

## **Section 2415. Concrete Box, Arch, and Circular Culverts**

### **2415.01 DESCRIPTION.**

#### **A. Cast-in-place.**

Construct a cast-in-place concrete box, arch, or circular culvert.

#### **B. Precast.**

1. Apply [Section 2419](#).
2. Use culvert sections that meet the requirements of ASTM C 1577.
3. The contract documents will designate the span, rise, and either the design earth cover, or the design loading, both defined in ASTM C 1577.
4. Use coarse aggregate in concrete mixture from an approved source meeting requirements of [Section 4115](#), with Class 2 or better durability rating.
5. **Deleted.**
5. Concrete strength will be based on cylinder tests.

### **2415.02 MATERIALS.**

Use Class C structural concrete meeting the requirements of [Section 2403](#), unless specified otherwise.

### **2415.03 CONSTRUCTION.**

Apply the requirements of [Sections 2401](#), [2402](#), [2403](#), [2404](#), and [2414](#).

#### **A. Footings.**

1. Construct footings to the elevations shown in the contract documents, unless directed otherwise by the Engineer.
2. Footing depths may be increased when necessary to prevent undermining or scour or to secure adequate bearing. In general, decrease footing depth only when solid rock is encountered at elevations above those shown.
3. Use suitable wood or metal forms according to [Section 2403](#) to enclose all footing concrete.

#### **B. Placing Concrete.**

##### **1. Footings.**

- a. Do not allow dirt, mud, or other foreign material to become mixed with concrete which is being placed in the footing.
- b. Monolithically construct footings, pavements, and curtain walls between construction joints if practical.

- c. Provide a key notch of the form shown in the contract documents between the walls and footings to insure proper anchorage.
- d. Remove all dirt, dust, shavings, or other foreign material from the key notch and wall forms before placing concrete.

**2. Barrels of Culverts.**

- a. The sidewalls and top slab may be constructed as a monolith between construction joints, or the concrete in sidewalls may be placed and allowed to harden before the top slab is placed, at the discretion of the Contractor.
- b. If the sidewalls and top slab are constructed as a monolith, all necessary construction joints are to be vertical and at right angles to the axis of the culvert. If the sidewalls are placed and allowed to harden before the top slab is placed, leave appropriate keys in the sidewalls for anchoring the cover slab.
- c. Place forming and reinforcement for the entire barrel section between construction joints before concrete is placed in the sidewalls or headwalls.

**3. Headwalls.**

- a. In general, construct headwalls monolithically. However, when construction joints are unavoidable, place them in a horizontal or vertical position and locate them so no joint is visible above the roadbed.
- b. Place triangular fillet strips in the forms to avoid sharp edges and corners.

**4. Placing Concrete in Arch Culverts.**

Place concrete in arch culverts as provided in [Section 2403](#).

**C. Surface Finish.**

Surface all exposed parts of the wingwalls, headwalls, and railings according to [Article 2403.03, P](#).

**D. Placing Backfill Material.**

Place backfill material according to [Article 2402.03, H](#).

**E. Protection Railings.**

- 1. Furnish and install protection railings shown in the contract documents.
- 2. Paint protection railings, other than aluminum or galvanized railings, as provided in [Section 2508](#).

**2415.04 METHOD OF MEASUREMENT.**

- A. Excavation for structures, structural concrete, steel reinforcement, and other items in the contract documents will be the quantity shown in the contract documents.
- B. Protection railing (when specified in the contract documents) will be the quantity shown in the contract documents.

**2415.05 BASIS OF PAYMENT.**

- A.** Payment for all concrete box, arch, or circular culverts will be the contract unit price for excavation for structures, structural concrete, steel reinforcement, and other items included in the contract documents.
- B.** Payment for protection railings will be the contract unit price for the railing material.
- C.** Payments are full compensation for furnishing all materials, equipment, and labor and for performance of all work necessary to complete the structures in conformance with the contract documents or as ordered by the Engineer.