

735 - PRECAST REINFORCED CONCRETE BOX

SECTION 735

PRECAST REINFORCED CONCRETE BOX

735.1 DESCRIPTION

Install the specified sizes of precast reinforced concrete boxes at the locations designated in the Contract Documents.

Unless specified otherwise in the Contract Documents, the Contractor has the option to substitute precast reinforced concrete boxes for the cast-in-place reinforced concrete boxes shown in the Contract Documents.

**BID ITEM**

Reinforced Concrete Box (\*) (Precast)  
\*Size

**UNITS**

Linear Foot

735.2 MATERIALS

**a. Precast Reinforced Concrete Box.** Provide precast reinforced concrete box sections complying with ASTM C 1433, Table 2.

Exceptions and additions to the above requirements are:

(1) ASTM Section 11. PERMISSIBLE VARIATIONS. Revise the first sentence of subsection 11.1 to read: The internal dimensions may not vary more than 1% or 3/4 inch, whichever is less, from the design dimensions.

(2) ASTM Section 11. PERMISSIBLE VARIATIONS. Add the following subsections:

(a) 11.8 Deviation from straightness of mating edge: ± 1/4 inch.

(b) 11.9 Squareness of ends (vertical and horizontal): ± 1/4 inch.

(c) 11.10 With any new production start-up or change in set-up, join a minimum of the first 5 production units at the fabrication plant for inspection of joint fit-up and alignment of boxes. Continue joining each unit until production is satisfactory. Check approximately 10% of the remaining production at random, using a minimum 3 unit assembly. The Engineer may order a 3 or more unit assembly at any time measurements or observations indicate a problem exists.

(3) Design multiple-cell precast reinforced concrete boxes according to the criteria used to develop the single-cell precast boxes.

(4) The minimum member thickness is not less than 3/4 the thickness of the corresponding member of an equivalent KDOT Standard cast-in-place rigid frame box culvert, but not less than 6 inches. When calculating the minimum thickness of the bottom slab, deduct 1/2 inch from the cast-in-place thickness before factoring by 3/4.

(5) Provide minimum clearances to reinforcing of 1 1/4 inches ± 1/4 inch from all faces except when the depth of fill is less than 2 feet. In that case, make the clearance in the top of the top slab 2 1/2 inches ± 1/4 inch.

(6) Use epoxy coated reinforcing in the top slab when the fill at the shoulder line is 6 inches or less.

(7) Fill heights less than 2 feet require a distribution slab. Precast distribution slabs may be used for fill heights over 1 foot, otherwise use cast-in-place.

(8) For the cast-in-place distribution slab, 1 of the following combinations of steel reinforcement may be used:

- 1 layer of mesh and 1 layer of reinforcement bars, or
- 1 layer of reinforcement bars.

Develop the reinforcement according to the applicable parts of Section 5, of the AASHTO LRFD Bridge Design Specifications.

(9) Provide a minimum of 0.06 square inches per foot of longitudinal reinforcing for shrinkage and temperature requirements in each face, except at the joint as shown in the Contract Documents).

(10) Provide minimum transverse steel areas in each face of 0.19 square inches per foot of barrel.

(11) The maximum shear reinforcement spacing in the longitudinal direction is 6 inches.

(12) Welding is not allowed on reinforcing bars or steel fabric, except that the original welding required to manufacture wire fabric is acceptable.

(13) Air entrainment is not required for dry-cast units. Use air entrainment for wet-cast units where the depth of fill will be less than 2 feet, as shown in the Contract Documents.

(14) Use material for precast reinforced concrete boxes that complies with the applicable requirements:

Grade 4.0(AE) Concrete ..... **DIVISION 400**

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Concrete Admixtures .....	<b>DIVISION 1400</b>
Reinforcing Steel (Grade 60) .....	<b>DIVISION 1600</b>
Reinforcing Steel (Epoxy Coated) (Grade 60) .....	<b>DIVISION 1600</b>

(15) Minimum length of a precast section is 4 feet.

(16) A single-cell box of equivalent area may be substituted for a double-cell box with cell spans less than or equal to 6 feet. Any revision in the cell height from that shown on the Contract Documents shall not be permitted unless approved by the Engineer. Two single-cell boxes may be substituted for a double-cell box, if approved by the Engineer.

(17) Prior to fabrication, submit shop drawings to the Engineer for approval (see **subsection 105.10**). Detail all phases of construction including layout, joint details, lifting devices, casting methods, construction placement and details of any cast-in-place sections. Note the proposed transportation methods on the shop drawings.

(18) Legibly mark this information on an inside face of each box section by waterproof paint or other approved means:

- Date of manufacture;
- Name or trademark, and location of the manufacturer;
- Weight of box section in tons; and
- The top of the box.

Allow the Engineer free access to the manufacturing plant at all times for the purpose of inspecting materials, plant facilities and manufacturing and curing procedures. Inform the Engineer of planned concrete placement and curing schedule 5 business days before work is started.

Precast reinforced concrete boxes will be accepted on the basis of satisfactory results of material tests performed by the Engineer, compliance with dimensional requirements and visual inspection at the point of usage.

**b. Materials for Sealing Joints of Precast Boxes.** Provide a compound type joint filler or rubber gasket that complies with **DIVISION 1500**.

Provide an external sealing band that complies with ASTM C877. The basis of acceptance for external sealing bands will be a Type D Certification as specified in **DIVISION 2600**.

Provide geotextile fabric complying with the following requirements:

In the manufacture of geotextile filter fabric, use fibers consisting of long chain synthetic polymers, polyesters or olyamides. Form into a network such that the filaments or yarns retain dimensional stability relative to each other, including selvages. Use materials complying with the physical requirements shown below.

Apparent Opening Size	ASTM D 4751	U.S. Standard Sieve 50
Permittivity	ASTM D 4491	0.5 per sec. minimum
Grab Strength	ASTM D 4632	100 lb. minimum, either pr direction
Seam Strength	ASTM D 4632	90 lb. minimum
Ultraviolet Degradation at 150 hrs	ASTM D 4355	70% retained

Provide geotextile rolls with suitable wrapping for protection against moisture and extended ultraviolet exposure prior to placement. Label or tag each roll to provide product identification sufficient for inventory and quality control purposes. Store rolls in a manner which protects them from the elements. If stored outdoors, elevate and protect with a waterproof cover.

The geotextile will be accepted on the basis of a Type A Certification as specified in **DIVISION 2600**. Submit certification to the Engineer that the materials meet the minimum average roll values as shown above.

**c. Foundation Materials for Precast Boxes.** Provide either crushed stone or concrete seal course for the foundation of the precast box.

Provide crushed stone that is free of soapstone, shale, shale-like or other easily disintegrated material. Provide crushed stone with adequate gradation to provide a uniform foundation. The Engineer will accept the crushed stone based on visual inspection at the point of usage.

For concrete seal course, provide commercial grade concrete that complies with **SECTION 401**, or use any other concrete acceptable for use on the project.

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### 735.3 CONSTRUCTION REQUIREMENTS

Excavate and prepare the foundation according to **DIVISION 200**. Construct a 6 inch (minimum) thickness of crushed stone, or 3 inches of concrete seal course for the foundation of the precast box.

Lay the precast reinforced concrete box culvert with the groove end of each section up-grade. Join the sections tightly.

Seal the joints using one of the options shown in the Contract Documents. Install the joint sealant according to the manufacturer's recommendations.

If geotextile is used to wrap the joint:

- Use only geotextile that has been properly stored;
- Limit the exposure to the elements (between placement and covering) of the geotextile to a maximum of 7 calendar days;
- Do not drop any backfill larger than 6 inches  $D_{50}$  size onto the geotextile from a height greater than 1 foot;
- Do not drop any backfill smaller than 6 inches  $D_{50}$  size onto the geotextile from a height greater than 3 feet; and
- Do not contaminate the geotextile with grease, mud or other foreign substances. Replace contaminated or damaged geotextile. If approved by the Engineer, repair damaged geotextile by placing a patch over the damaged area and sewing the patch to the geotextile. Extend the patch a minimum of 1 foot beyond the perimeter of the damaged area. Replace contaminated or damaged geotextile, or repair if approved, at the Contractor's expense.

Fill the lifting holes with precast plugs sealed with mastic or mortar.

Unless otherwise approved by the Engineer, construct cast-in-place collars at horizontal and vertical changes in RCB alignment.

Construct the cast-in-place sections, end sections and wingwalls, according to **DIVISION 700**, and as detailed in the Contract Documents.

### 735.4 MEASUREMENT AND PAYMENT

The Engineer will measure precast reinforced concrete boxes by the linear foot. Precast end sections, and cast-in-place end sections and wingwalls will not be measured for payment.

Payment for "Reinforced Concrete Box (Precast)" at the contract unit price is full compensation for the specified work.

If constructed as an option to cast-in-place RCB's, the Engineer will not measure the precast reinforced concrete boxes for payment. The cast-in-place quantities are the basis of payment. Payment of the cast-in-place quantities at the contract unit prices is full compensation for the specified work.