



Utilities
Penetrations in Levees/Floodwalls
General Requirements for New Pipes Penetrating Existing Earthen
Levees
4 April 2008

During permit reviews, the geotechnical, structural and mechanical engineers evaluate the permit requests from the sponsors based on the following list of items involving proposed pipes requiring penetration into/thru existing earthen levee.

Pressure Pipes – Earthen Levees

- 1) All pressure pipes will be required to go up and over existing levee embankments within the freeboard zone.
- 2) Pressure Pipes – Shut off valves shall be provided on the landside and riverside of an earthen levee embankment a minimum of 10 ft and no greater than 50 ft out from the levee toes.
- 3) Information regarding providing testing for 0% pipe leakage between 10' out from levee toes shall be provided along with permit submittal. Pressure test to 200 psi or 150% of working pressure which ever is greater.
- 4) No sleeving/casing around the outside of pressure pipes going up and over earthen levees will be required.
- 5) Pipe installation details shall contain pipe bedding information. Bedding materials cannot be permeable.
- 6) All pressure pipes shall be ductile iron or steel material pipes with mechanical joint couplings (required).
- 7) If pressure pipe require a depth of embedment deeper than the design freeboard limits, additional material can be added over the top of the pipe and smooth graded in with the levee embankment to allow for proper mowing of the levee crown and side slopes.

- 8)** Permit submittal shall include a cross-section of the levee embankment affected by proposed placement of new pipe and any associated structures (shut off valves.....) and a plan of the levee right of way at the same location.
- 9)** Permit submittal shall include the ACOE As-Built stationing where the proposed pipe crossing will occur.
- 10)** Permit submittal shall provide a detail of the mechanical pipe joints/couplings (required).

Pressure Pipes – New Construction – Gate Closures

- 1) Pressure testing is required between gate valves for 0% pipe leakage and the testing requirements are the following: Pressure test to 200 psi or 150% of working pressure which ever is greater.
- 2) The waterline must be sleeved totally through the gate sill. The gate valves must be located outside the pipe sleeve. Sleeve must be equipped with pipe ring and be approximately 5 ft either side of the gate sill and shall be poured in place with gate closure sill. Then annular space between the sleeve and the storm drain pipe shall contain "Link Seal" or approved equal on both sides of the floodwall.
- 3) What type of pipe and mechanical couplings (required) are being proposed to be used for the waterline?
- 4) Provide a detailed cross-section of waterline pipe installed in gate closure sill.
- 5) Shut off valves are required on the landside and riverside of the floodwall. Valves must be located within 10-ft of the floodwall.

Gravity Pipes thru Earthen Levee – Open Cut Only

- 2) Pre-cast structures are not allowed while cast-in-place structures are allowed to be excavated into an existing levee embankment. This is related to valve boxes, sluice gates, pump stations and etc.
- 3) Permit submittal shall discuss the size and slopes of the open cut excavation for the gravity pipe thru existing earthen levee.
- 4) Information regarding providing testing for 0% pipe leakage between 10' out from levees toes shall be provided along with permit submittal. The requirements for the pressure test for the gravity line is a test limit of 20 psi.
- 5) Submittal shall provide a detail of the mechanical pipe joints/couplings.
- 6) Submittal shall include a cross-section of the levee embankment affected by proposed placement of new pipe and a plan of the levee right of way at the same location.
- 7) Submittal shall include the As-Built stationing where the proposed pipe will be located.
- 8) A concrete seepage plug will be required to be constructed under the gravity pipe approximately 1/3 the base distance of the new pipe from riverside toe. The thickness shall be the bedding thickness plus 2 ft and approximately a 5 ft bottom length under the pipe. The width of the plug shall be 1.5 times the diameter of the pipe or 12-inches on each side of pipe whichever is greater.
- 9) Gravity Pipes – Flap gates shall be provided on the riverside of gravity pipes. An emergency closure system shall also be provided – either a slide gate or a sluice gate approximately 1/3 of the distance from the riverside levee toe.
- 10) Submittal shall contain information regarding the gravity piping materials to be used.
- 11) Submittal for pipes shall contain pipe bedding information when excavation is required to place pipes over or under existing levees. If proposal includes the use of flowable fill (FF) for the bedding material, the following are the specifications for using this material:
 - a. Material shall have a minimum compressive strength of 300 psi in 28 days.

- b. FF material shall be placed 6-inches below and above the pipe and typically 1 pipe diameter on either side of the proposed pipe.

12) Gravity Pipes – Flap gates shall be provided on the riverside of gravity pipes. An emergency closure system would be required for these structures on the subject project due to the size of pipe (>36"), maximum submergence (assuming ??? >12') and duration of flooding (extended > 72 hrs).

New Pipes Passing Thru Existing Floodwalls

During permit reviews, the structural engineer should review the reinforcement drawings for the particular wall section that the proposed utility is to pass thru. If the primary reinforcement on the tension side of the stem is spaced at 12-inches c-c, then a pipe of up to 8-inches may be permitted to pass thru. If the primary reinforcement on the tension side of the stem is spaced at 6-inches c-c, then a pipe of up to 4-inches may be permitted to pass thru. This permission is based on several requirements:

- 1) The utility passage thru the floodwall shall be thru the stem only - not thru the base nor thru the key below the base.
- 2) At the location in the floodwall where the utility crossing is to be made, an excavation must be completed on both sides of the floodwall allowing sufficient clearance for coring equipment to be properly mounted;
- 3) The hole shall be cored thru the floodwall (from riverside to landside of the floodwall) and the wall of the resulting hole shall be smooth. Holes drilled using rotary percussion tools should not be permitted. Holes must be circular.
- 4) The core hole diameter shall be selected based on the outside diameter of the utility pipe in conjunction with the smallest "Link-Seal" (as manufactured by Thunderline Link-Seal) or "Pipe Linx" (as manufactured by Calpico, Inc.) that will fit; and
- 5) The pipe must be installed thru the floodwall with the annular space between the pipe and the smooth-walled, cored hole filled with no less than one "Link-Seal" or "Pipe Linx", installed in accordance with manufacturer's recommendations. The reviewer may select whether one or two sealing devices are required, based on the head during the flood event and the hazard in the event of a leak.
- 6) What type of pipe and mechanical couplings (required) are being proposed to be used for the waterline?

- 7) Provide a detailed cross-section of waterline pipe proposed to be installed thru monolith 60.
- 8) Shut off valves are required on the landside and riverside of the floodwall. Valves must be located within 10-ft of the floodwall.
- 9) Pressure testing is required between gate valves for 0% pipe leakage and the testing requirements are the following: Pressure test to 200 psi or 150% of working pressure which ever is greater.

If the permittee is proposing to install a pipe greater than 8-inches in diameter thru an existing floodwall, a modification to the floodwall may be necessary, as this would likely require cutting of two adjacent primary reinforcement elements. To avoid a structural modification the permittee must submit design calculations based on "As Built" drawings and the latest Corps reinforced concrete design guidance to determine whether coring a larger diameter hole is possible without modification to the existing wall. Possible modifications include installation of a structural buttress or counterfort, or installing structural bridging across the hole that redistributes the bending moments.

Reference Corps of Engineers Manuals EM 1110-2-1913 Chapter 8 and EM 1110-2-2902 Chapter 5. Please provide the necessary calculations for the placement of this pipe below the levee embankment per the referenced EM's.