

**410 PRECAST CONCRETE BOX CULVERT.**  
**(REV 12-5-11) (FA 12-8-11) (7-12)**

ARTICLE 410-2 (Page 416) is deleted and the following substituted:

**410-2 Materials.**

Ensure that the materials used for the construction of precast box culverts have certification statements from each source, showing that they meet the applicable requirements of the following:

Portland Cement Concrete .....	Section 346
Reinforcing Steel .....	Section 415
Precast Concrete Drainage Products .....	Section 449
Wire for Site Cage Machines .....	ASTM A-82, ASTM A-496
.....	or ASTM A-615
Coarse Aggregate* .....	Section 901
Fine Aggregate* .....	Section 902
Curing Materials for Concrete .....	Section 925
Materials for Concrete Repair** .....	Section 930
Non-Shrink Grout** .....	Section 934
Joint Materials .....	ASTM C-877
.....	ASTM C-1677 or ASTM C-990
Geotextile Fabrics .....	Section 985

\* The gradation requirements of aggregates are not applicable when using dry-cast concrete.

\*\* Use products listed on the Department's Qualified Products List (QPL).

SUBARTICLE 410-3.1 (Page 416) is deleted and the following substituted:

**410-3.1 General:** Meet the requirements of Section 346, except as modified herein:

Prepare, cure, and test the test cylinders in accordance with ASTM C-31 and ASTM C-39 test methods. Follow the alternative method of compaction, in accordance with ASTM C-497, if the consistency of concrete is too stiff for compaction by rodding or internal vibrations. Expose shipping strength test cylinders to the same curing conditions as the precast concrete box sections.

Perform all concrete quality control testing and inspections in accordance with 346-9.2.

For training and other qualifications meet the requirements of Section 105. Test all QC samples for compressive strength in a laboratory meeting the requirements of Section 105.

SUBARTICLE 410-3.3 (Page 417) is deleted and the following substituted:

**410-3.3 Special Requirements for Dry-Cast Concrete:** Dry-cast concrete is defined as a very low slump concrete that requires continuous and intense vibration to compact the

concrete, enabling immediate removal of the side forms without detrimental effects to the concrete when used in a dry-cast manufacturing process.

The target slump and air content ranges of Section 346 - Table 2 and the plastic property tolerances of Section 346 - Table 6 are not applicable to dry-cast concrete.

Perform absorption tests on specimens from each LOT of dry-cast production in accordance with the test methods in ASTM C-497. The absorption of each specimen must not exceed 9.0 percent of the dry mass for Test Method A procedure or 8.5 percent for Test Method B procedure. All specimens must be free of visible cracks and must represent the full thickness of the product. Test specimens after 28 days of standard curing, or prior to the date of shipping if the precast box sections are to be shipped before the completion of the 28 day curing period.

Core three specimens for Test Method B in accordance with ASTM C-42 and meet the sampling location and size requirements of ASTM C-497. Prepare or core a minimum of one specimen for Test Method A in accordance with the test cylinder requirements of ASTM C-497. When the initial absorption specimen from a concrete box section fails to conform to this Specification, the absorption test may be made on another specimen from the same box section and the results of the retest may be substituted for the original test results for acceptance of the LOT. The manufacturer may test each box section within a LOT and cull the box sections not meeting absorption requirements marking them as deficient with waterproof paint or other approved means. Deficient box sections must not be shipped to the project site. Reduce the frequency of absorption tests to one test every five LOTs when the results of five consecutive LOTs meet the specified limit.

SUBARTICLE 410-6.1 (Page 419) is deleted and the following substituted:

**410-6.1 Casting:** Cast precast elements in unyielding beds and forms. Ensure bearing surfaces in casting forms are level and straight, and vertical surfaces are plumb prior to casting. Ensure surfaces within the forms against which concrete will be cast, are clean and free from rust and hardened residual concrete. Provide full concrete cover clearance to all form wires and other miscellaneous pieces of metal, except as permitted by Section 415. Bend all tie wires away from the form surface to provide maximum concrete cover. Provide inserts and lifting devices in accordance with 450-9.2.1.

SUBARTICLE 410-6.4.5 (Page 420) is deleted and the following substituted:

**410-6.4.5 Tongue and Groove Joints or Ends:** Ensure the planes formed by the ends of box sections do not vary perpendicular from the joint axis by more than the following:

1. Profiled Rubber Gasket Joints (ASTM C-1677): 1/8 inch/ft of internal span with a maximum 5/8 inch for internal spans or heights less than or equal to 7 feet, and a maximum of 3/4 inch for internal spans greater than 7 feet.
2. Preformed Flexible Joints (ASTM C-990): 1/4 inch for internal spans or heights less than 5 feet, or more than 3/8 inch for internal spans or heights of 5 feet or greater.

ARTICLE 410-8 (Page 421) is deleted and the following substituted:

**410-8 Repairs and Rejection.**

Evaluate cracks, spalls and other deficiencies in accordance with 450-12. Classify fractures and cracks passing through the wall or slab, except for a single end crack with a length that does not exceed the depth of the joint, as major cracks. Walls and slab areas outside the middle half of the internal span will be considered non-critical locations for the purpose of evaluating cracks. Repair cracks and all other deficiencies in accordance with 450-13 or the plant's approved repair methods that are included as part of the Quality Control Plan. Ensure that the original performance and durability of the repaired box culverts are maintained.

Use materials for concrete repair that will meet or exceed the strength requirement of the class of concrete used. Materials meeting the requirements of Section 930 may be substituted for non-shrink grout when required by 450-13. Precast box culvert elements are subject to rejection if they fail to conform to any of the Specification requirements after repair or when damaged ends would prevent making a satisfactory joint.

ARTICLE 410-10 (Pages 421 – 422) is expanded by the following new Subarticle:

**410-10.6 Underdrain and Weep Holes:** Provide a continuous underdrain in accordance with Design Standard Index No. 289.

ARTICLE 410-11 (Pages 422 - 424) is deleted and the following substituted:

**410-11 Joints.**

**410-11.1 General:** Make field joints for precast concrete box culvert sections with either profile rubber gaskets or preformed joint sealants, unless otherwise detailed in the plans or approved shop drawings. Joint openings at the outside face must not exceed 1 1/2 inches in the assembled position at any location along the joint perimeter. Ensure a minimum 50% overlap of the joint tongue and groove around the entire perimeter of the box in the assembled position.

Completely wrap the outside of each joint with geotextile filter fabric. Use fabric meeting the physical requirements of Class D, Type 3 specified on Design Standards, Index No. 199. Provide fabric with a minimum width of 2 feet and a length sufficient to ensure a minimum overlap of 24 inches. The filter fabric must extend a minimum of 12 inches beyond each side of the joint. Secure the fabric tightly against the box culvert sections with metal or plastic strapping. Other methods which will hold the fabric securely against the wall of the culvert until the backfill is placed and compacted, may be used when approved by the Engineer. When specified in the plans, secure the joint by a suitable device capable of holding the sections to line and grade as well as fully home. Remove these devices and repair locations as necessary if intrusive into the concrete after placing and compacting sufficient backfill to secure the sections.

**410-11.2 Profile Rubber Gaskets:** Install field joints in accordance with the joint manufacturer's instructions and meet the following:

1. Meet the requirements of ASTM C-1677,
2. Store all gaskets in a cool place prior to use,

3. Furnish to the Engineer written details regarding configuration of the joint and gasket required to create a soil-tight seal. Do not apply mortar, joint compound or other filler which would restrict the flexibility of the joint.

**410-11.3 Preformed Flexible Joint Sealants:** Install field joints in accordance with the joint manufacturer's instructions and meet the following:

1. Meet the requirements of ASTM C-990,
2. Furnish to the Engineer a written recommendation of the size (cross-sectional area) of joint sealant which will create a soil-tight seal. Ensure that this amount is the minimum quantity of bitumen sealant used. Do not brush or wipe joint surfaces which are to be in contact with the joint sealant with cement slurry. Fill minor voids with non-shrink grout,
3. Thoroughly clean and dry all joint surfaces which are to be in contact with the sealant material. When recommended by the sealant manufacturer, apply a primer of the type recommended to all joint surfaces which are to be in contact with the sealant material.
4. Apply sealant to form a continuous seal around each joint. The sealant must be protected by a removable wrapper. Do not remove the paper wrapper on the exterior surface of the preformed flexible joint sealant until immediately prior to joining the precast sections. Apply the joint sealant only to dry surfaces. When the atmospheric temperature is below 60°F, either store the joint sealant in an area above 70°F, or artificially warm the joint sealant to 70°F in a manner satisfactory to the Engineer. After assembly, ensure that there is full contact and compression of the sealant for the entire perimeter of the joint, as evidenced by the presence of minor bulging along any visible edges of the sealant. Neatly trim any extruded sealant flush with the concrete surface.

**410-11.4 Water-tight Joint Treatment:** Provide water-tight joints when shown in the Contract Documents. Utilize an external sealing band in accordance with ASTM C-877 in addition to the requirements of 410-11.2 or 410-11.3. Determine the minimum width of sealing bands by substituting the larger of the clear rise or span of the precast concrete box section, for the equivalent pipe diameter in ASTM C-877 Tables 1 and 2. Install external sealing band wrap in accordance with the manufacturer's instructions prior to wrapping the joint with geotextile filter fabric.