

## SECTION 407 THREE-SIDED PRECAST CULVERT

### 407-1 Description.

Design and construct a three-sided precast culvert as an alternative to the structure shown in the plans.

### 407-2 Materials.

Meet the following requirements:

Shop Drawings.....	5-1
Portland Cement Concrete .....	Section 346
Reinforcing Steel .....	Section 415
Riprap .....	Section 530
Non-Shrink Grout .....	Section 934
Filter Fabric.....	Section 985

### 407-3 Limitations on Use.

Do not use three-sided precast culverts at locations with an Extremely or Moderately Aggressive Environmental classification. Also, do not use a three-sided precast culvert to extend the inlets of existing multi-cell culverts due to the potential for clogging with debris.

### 407-4 Design Requirements.

Provide a design that complies with the requirements of the AASHTO Standard Specifications for Highway Bridges and the Structures Design Guidelines, current at the time of letting. Use a design load of HS-25 [MS-22.5]. In addition, ensure that a hydraulic analysis and scour evaluation is completed, signed, and sealed by the Specialty Engineer, and submitted to the Engineer. Line the channel between footings with either a cast-in-place reinforced concrete slab with a toe wall at the inlet and outlet end of the structure, a blanket of rubble riprap with a minimum thickness of 18 inches [450 mm], or similar treatment. Use a concrete slab with a minimum thickness of 6 inches [15 mm] and with toe walls that have a minimum depth of 30 inches [750 mm]. Use lining designed to withstand the hydraulic forces and extend the lining beyond the ends of the structure a minimum of 10 feet [3 m].

Ensure that the bottom of spread footings are a minimum of 30 inches [750 mm] below the bottom of the channel lining.

### 407-5 Dimensional Tolerances.

Meet the following plan dimension tolerances:

Internal dimensions.....	±0.5 inch [±13 mm]
Haunch radius .....	±1 inch [±25 mm]
Slab and wall thickness.....	-1/4 inch, +1/2 inch [-6 mm, +13 mm]
Laying lengths of two opposite surfaces of a precast unit	±1 inch [±25 mm]
Underrun in length of a section.....	1 inch [25 mm]

Reinforcing steel areas greater than specified in the shop drawings will be acceptable.

### 407-6 Joints.

Produce the precast units with keyways at the adjoining surfaces or with butt joints between adjacent units. In the keyways, use a non-shrinking grout listed on the Qualified Products List. Design and construct the adjoining surfaces so that when placed together, they make a continuous line of units with a smooth interior free of appreciable irregularities within the tolerance permitted. Seal all joints between precast units with a bituminous seal and cover with a strip of filter fabric adhered to the precast

unit. Ensure that the filter fabric strip is a minimum of 24 inches [600 mm] wide and meets the requirements of Section 985. Obtain the Engineer's approval of the adhesive used. The Contractor may use an alternate joint sealant using a low modulus silicone sealant if approved on the shop drawings. Exercise care during backfilling to prevent damage to the filter fabric.

Construct headwalls, wingwalls, and other special features in place or as detailed on the shop drawings. Leave sufficient steel exposed in end units for connection of endwalls and cast-in-place sections.

#### **407-7 Handling.**

Use handling devices or holes in each unit for the purpose of handling and laying. Remove the handling devices and fill all holes with non-shrink grout after erection, as approved by the Engineer.

#### **407-8 Marking.**

Clearly mark the following information on the interior of each precast unit by indention, water proof paint, or other approved method: span, rise, skew angle, date of manufacture, name or trademark of manufacturer, and design earth cover.

#### **407-9 Construction Requirements.**

Prior to constructing the footing, prepare the bearing soil in accordance with Section 455. If a precast concrete footing is used, prepare a 4 inch [100 mm] thick layer of compacted granular material to a minimum width of 12 inches [300 mm] outside the footing width. Accomplish all footing construction in the dry as defined in 455-15.2. Use dewatering devices that are capable of maintaining a stable as well as surface dry trench bottom.

Form a 3 inch [75 mm] deep key in the top surface of the footing 4 inches [100 mm] wider than the wall thickness. Ensure that footings reach a compressive strength of 3,000 psi [20 MPa] before placing precast units.

Place the units as shown in the shop drawings. Carefully set the structure to the true line and grade. Set the units in a bed of mortar placed in the keyway in the top of the footing. Fill the keyway with mortar, and float the mortar flush with the top of the footing or use shims between the footer and culvert during setting, then inject grout under the culvert walls.

Carefully place backfill against the filter fabric and bituminous seal to avoid damage to the material. Use mechanical tampers or approved compacting equipment to compact all backfill and embankment immediately adjacent to each side of the structure. Place the backfill within 4 feet [1.2 m] of each side of the structure in lifts of 8 inches [200 mm] or less (loose depth). Do not operate heavy compaction equipment within 4 feet [1.2 m] of the structure. Ensure that the backfill elevation differential between both sides of the structure does not exceed 24 inches [600 mm]. Carry backfill in front of wingwalls to ground lines shown in the plans.

#### **407-10 Basis of Payment.**

Payment for the alternative three-sided precast culvert will be at the price bid for the sum of the items included in the structure shown in the design plans.

Price and payment will be full compensation for all work and materials specified in this Section necessary to complete the structure, including dewatering, excavation, channel excavation, channel lining, backfilling, and other miscellaneous items.