Standard Practice for

Pipe Joint Selection for Highway Culvert and Storm Drains

AASHTO Designation: R 82-17 (2021)[1]

First Published: 2017 **Reviewed but Not Updated: 2021**

Technical Subcommittee: 4b, Flexible and Metallic Pipe

AASHTO

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1. SCOPE

1.1. Pipe joint design considerations are a critical component for the overall performance of culvert and storm drain installations. Experience has shown that the component responsible for many culvert and sewer performance problems and failures can be traced back to the pipe joint. The structural and hydraulic performance of the joint affects the stability of backfill and soil envelope around the pipe, the line and grade of the culvert, integrity of the overlying embankment and pavement, and compliance to storm and sanitary sewer permits. This practice is to provide clear definitions of joint performance terms, rational design methodology to determine appropriate joint performance requirements, and uniform criteria for manufacturers' joint qualification and contractors' post-installation pipe joint testing.

1.2. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use*.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 36, Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
- M 288, Geosynthetic Specification for Highway Applications
- M 294, Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
- M 304, Poly(Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
- *AASHTO LRFD Bridge Construction Specifications*

2.2. *ASTM Standards*:

- C443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- C497, Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile
- C877, Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
- C924, Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method (withdrawn 2013; no replacement)
- C969, Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines

- C1091, Standard Test Method for Hydrostatic Infiltration Testing of Vitrified Clay Pipe Lines
- C1103, Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
- C1619, Standard Specification for Elastomeric Seals for Joining Concrete Structures
- D3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- F477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- F1417, Standard Practice for Installation Acceptance of Plastic Non-Pressure Sewer Lines Using Low-Pressure Air

3. TERMINOLOGY

3.1. *Definitions*:

3.1.1. *brownfields*—abandoned industrial or commercial sites with some soil contamination from previous use, now available for new construction.

3.1.2. *erodible conditions*—soil or backfill materials or conditions where the soil or backfill surrounding the pipe may be removed by the flow of liquid (water) leaking from the pipe or pipe joint.

3.1.3. *exfiltration*—the passage of fluid from a pipe section through small openings or leaks in the pipe wall or in the joint. Fluid that enters the pipe backfill may change the structural characteristics of the backfill or cause migration of the backfill or surrounding soils.

3.1.4. *infiltration*—the passage of fluid into a pipe section through small openings in the pipe wall or in the joint. Extraneous flow entering a pipe system may cause migration of the backfill or surrounding soils into the pipe and change the structural characteristics of the backfill.

3.1.5. *leakage rate*—an amount of infiltration or exfiltration within the pipe system. A maximum leakage rate may be established as a condition of project compliance to assure structural quality and proper installation.

3.1.6. *leak resistance*—leak resistance refers to a system that is not completely (100 percent) watertight, but allows some defined allowable rate of water leakage into and out of the system.

3.1.7. *leak-resistant joint*—a joint that limits water leakage at a maximum rate of 200 gallons/inch-diameter/mile/day for the pipeline system for the project specified head or pressure.

3.1.8. *post-installation test*—leakage test conducted after pipe installation and backfill utilizing air or water to verify project specification compliance when required as a condition of project acceptance.

3.1.9. *proof of design*—laboratory or in-plant tests for leakage through the pipe or pipe joint under pressure or vacuum that verifies the performance of the pipe joint in a specific test. This type of test may not directly correlate to field performance.

3.1.10. *restrained joints*—joints used for applications in which the joint may be subject to significant tensile and shear forces and moments. Examples of these applications are installations on slopes, sites where differential settlement may occur, and pipes for high pressures and high heads or velocities.

3.1.11. *silt-tight joint*—a joint that is resistant to infiltration of particles that are smaller than particles passing the No. 200 sieve. Silt-tight joints provide protection against infiltration of backfill