



ACPA Key Issue Statement

Concrete Pipe Joints: Your Best Choice

As infiltration and exfiltration standards have changed considerably over the last century, so has the performance of concrete pipe and concrete pipe joints. A long-time proven solution, concrete pipe offers the design engineer several different joint types, depending on the application, to meet the utmost 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.

ADVANTAGES OF CONCRETE JOINTS

In addition to the inherent strength of a pipe constructed using reinforced concrete, the pipe joint can be designed to meet different sealing requirements, with the ability to accommodate lateral or longitudinal movement by using several joint options including mortar, flexible joint sealants, rubber gaskets and external sealing bands.

Concrete joint designs provide the following performance characteristics:

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

Did you know?

Two common misconceptions often shared by competing products are that concrete pipe is inferior because of the number of joints, and it's not water-tight. However, these are false. With an increased number of joints, line and grade are 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. What's more, RCP joints can be designed to be watertight, soiltight and silttight. In most regions, soiltight is the standard specification.



Did you know?

Although alternate materials may use rubber gaskets, the use of a rubber gasket does not by itself ensure that different joint types are equal. Designers can utilize ASTM Standards to specify for desired performance, but in the case of alternate materials, additional guidance may be required. Concrete pipe joints are governed in national standards by better, more detailed designs with tighter tolerances and higher test pressures. Rubber-gasketed concrete pipe joints meet the stringent requirements of ASTM C 443. Additionally, the project owner benefits from the concrete pipe joint's inherent strength and rigid pipe design to ensure line and grade and maintain joint integrity.

DESIGNED TO PERFORM

A pipeline's function generally determines the performance requirements of the pipe joints, and today's concrete pipe manufacturers offers several types of joints that meet stringent industry and national performance standards. Whether the purpose is to convey sanitary sewage or storm water, 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 be soiltight or watertight with the ability to accommodate lateral or longitudinal movement, and strength to handle shear or vertical movement.

Concrete surfaces with opposing shoulders on both ends, such as the bell and spigot joint, generally utilize a rubber gasket for sealing. Preformed flexible joint sealants or mortar are used for lesser performance requirements or where the product shape dictates the type of seal.

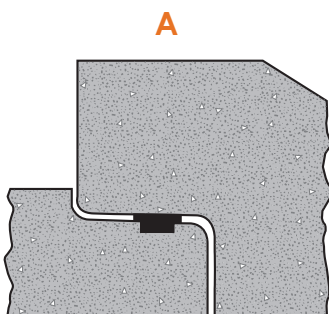
The concrete pipe industry offers several joint systems to satisfy the broad range of performance requirements. Consultation with local concrete pipe manufacturers will provide information on the availability of the various joints.

TYPES OF JOINTS

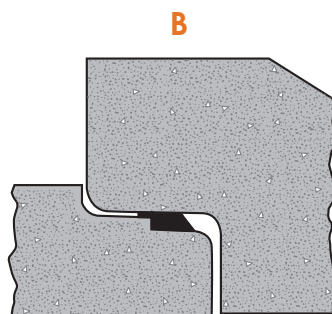
When comparing the performance of jointing systems between concrete pipe and alternate products, one should review the standard specifications of each product and be aware of what is and is not included within the suggested standards.

Precast concrete pipe joints are manufactured in two basic shapes: tongue and groove, and bell and spigot. The types of joints include:

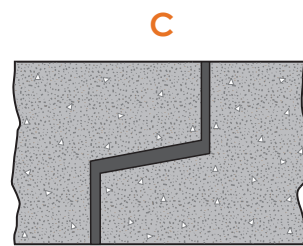
- Rubber gasket joints (*belows, example A and B*) – leak-resistant and watertight joints
- Preformed flexible joint sealants (*below, example C*) – soiltight and silt-tight joints
- Mortar tongue and groove (*below, example D*) – soiltight and silt-tight joints



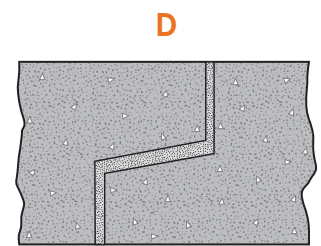
Typical cross-section of opposing shoulder type bell and spigot joint with a confined o-ring rubber gasket.



Typical cross-section of opposing shoulder type bell and spigot joint with a single offset rubber gasket.



Typical cross-section of tongue and groove joint with flexible mastic sealant.



Typical cross-section of tongue and groove joint with mortar packing.

STANDARDS

ASTM and AASHTO standards apply to concrete products' joints. The versatility of joints allows the designer to match project requirements with the appropriate joint and/or seal. Note that joints for most pipe products are specified in separate standards than the pipe and precast manufacturing and design standards.

FIELD TESTS TO VERIFY JOINT DESIGN

There are three different field test methods to verify concrete pipe joint design, for vacuum, air or water:

1. ASTM C 1103 Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines provides procedures for acceptance testing of joints by air or water tests of installed concrete pipe joints.
2. ASTM C 969 Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines covers procedures for testing installed concrete pipe sewer lines using water infiltration or exfiltration acceptance limits to demonstrate the integrity of the joints.
3. ASTM C 1214 Standard Test Methods for Concrete Pipe Sewer Lines by Negative Air Pressure (Vacuum) Test Method covers procedures for testing 4- to 36-inch concrete pipe sewer lines using the vacuum test method.

Advantages of Concrete Joints

- Strength: concrete is inherently strong
- Project-specific joint configurations
 - Mortar
 - Flexible joint sealants
 - Rubber gaskets
 - External sealing bands
- Design Versatility: Concrete pipe comes in the shape, size and joint configuration for virtually any drainage program



American **Concrete Pipe** Association