

Concrete Pipe **Insights**

A Message from the American **Concrete Pipe** Association

Concrete Pipe Joints — Your Best Choice

Concrete pipe has been used for several different purposes since the ancient days of man. In North America, concrete pipe has been used extensively in drainage and sanitary sewer systems since the 19th century. Technological advancements in industry over the last century have led to major improvements in the manufacturing processes, mix designs, strength, reinforcement, new products, and installation designs. One area that has continued to evolve and progress along with the rest of the concrete pipe industry is joint design and production. Today's concrete pipe offers several types of joints that meet stringent industry and national standards for performance.

The function of a pipeline generally determines the performance requirements of the pipe joints. Whether the purpose is to convey sanitary sewage or stormwater, joints are designed so that when sections are laid together they will make a continuous line of pipe with an interior free from irregularities. Joints can be designed to provide soil-tightness, or watertightness, with the ability to accommodate deflection or longitudinal movement, and strength to handle shear or vertical movement.

Concrete pipe manufacturers have developed joint designs to provide the following performance characteristics:

- Resistance to infiltration of groundwater and backfill material
- Resistance to exfiltration of sewage or storm water
- Flexibility to accommodate lateral deflection or longitudinal movement
- Strength to handle shear or vertical movement
- Pipeline continuity and smooth flow line
- Infiltration of groundwater for subsurface drainage
- Ease of installation

In addition to the advantages of the concrete pipe joints mentioned above, the increased number of joints, typically marketed by competing products as a perceived shortcoming of concrete pipe, may in fact be an advantage for many installations. With an increased number of joints: line and grade is maintained and checked more frequently, pipe lengths can fit and be positioned in standard trench boxes more easily, and longitudinal stresses in pipe walls are relieved when pipelines encounter non-uniform bedding foundations.

The concrete pipe industry offers several joint systems to satisfy this broad range of performance requirements. Consultation with local concrete pipe manufacturers will provide information on the availability of the various joints.

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Precast concrete pipe joints are manufactured in three basic shapes:

- Modified tongue and groove
- Tongue and groove
- Bell and spigot

Concrete surfaces with opposing shoulders on both ends, such as the bell and spigot and the modified tongue and groove joints, generally utilize a rubber gasket for sealing. Preformed flexible joint sealants or mortar joints are used for lesser performance requirements or where the product shape dictates the type of seal. Joints utilizing flexible mastic sealants typically perform as a soil-tight system unless higher performance expectations are described in the project specifications.

Design engineers need to be aware of what is and is not included within suggested pipe standards for their projects. As an example, unless explicitly specified, the typical joint performance prospect for flexible HDPE pipe is only soil tightness in dry soil conditions. When comparing the performance of pipe jointing systems between concrete pipe and alternate products, one should review the standard specifications of each product. Two of the bodies most often referred to are the American Society for Testing and Materials (ASTM) and the American Association of State Highway and Transportation Officials (AASHTO). ASTM standards are consensus-based standards that exist for both storm and sanitary sewer joints. The AASHTO standards for storm sewers and culverts are developed by the 50 State Highway or Transportation Departments, the District of Columbia, and Puerto Rico. Many ASTM and AASHTO specifications are identical or “sister” specifications. The AASHTO standards are intended to serve as a standard for the preparation of state DOT specifications, whereas ASTM standards are typically referenced in other applications.

ASTM C 443, *Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets*, covers rubber gasketed, watertight joints for circular concrete sewer and culvert pipe and precast manhole sections. The specification includes both the design of joints and the physical requirements for rubber gaskets to be used therewith. ASTM C 443 requires acceptability of concrete pipe joints and gaskets based on the results of proof-of-design tests.

As infiltration and exfiltration standards have changed considerably over the last century, so has the performance of concrete pipe and concrete pipe joints. Concrete pipe offers the design engineer several different joint types depending on the application. The joint types include mortar, flexible sealants, external sealing bands, and rubber gaskets. Throughout North America, concrete pipe manufacturers routinely meet demanding project specifications. Because of its superior durability, strength and joint system performance, concrete pipe remains the pipe of choice for engineers and owners of drainage and sanitary sewer projects.