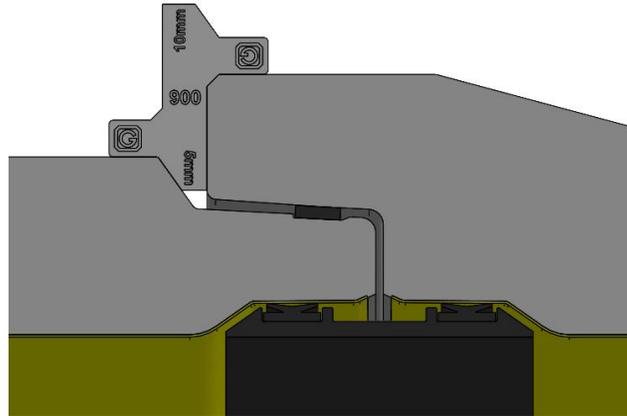


Figure 6: Acceptable Joint Gap

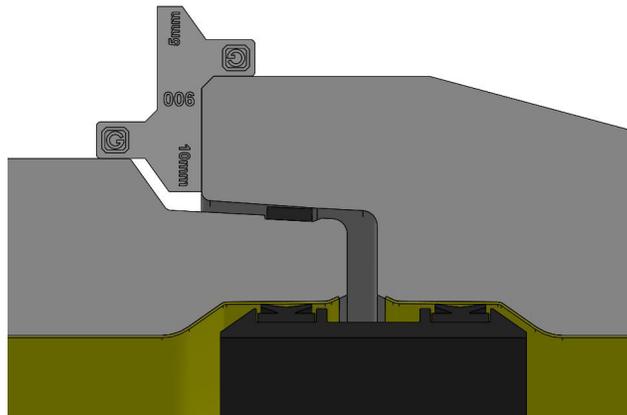


Figure 7: Unacceptable Joint Gap

Section 8: Relevant Specifications

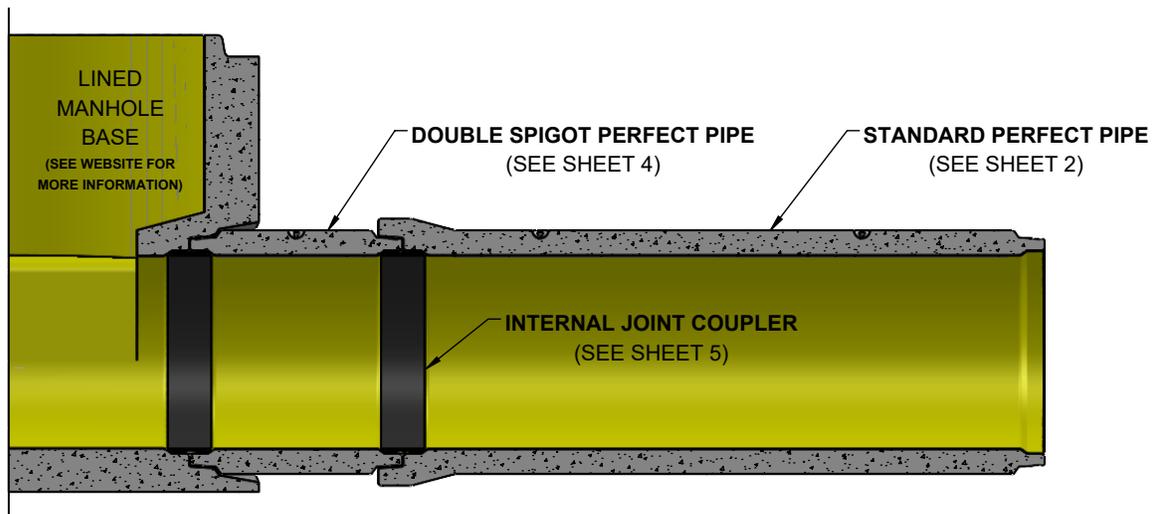
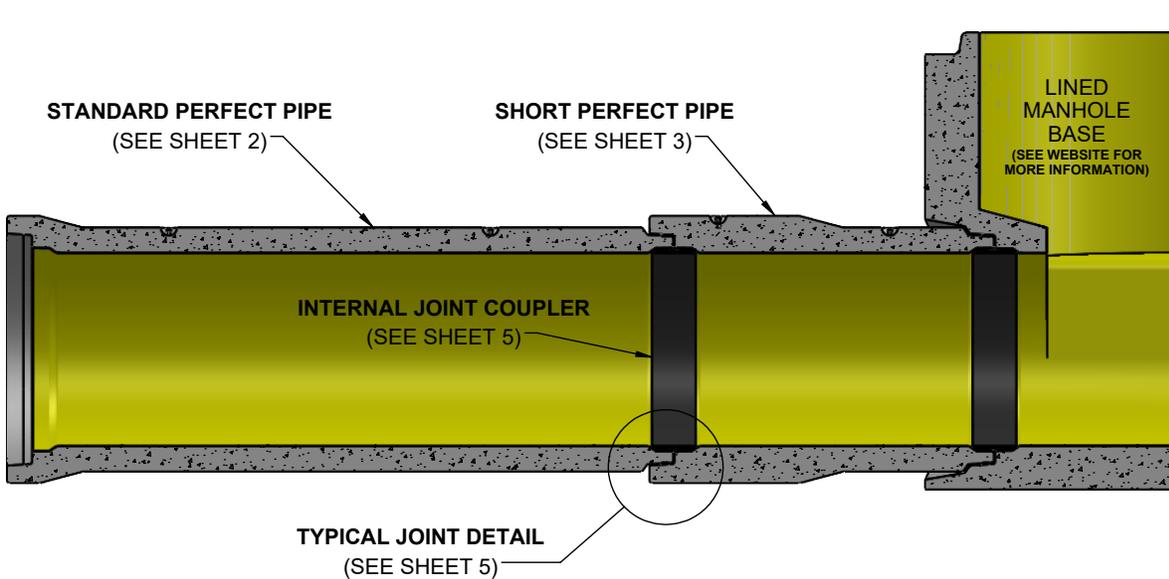
Table 5: Relevant Standard Specifications and Manuals

ACPA's Concrete Pipe and Box Culvert Installation Manual	
Specifications	Title
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C497	Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile
ASTM C1479	Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
ASTM C1619	Standard Specification for Elastomeric Seals for Joining Concrete Structures
ASTM D395	Standard Test Methods for Rubber Property—Compression Set
ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
ASTM D471	Standard Test Method for Rubber Property—Effect of Liquids
ASTM D573	Standard Test Method for Rubber—Deterioration in an Air Oven
ASTM D7853	Standard Test Method for Hydraulic Pullout Resistance of a Geomembrane with Locking Extensions Embedded in Concrete
ASTM D1149	Standard Test Methods for Rubber- Deterioration—Cracking in an Ozone Controlled Environment
ASTM D2240	Standard Test Method for Rubber Property—Durometer Hardness
ASTM D2527	Standard Specification for Rubber Seals—Splice Strength
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

Section 9: Product Drawings

On the following pages are five sheets of technical drawings including:

- Overview of Perfect Pipe System
- Standard Perfect Pipe Isometric & Cross Section View
- Short Perfect Pipe Isometric & Cross Section View
- Double Spigot Perfect Pipe Isometric & Cross Section View
- HDPE Liner & Joint Detail



SHORT PERFECT PIPE:

- USED FOR MINOR PIPELINE LENGTH ADJUSTMENTS.

DOUBLE SPIGOT PERFECT PIPE:

- USED TO CONNECT TO MANHOLES. ONLY SPIGOT END OF PIPE CAN CONNECT TO MANHOLES.

INTERNAL JOINT COUPLER:

- USED IN EACH JOINT CONNECTION TO PROVIDE RESISTANCE TO INFILTRATION AND EXFILTRATION.

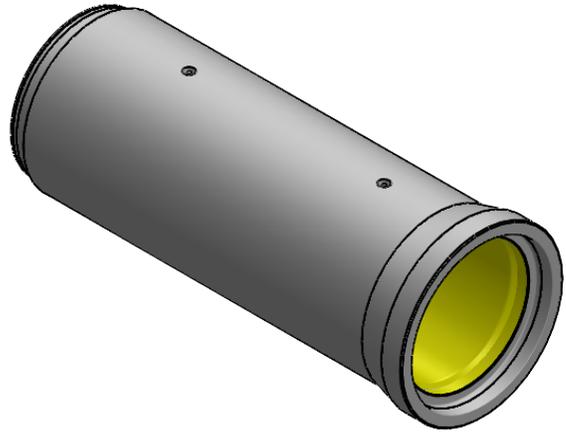


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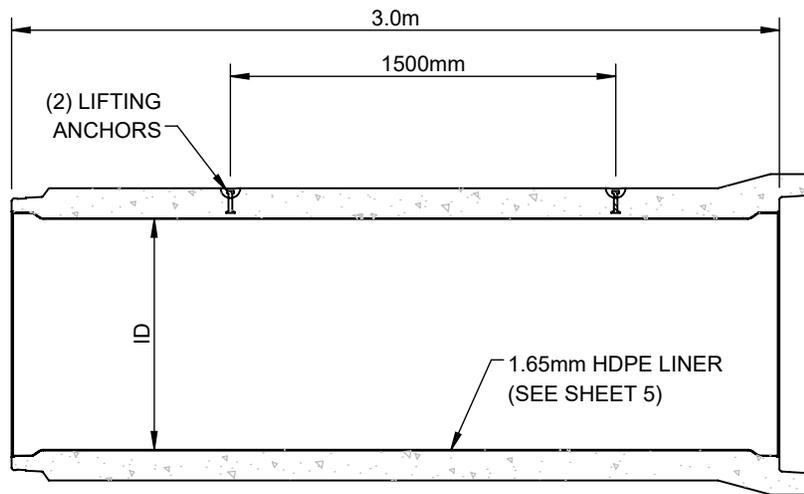
PRODUCT:		PERFECT PIPE SYSTEM			
DRAWN BY:	DMANNING	DATE:	7/16/2020	LOADING:	PER PROJECT
CONTACT:	(801) 225-2416 or info@genevapipe.com		WEBSITE:	www.genevapipe.com	
				SHEET:	1



ISOMETRIC VIEW
(SPIGOT END)



ISOMETRIC VIEW
(BELL END)

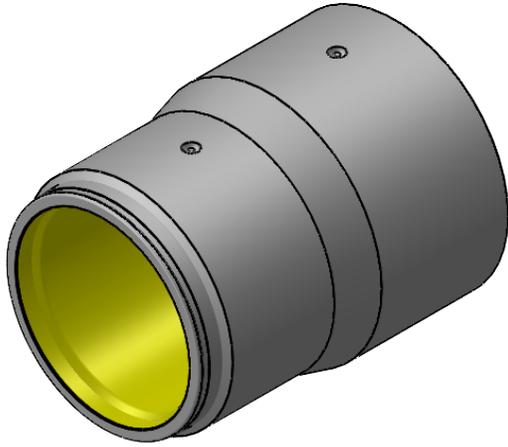


SECTION VIEW

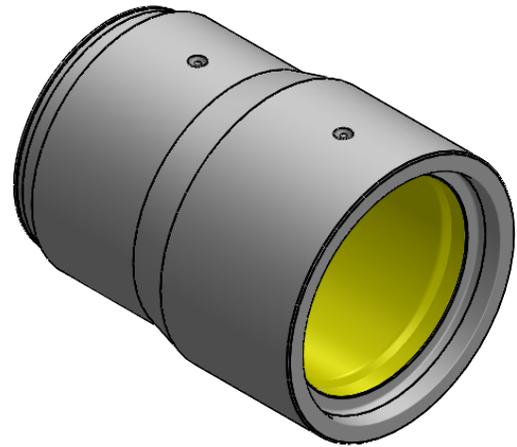
NOMINAL SIZE (inch)	ID (mm)
12"	300
15"	400
21"	500
24"	600
27"	700
30"	800
36"	900
40"	1,000
42"	1,100
48"	1,200
52"	1,300
56"	1,400
60"	1,500



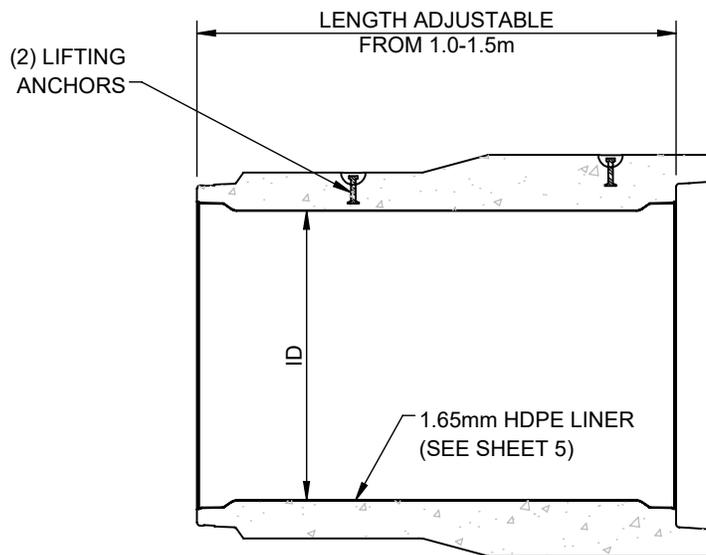
PRODUCT: STANDARD PERFECT PIPE			
DRAWN BY: DMANNING	DATE: 7/16/2020	LOADING: PER PROJECT	
CONTACT: (801) 225-2416 or info@genevapipe.com	WEBSITE: www.genevapipe.com	SHEET: 2	



ISOMETRIC VIEW
(SPIGOT END)



ISOMETRIC VIEW
(BELL END)



SECTION VIEW

NOMINAL SIZE (inch)	ID (mm)
12"	300
15"	400
21"	500
24"	600
27"	700
30"	800
36"	900
40"	1,000
42"	1,100
48"	1,200
52"	1,300
56"	1,400
60"	1,500

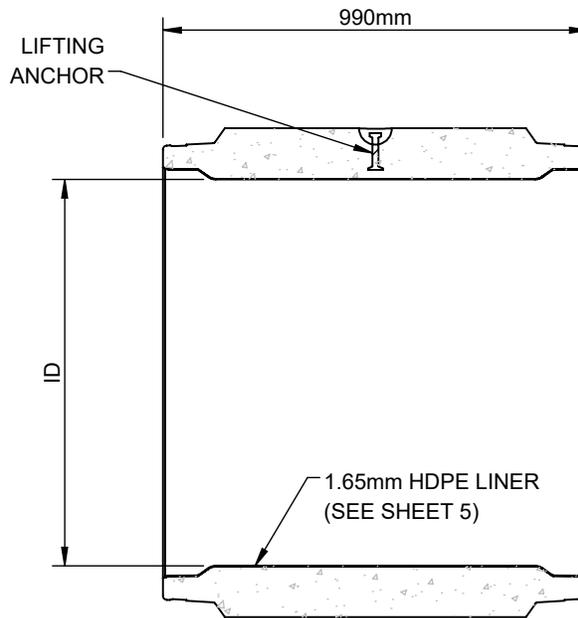


**Geneva Pipe
and Precast**
A Northwest Pipe Company

PRODUCT: SHORT PERFECT PIPE			
DRAWN BY: DMANNING	DATE: 7/16/2020	LOADING: PER PROJECT	
CONTACT: (801) 225-2416 or info@genevapipe.com		WEBSITE: www.genevapipe.com	SHEET: 3



ISOMETRIC VIEW



SECTION VIEW

NOMINAL SIZE (inch)	ID (mm)
12"	300
15"	400
21"	500
24"	600
27"	700
30"	800
36"	900
40"	1,000
42"	1,100
48"	1,200
52"	1,300
56"	1,400
60"	1,500

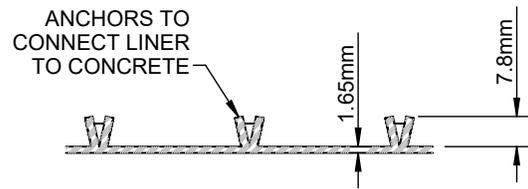


**Geneva Pipe
and Precast**
A Northwest Pipe Company

PRODUCT: DOUBLE SPIGOT PERFECT PIPE			
DRAWN BY: DMANNING	DATE: 7/16/2020	LOADING: PER PROJECT	
CONTACT: (801) 225-2416 or info@genevapipe.com	WEBSITE: www.genevapipe.com	SHEET: 4	

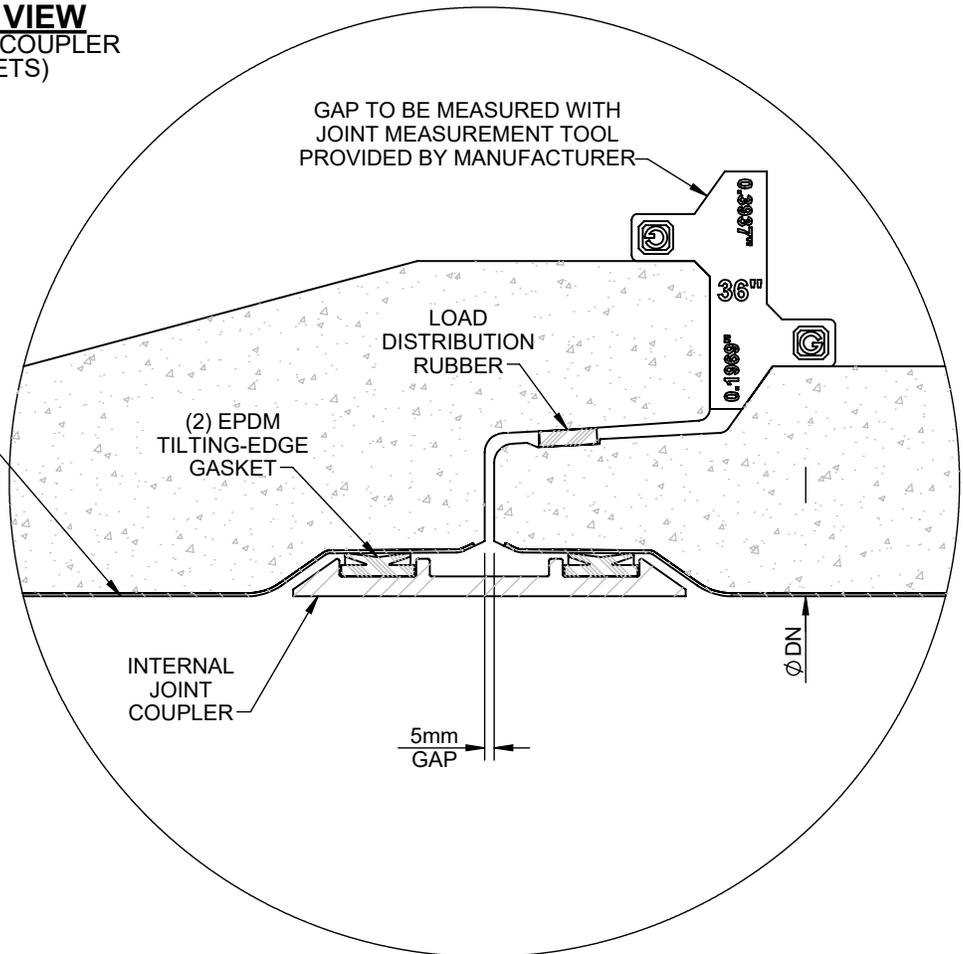


ISOMETRIC VIEW
(INTERNAL JOINT COUPLER
WITH GASKETS)



**HDPE LINER DETAIL
WITH ANCHORS**

1.65mm
HDPE LINER



JOINT DETAIL

NOMINAL SIZE (inch)	ID (mm)
12"	300
15"	400
21"	500
24"	600
27"	700
30"	800
36"	900
40"	1,000
42"	1,100
48"	1,200
52"	1,300
56"	1,400
60"	1,500