

ORIGINATION FORM

THE INFORMATION BELOW IS TO BE PROVIDED BY THE ORIGINATOR

(The person who receives or originates the issue and needs to forward the issue for action.)

Modify Specification 410/4100000SS.
Section/File number

New Section _____.
Section number

Subject: **Precast Concrete Box Culvert**

Origination date: **07/18/11**

Originator: **Steven J. Nolan**
Office/Phone: **(850) 414-4272**
Email address/ **steven.nolan@dot.state.fl.us**
Userid: **st986sn**

Problem statement: 1) ASTM C-1677 was developed specifically for profile rubber gasket joints for box culverts in 2009. This change implements this new specification to replace the partial specification references to ASTM C-443.
2) Curing of concrete cylinders for 28 day strength is covered in the referenced ASTM's in 410-3.1, so no additional reference to 346 is required in this section.
3) State Materials Office preference is to evaluate and repair cracks in accordance with the new revisions to Section 450.

Information source: Steve Nolan – State Structures Design Office;
Ghulam Mujtaba – State Materials Office.

Background data: The hydrostatic testing requirements of ASTM C-1677 meet the Department's definition for water-tight joints, so the addition of an ASTM C-877 external sealing band will no longer be required for joints using ASTM C-1677 profile rubber gaskets when water-tight joints are specified in the plans. Corresponding changes to the joint tolerances have also been included.

Recommended Usage Note: All projects with concrete box culverts:

Estimated fiscal impact, if implemented: No fiscal impact is expected.

Desired implementation date: Beginning with the January 2012 letting.



Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

ANANTH PRASAD, P.E.
SECRETARY

M E M O R A N D U M

DATE: August 29, 2011

TO: Specification Review Distribution List

FROM: Rudy Powell, Jr., P.E., State Specifications Engineer

SUBJECT: Proposed Specification: **4100200 Precast Concrete Box Culvert.**

In accordance with Specification Development Procedures, we are sending you a copy of a proposed specification change.

This change was proposed by Steve Nolan of the State Structures Design Office to include ASTM C-1677 for profile rubber gasket joints for box culverts and remove reference to curing of concrete cylinders for 28 day strength which is already covered in the referenced ASTM's in 410-3.1 and evaluate and repair cracks in accordance the new revisions to Section 450.

Please share this proposal with others within your responsibility. Review comments are due within four weeks and should be sent to Mail Station 75 or to my attention via e-mail at SP965RP or rudy.powell@dot.state.fl.us. Comments received after **September 26, 2011** may not be considered. Your input is encouraged.

RP/cah
Attachment

PRECAST CONCRETE BOX CULVERT.
(REV 7-20-11)

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-443, ASTM C-877
.....	<i>ASTM C-1677</i> or ASTM C-990
Geotextile Fabrics	Section 985

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

SUBARTICLE 410-3.1 (of the Supplemental Specification) 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. ~~Cure the 28-day strength test cylinders in accordance with Section 346.~~

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 ~~to~~ 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 410-6.4.5 (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 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, ~~except that cracks will be classified in accordance with 400-21.~~ 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 ~~structural-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 ~~nonstructural~~ cracks ~~in accordance with 400-21 (substructure requirements),~~ 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 410-11 (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 performance must meet the requirements of ASTM C-990, and~~ 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 ~~Article 6 of ASTM C-443~~ *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~~ *water-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 *for joints using preformed flexible joint sealants*. 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.