External Joint Test Methodology

For single-offset joint designs in Concrete Pipe and Box Sections

TECH NOTE

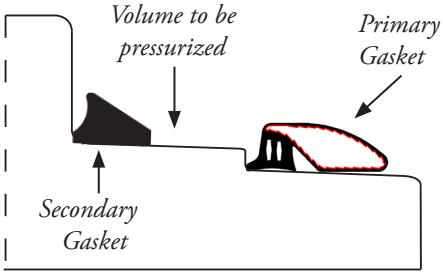
1. Scope

ASTM C1677, C443, C497 and C1628 allow for the testing of all sizes of concrete pipe and box sections by the use of either internal or external pressurization of the joint.

This test methodology for an external test (infiltration) is based on the design concept of creating a pressurized pocket between the primary (normal) joint gasket, and a secondary gasket which seals the outboard gap between the face of the bell and the end of the spigot. ***Note: leaking around the secondary gasket does not constitute a failure of the testing provided the required pressure can be maintained.***

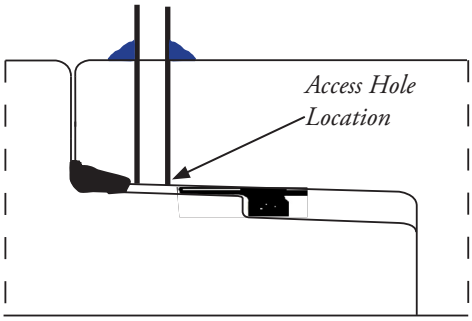
In order to perform the test, hydrostatic pressure will need to be introduced into, and air exhausted out of, the pressure pocket. Consequently two access holes will need to be drilled through the wall of the bell, into the space between the two gaskets. A hole size sufficient to allow the epoxying-in of a galvanized steel nipple with a 1/8" to 3/8" NPT-M size with a threaded end. The available space between the two gaskets (including the roll of the pre-lube gasket tube) determines the nipple size so the opening inside the joint will not be blocked by one of the gaskets. Usually for pipe joints a 1/8" works best, and that means that a 1/8" to 1/4" adapter will be necessary since the gauge, ball valves, etc. will likely have 1/4" connections.

It is imperative that the exhaust port be located at the highest vertical point to allow the full and complete release of all entrapped air; consequently it is recommended that testing be performed with test pieces/sections installed horizontally. Typically the exhaust port is connected to a 1/8" to 3/8" NPT-F threaded tee, with one side of the tee going to a shut-off ball valve and the other side of the tee going to a pressure gauge (0 - 30 psig).



The inlet hole placement is optional, but if the pressure gauge is to be connected to this point in lieu of the outlet hole then, in accordance with established practices, it should be located no lower than the Horizontal centerline of the joint.

Note, with large diameter pipe and box culverts, the pressurization of the joint will result in thrust forces being generated. A 1/2" annular space on a 4' x 8' box section, or a 96" manhole, will generate close to 2000 lb of thrust at 13 psig test pressure. So a suitable restraining method must be utilized to hold the sections being tested together. Failure to do so will not only jeopardize the safety of test personnel but, a slight movement of the joint would significantly increase the test volume and could potentially provide false, negative test results.



Additionally, sufficient (homing) force must be maintained against the secondary gasket or leakage could occur between it and the bell and also give false, negative test results.

2. Required Equipment

Typical restraining fixture, utilising steel-channel retaining beams and high tensile-strength threaded retaining rods.

- 1 - primary sealing gasket for joint to be tested
- 1 - secondary gasket for joint to be tested
- 2 - 6" Long steel nipple, at least one end of each tube threaded 1/8" to 3/8" NPT
- 2 - 1/8" to 3/8" NPT-F Shut-off Ball-valves
- 1 - 1/8" to 3/8" NPT-F Tee
- 1 - 1/8" to 3/8" NPT-M, 0-30 psig, Pressure-gauge
- Close pipe nipples and adapter as needed to make connections
- Quick-drying, two-part epoxy (e.g. J-B Weld)
- 1 tube/roll of PTFE thread sealant/tape
- Restraining equipment - threaded rods and timbers or I-beams.

3. Preparation

- Obtain recommended drilling locations from gasket supplier. In most case, position outside edge of drill hole at the inside edge of the bell bevel.
- Drill two holes through bell as described in section 1. Drill from inside out and use caution to not spall the concrete. Try to avoid reinforcement.
- Epoxy one end of 6" long steel nipple into each hole; tape inside end to prevent epoxy from clogging pipe. Stop nipple flush or 1/16" short of flush on inside surface. Allow epoxy to set as per manufacturer's instructions. Punch holes in taped end of nipple.
- Install secondary gasket against the shoulder of the spigot end, with tapered edge facing out, glue bottom section to spigot. Lube this gasket.
- Install primary gasket on spigot, glue bottom section to spigot. For non pre-lubed gaskets, lubricate this gasket per manufacturer instructions.
- Home sections together as completely as possible.
- Use 1" or larger dia. threaded rods (threaded on ends only) and 6"x6" timbers (or steel I-beams) for restraints. Utilize at least 2 thick, heavy washers against timbers, and tighten with heavy duty nuts. Other methods can be used only if they prevent creeping of joint opening.

- Assemble ball-valve to one leg of tee assembly. (Utilize thread sealant/tape on all connections to ensure watertight joint.)
- Assemble pressure-gauge to other leg of tee assembly.
- Thread finished tee assembly onto exhaust nipple (top of structure).
- Thread remaining ball valve onto inlet nipple (side of structure).
- Fasten inlet hose to inlet ball-valve.
- With both ball-valves open, allow water to slowly enter joint assembly until water is seen to flow steadily out of exhaust hose. Close outlet ball-valve after air is exhausted.

4. Testing

- Allow pressure in joint to slowly build until required test pressure is achieved and close inlet ball-valve
- Test joint as detailed in the applicable specification, which may include straight and deflected alignment.

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