

SECTION 1085—PRECAST REINFORCED CONCRETE BOX CULVERT

1085.1 DESCRIPTION—This work is the manufacture, storage, delivery, installation, and assembly of precast reinforced concrete box culvert segments into one continuous unit.

1085.2 MATERIAL—

- (a) **Class A Cement Concrete.** [Section 704](#)
- (b) **Deformed Welded Wire Fabric.** [Section 709.4](#)
- (c) **Galvanized Specialized Assembly and Tightening Hardware, Sleeves, Lug Plates, Bolts, Nuts, and Washers.** [Section 1105.02\(d\)](#)
- (d) **Nonshrink Grout.** [Section 1080.2\(c\)](#)
- (e) **Precast Reinforced Concrete Box Culvert Segments.** From a manufacturer listed in [Bulletin 15](#). Provide cement concrete as specified in [Section 704](#); except, with a minimum 28-day compressive strength of 35 MPa (5,000 pounds per square inch). AASHTO M 259/M 259M or M 273/M 273M; except, modify Section 11, Permissible Variations as follows:

- **11.1 Internal Dimensions**—Do not allow the internal dimensions to vary from design by more than 1% with a maximum variation of 25 mm (1 inch). Do not allow the internal diagonal dimensions to vary by more than 25 mm (1 inch). Do not allow the haunch dimensions to vary more than 6 mm (1/4 inch) from design dimensions.
- **11.2 Slab and Wall Thickness**—Do not allow slab and wall thickness to vary from design dimensions by more than minus 5 mm (3/16 inch).
- **11.3 Length of Opposite Surface**—Do not allow laying length of two opposite surfaces of the box section to vary more than 10 mm/m (1/8 inch/foot) of the internal span, with a maximum of 16 mm (5/8 inch).
- **11.5 Position of Reinforcement**—Do not allow the position of the reinforcement to vary from the approved shop drawings by more than 13 mm (1/2 inch) in any direction. Place reinforcement so the indicated cover clearance does not deviate more than ± 6 mm ($\pm 1/4$ inch). Provide 38 mm (1 1/2 inch) minimum cover at the mating surface, as measured to the end of the joint.

Certify as specified in [Section 106.03\(b\)3](#).

- (f) **Reinforcement Bars.** [Section 1002.2](#)
- (g) **Waterproofing.** [Section 680.2](#)
- (h) **Selected Borrow Excavation - Structure Backfill.** As shown on the [Standard Drawings](#).

- (i) **Concrete Bonding Compound.** [Section 706](#)
- (j) **Rock Protection, Class R-5.** [Section 850.2\(a\)](#)
- (k) **Joint Sealing Compound.** [Section 705.4\(e\)](#)

(m) **Neoprene Joint Material.** Identify neoprene material according to the type, class, and grade. Print, stencil, or otherwise affix this code to each pad at intervals of not more than 600 mm (24 inches) and in letters and numerals of not less than 5 mm (1/4-inch) height. Additional information such as lot or batch numbers, date, plant and place of manufacture, trademark, or name of manufacturer may also be added. Certify as specified in [Section 106.03\(b\)3](#).

1. Closed-Cell Neoprene Sponge. Pads may be manufactured as sponge neoprene or expanded neoprene and may be composed of laminations. Use material conforming to the following:

- [ASTM D1056](#), Type 2, Class C, Grade 5, including the requirements of suffixes B3 and F1
- [ASTM D 1171](#), Quality Retention Rating of 100% after 6 weeks exposure

- (n) **Post Tensioning Strands.** [Section 1108.02\(g\)](#)

1085.3 CONSTRUCTION—Construct as indicated and according to Article 12.11 of the AASHTO LRFD Specifications.

(a) **Design.** Design according to AASHTO specifications, as supplemented by PENNDOT Design Manual, Part 4.

(b) **Shop Drawings.** Obtain approval of shop drawings before fabricating precast box culverts.

Show segment length on drawing. Provide segments of maximum length compatible with hauling equipment in order to minimize the number of joints.

Provide shop drawings as specified in [Section 105.02\(d\)](#).

Provide shop drawings clearly showing all items incorporated into the box culvert including all reinforcing. List items such as chairs and inserts by source, type, and supplier.

(c) **Inspection.** The Department will inspect precast segments during the entire fabrication process. The necessary facilities for inspection include a plant office as specified in [Section 714.5\(a\)](#).

(d) **Plant Acceptance.** Section 714.4, except, register and certify the plant under either the National Precast Concrete Association (NPCA), American Concrete Pipe Association (ACPA) box culvert or Prestressed Concrete Institute (PCI), box culvert plant certification program. Submit an annual endorsed copy to the Structural Materials Engineer for continued qualification.

(e) **Handling and Storage.** Handle and store precast reinforced concrete box culvert segments so that damage will not occur to the concrete or reinforcing steel.

(f) **Delivery.** Replace precast reinforced concrete box culvert segments damaged by improper storing, handling, transporting, or erection.

The Representative will inspect the segments at the site for possible damage and cracking during shipment and for tolerances and other dimensions required for acceptance.

Do not ship segments until the 28-day minimum compressive strength is attained.

Provide 24-hour advance notice of loading and shipping schedule. Have the Department representative verify Form CS-4171 and properly tag segments before shipping. Do not ship unapproved items.

(g) Installation Requirements.

1. Foundation Material. Construct foundation as specified in [Section 206](#), excluding [Section 206.2\(a\)1.e](#). If unsuitable foundation material or rock is encountered, remove all unsuitable material or rock at least 300 mm (12 inches) below bottom of box culvert and backfill with No. 2A or AASHTO No. 8 Coarse Aggregate, as shown on the [Standard Drawings](#), graded in close conformity with the stream bed grade to provide proper bedding conditions. Accurately shape bedding material with a template to provide uniform contact (90% of bearing).

2. Grouting. Grout hand holes, pockets, bolt sleeves, tie rod holes, and lifting lugs after joints are sealed and hardware is installed.

3. Placement. Place box culverts as indicated. Do not disturb the bedding or damage the box culvert.

4. Backfill. Backfill reinforced concrete box culverts to limits shown on Standard Drawing RC-12M. Backfill trench as specified in [Section 601.3\(f\)](#).

5. Compaction of Cover. If cover or fill is indicated, do not traverse top of box culverts with construction equipment until after cover or fill has been placed, unless cover exceeds 1500 mm (5 feet). Do not use vibratory rollers to compact cover or fill over, or directly adjacent to, box culverts.

6. Waterproofing. Apply waterproofing as specified in [Section 680.3](#) and as shown on the [Standard Drawings](#).

(h) Guide Rails. If indicated, install guide rail over box culverts as follows:

For fill heights greater than 600 mm (24 inches) at post locations, provide guide rail as shown on Standard Drawing RC-52M, "Type 2 Strong Post Guide Rail."

For fill heights 600 mm (24 inches) or less at post locations, provide structure mounted guide rail as shown on Standard Drawing BD-632M, "R.C. Box Culvert Precast," and furnish a Class A cement concrete headwall.

(i) Cutoff Walls. If indicated, provide cast-in-place or precast cutoff walls of 300 mm (12-inch) thick by 1050 mm (42-inch) deep Class A cement concrete, or less if directed, and install upstream and downstream.

(j) Wingwalls. If indicated, provide cast-in-place Class A cement concrete wing walls.

(k) Aprons. If indicated, provide aprons of 150 mm (6-inch) thick Class A cement concrete, reinforced as shown on the [Standard Drawings](#).

(l) Concrete Bonding Compound. If cutoff walls or wing walls are indicated, bond to box culvert by coating the contact surfaces with concrete bonding compound.

(m) Protective Coating. If indicated, apply two spray coats of coal tar epoxy, conforming to the requirements of SSPC-PS 16-82, to the top of the box and exposed end faces and to the entire height of the outside walls.

(n) Curing. [Section 714.8](#); except, maintain box culvert segments, after stripping and during secondary curing, in a minimum 10°C (50F) environment until they have reached a compressive strength of 70% of the required 28-day minimum concrete design strength shown on the approved shop drawings.

(o) Post-Tensioning. Install precast culvert segments as shown on the [Standard Drawings](#), as indicated, and as specified in [Section 1108](#).

1085.4 MEASUREMENT AND PAYMENT—**(a) Precast Reinforced Concrete Box Culvert.** Lump Sum

The price includes the following component items:

- **Class A Cement Concrete.** [Section 1001.4\(a\)](#)
- **Deformed Welded Wire Fabric.** Kilogram (Pound)
Annealed iron wire, chairs, and ties are incidental to the deformed wire fabric.
- **Precast Reinforced Concrete Box Culvert Segments.** Meter (Linear Foot)
The unit price includes post-tensioning, if indicated.
- **Reinforcement Bars.** [Section 1002.4](#)
- **Membrane Waterproofing.** [Section 680.4](#)
- **Selected Borrow Excavation - Structure Backfill.** [Section 1001.4\(g\)](#)
- **Rock Protection.** [Section 850.4\(a\)](#)
- **Protective Coating (Coal Tar Epoxy).** Square Meter (Square Yard)

Work to divert running water according to the accepted Erosion and Sedimentation Control Plan is incidental to box culvert construction.

(b) Guide Rail. [Section 620.4](#)**(c) Excavation for Unsuitable Material or Rock.** [Section 204.4](#)**(d) Backfill for Unsuitable Material or Rock Excavation.** Cubic Meter (Cubic Yard)

The Department will pay as specified in [Section 110.03](#).