

**SECTION 605****THERMOPLASTIC PIPE CULVERTS**

## DESCRIPTION

**605.01.01 GENERAL**

- A. This work shall consist of furnishing and installing thermoplastic pipe culverts, storm drains, and conduits of the size and dimensions and at locations shown on the plans or established by the Engineer.
- B. Installation shall conform to **Section 709, "Metal and Thermoplastic Pipe,"** and these specifications including exceptions/additions below. The more stringent requirements shall apply.

## MATERIALS

**605.02.02 GENERAL**

- A. Materials and their use shall conform to **Subsection 601.02.01, "General,"** and the requirements below.
- B. Prior to the use of these materials, the Contractor shall submit to the Engineer for approval a document certifying that the material meets these specifications and **Section 709, "Metal and Thermoplastic Pipe,"** from an authorized source approved by the Interagency Quality Assurance Committee (IQAC).

**605.02.03 MARKINGS**

- A. Markings on pipe shall be in accordance with **Section 709, "Metal and Thermoplastic Pipe."**

## CONSTRUCTION

**605.03.01 GENERAL**

- A. Construction methods shall conform to **Subsection 601.03.01, "Earthwork,"** through **Subsection 601.03.06, "Extending Existing Culverts,"** and shall conform to the workmanship and inspection requirements of AASHTO LRFD Bridge Construction Specifications, AASHTO M278, AASHTO M294, AASHTO M330, AASHTO M304, and this section. The more stringent requirements shall apply.
- B. The pipe shall be excavated and backfilled in accordance with **Section 208, "Trench Excavation and Backfill."**
- C. Non-UV protected pipe shall be protected from direct sunlight until the day of installation.

**605.03.02 EARTHWORK**

- A. Where pipes are to be installed in new embankment (projection), the embankment shall first be constructed to the required elevation as set forth below. The height of embankment to be constructed before installing the pipe may be varied when permitted by the Engineer.

- B. In the case of pipes 24 inches or less in diameter, the roadway embankment shall be constructed to an elevation of 6 inches above the grade proposed for the top of the pipe, after which the trench shall be excavated and the pipe installed.
- C. In the case of pipes more than 24 inches in diameter, the roadway embankment shall be constructed to an elevation of 30 inches above the grade proposed for the bottom of the pipe, after which the trench shall be excavated and the pipe installed.
- D. When pipe having bells or hubs is used, cross trenches shall be excavated for the pipe to prevent non-uniform loading of the joints.

### 605.03.03 LAYING CULVERT PIPE

- A. Installation shall comply with the AASHTO LRFD Bridge Construction Specifications, Section 30; **Section 208**, *“Trench Excavation and Backfill”*; and this subsection.
  - 1. The installation shall be conducted by a certified supervisor/foreman at the crew level who is responsible for the work.
  - 2. The certified person is the designated installation inspector for the Contractor and shall generate a daily report attesting to the workmanship for each of the installation components described below.
  - 3. This does not relieve the Contractor of responsibility for other Quality Control aspects of this and other specifications.
- B. Installation Components:
  - 1. Bedding
  - 2. Pipe Condition
  - 3. Pipe Installation
  - 4. Haunch Compaction
  - 5. Complete pipe zone compaction
- C. Pipe section shall be checked for alignment and grade at the time of joining the sections. All pipes shall be laid true to the designated line and grade, unless otherwise permitted by the Engineer.
- D. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe. Blocking shall not be used to bring the pipe to grade.
- E. Pipe laying shall begin at the downstream end of the pipeline except for extensions of existing pipes.
  - 1. Place the bottom of the pipe in contact with the bedding throughout its full length.
  - 2. Place the spigot or outside circumferential laps of pipes facing upstream such that a shingling effect is obtained.
  - 3. Place pipe with longitudinal laps or seams with the laps or seams at the sides.
  - 4. Maintain the manufacturer’s recommended minimum and maximum cover at all times unless otherwise shown in the contract.
- F. Pipe shall be inspected before placing backfill.

1. Ensure that no rocks or other rigid or jagged material is present in the bedding material where pipe may be laid directly on the material.
2. Ensure that no “floating” occurs during installation of plastic pipe culverts.
3. Remove and relay or replace pipe that is out of alignment, unduly settled, or damaged.

#### 605.03.04 RUBBER GASKETED JOINTS

- A. Rubber gaskets shall not be exposed to the direct rays of the sun for more than 72 hours.
- B. Rubber gaskets of the type requiring lubrication shall be lubricated with the lubricant supplied by the manufacturer of the pipe. Manufactured self-lubricating gaskets are also acceptable.
- C. The Contractor shall make every effort to provide a tight connection and pull the pipe completely home.
  1. Should gapping occur due to changes or corrections in horizontal or vertical alignment or radius turns, the gaps shall not exceed the gap tolerance indicated in Table 1.
  2. If pipes are laid that exceed the maximum, the pipe will need to be removed and relaid.

**Table 1 - Maximum Joint Gap<sup>1</sup>**

Inner Diameter of Pipe	Maximum Joint Gap Tolerance
10-inch to 12-inch	3/4 inch
15-inch to 30-inch-inch	1-1/4 inch
36-inch to 54-inch	1-1/2 inch
60-inch	1-3/4 inch

#### 605.03.05 SIPHONS AND PRESSURE PIPE

- A. Pipe used for siphons or pressure pipe shall be laid in accordance with the above provisions, be connected by flexible, watertight rubber gasketed joint and, prior to backfilling, be subject to the following hydrostatic test:
  1. The pipeline shall be filled with water at the hydrostatic head required to maintain the designed pressure.
  2. The pressure head shall be maintained for a period of not less than 24 hours and any visible leaks or other defects that develop under test shall be corrected by the Contractor at no additional cost to the Contracting Agency.
  3. Sweating that does not develop into a flow or drip will not be considered as leakage.
  4. The test shall be repeated until all leaks or other defects are eliminated.

#### 605.03.06 JUNCTIONS

- A. All junctions of laterals with a main line or junctions of 2 or more main lines, that are not made in a manhole or concrete junction structure, shall be in a manufactured wye or tee.

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<sup>1</sup> In no case shall maximum joint gap tolerance exceed 1/2 the length where the gasket seats within the pipe

- B. The wye or tee shall be of the same material as the conduits to which they are joined, and shall have the same or greater stiffness as the pipe.

#### **605.03.07 INSPECTION AND DEFLECTION TESTING**

- A. All pipe joints and lengths shall be 100 percent inspected.
1. Installation, placement, and compaction of bedding and backfill materials shall conform to this specification.
  2. During the initial phases of the installation process, inspection shall concentrate on detecting improper practice and poor workmanship.
  3. Errors in line and grade, improper assembly, and improper backfill techniques shall be corrected prior to placing significant backfill or trench fill.
  4. Joints shall be properly assembled to prevent the infiltration of soil fines.
  5. Gaskets shall be properly seated to prevent groundwater infiltration and shall appear uniformly oriented around the pipe.
  6. Shallow cover installations shall be checked to ensure the minimum cover level is provided.
- B. After the pipe has been bedded and backfilled to subgrade level, internal quality inspection shall be paid for and performed by the Contractor a minimum of 30 days after final backfill has been placed.
1. The line shall be cleaned and inspected for damage, joint gaps, and deflection using visual physical measurement or other devices, including but not limited to calibrated television or video cameras, subject to approval by the Engineer.
  2. Damaged pipe shall be repaired or replaced.
  3. The replacement pipe shall also be subject to the same testing.
  4. Joints that do not meet the specification shall be repaired or pipe replaced at no additional cost to the Contracting Agency.
  5. All inspection results shall be submitted and approved by the Engineer before final payment.
- C. The video camera shall physically verify quality of the pipe installation and shall not be limited by poor lighting, water flow, pipe length, or other limiting conditions of the installed environment.
- D. For pipe greater than 36-inch inside diameter, deflection determination by physical measurement may be performed using 4 cross section measurements taken beginning at the vertical and for each 90-degree interval with a longitudinal frequency of once every 10 feet of the pipe.
- E. The minimum diameter at any point shall be 5 percent less than the nominal diameter (minus fabrication tolerance in accordance with AASHTO M294 and AASHTO M330, Section 7.2.3) of the pipe being tested.
- F. If a mandrel is used, it must be approved before use.
1. Mandrel shall be rigid, nonadjustable, odd-numbered legged (minimum 9 legs) having a length not less than its nominal diameter.

2. Mandrel shall be fitted with pulling rings at each end, stamped or engraved on some segment other than a runner with the nominal pipe size and mandrel outside diameter, and furnished in a suitable carrying case.
  3. Use of an unapproved mandrel or a mandrel altered or modified after approval will invalidate the test.
  4. If the mandrel fails to pass, the pipe is overdeflected.
  5. A properly sized proving ring shall be used to check or test the mandrel for accuracy.
  6. The mandrel shall be pulled through the pipe with a force not greater than 1,000 pounds.
- G. For locations where pipe deflection exceeds 5 percent of the inside diameter and/or fails other quality pipe criteria, an evaluation shall be conducted by the Contractor and a recommendation by the Contractor's Nevada registered professional engineer submitted to the Engineer for review and approval addressing the severity of the deflection, structural integrity, environmental conditions, and the design service life of the pipe. For locations where pipe deflection exceeds 7.5 percent of the inside diameter, remediation or replacement of the pipe is required.
- H. Unless otherwise permitted, pipe that does not meet the specification shall be uncovered and, if not damaged, corrected in accordance with the Engineer approved recommendation from the Contractor at no additional cost to the Contracting Agency.
1. Do not reinstall damaged pipe, but remove and replace with new pipe.
  2. The replacement pipe shall also be subject to the same testing.
- I. The Engineer shall be allowed access to randomly inspect at least 10 percent of the total number of pipe runs.

#### METHOD OF MEASUREMENT

##### 605.04.01 MEASUREMENT

- A. Method of measurement shall conform to **Subsection [601.04.01](#), "Measurement,"** and the requirements below.
- B. The quantity of thermoplastic pipe measured for payment will be the number of linear feet complete and in place.
- C. The quantity of thermoplastic pipe end sections measured for payment will be the number of units of each size of each class complete and in place.
- D. All measurements will be made in accordance with **Subsection [109.01](#), "Measurement of Quantities."**

#### BASIS OF PAYMENT

##### 605.05.01 PAYMENT

- A. Payment shall conform to **Subsection [601.05.01](#), "Payment,"** and the requirements below.
- B. The accepted quantities of thermoplastic pipe, measured as specified in **Subsection [601.04.01](#), "Measurement,"** will be paid for at the contract unit price bid per linear foot for the types and sizes specified.

- C. The contract unit price paid for thermoplastic pipe shall be full compensation for excavating trench, disposal of excess material, hauling, placing and compacting backfill, dewatering, compaction, shoring, furnishing and placing pipe, pipe fittings, video inspection, protection and restoration, if damaged, of all existing facilities and improvements required to remain in place, related items of work not otherwise provided for, and for all labor, tools and equipment necessary to complete the work as shown on the drawings, as specified herein, and as directed by the Engineer.
- D. End sections will be paid for at the contract unit price bid per each for the kind and size specified, which payment shall include structure excavation and backfill for fabricated end sections.
- E. Compensation for supplying certified mandrels or other deflection testing devices shall be included in the contract unit price paid for the appropriate thermoplastic pipe item and no separate payment will be made therefor.
- F. All payments will be made in accordance with **Subsection [109.02](#), "Scope of Payment."**
- G. Payment will be made under:

<b>PAY ITEM</b>	<b>PAY UNIT</b>
(Size) Thermoplastic Pipe (type) .....	Linear Foot
(Size) Thermoplastic Pipe End Section (type)..... (only end sections 30-inch and less are allowed)	Each