

ITEM 480

PRECAST REINFORCED CONCRETE BOX SEWERS

- 480.1 Description. This specification shall govern for the furnishing and placing of precast reinforced concrete box sewers of the size, type and configuration installed to the lines and grades established by the drawings.
- 480.2 Material. Precast reinforced concrete box sewers shall be manufactured in accordance with the latest revisions published by the American Society for Testing Materials of the following specifications:
- A. ASTM C 1433 - Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers.
 - B. ASTM C 1433 - Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers with less than Two Feet of Cover and Subjected to Highway Loadings.

In the manufacture of concrete box sewers, the supplier has the option of using Portland cement or Portland cement plus fly ash, as defined herein. Cement plus fly ash shall be composed of Portland cement and 20-30 percent fly ash, by absolute volume. Fly ash shall be Class C, conforming to the requirements of ASTM C618, titled "Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement". Fly ash shall have a minimum CaO content of 20 percent.

Unless otherwise specified, all boxes furnished under this specification shall be fabricated with tongue and groove joint.

Joints in concrete boxes will be made watertight by the methods described herein. The Contractor shall be fully responsible for using methods, workmanship and materials and taking precautions as may be necessary to secure the required water tightness per ASTM C990 Section 10.

Gasket material for sealing tongue and groove joints shall be preformed flexible butyl rubber meeting the requirements of ASTM C990 Section 6.2 Butyl Rubber Sealant. Joints shall be water tight using sealants such as "RU106 – RUBR-NEK", manufactured by Henry Company, or "CS-102" manufactured by ConSeal Concrete Sealants, Inc., or any other approved equal.

Gasket width shall be in accordance with the joint material manufacturer's recommendations, and large enough to properly seal the entire perimeter of the tongue and groove joint.

In addition, joints shall be sealed externally with a continuous 12" wide minimum strip along the entire joint. The strip shall be centered on the joint and wrapped around all four sides completely covering the exposed surface of the joint. The seal strip shall be in accordance with ASTM C877, types II and/or III. The seal strip shall have a rubberized mastic sealer with woven polypropylene reinforcing, and heavy polyethylene backing such as "MacWrap", which is manufactured by Mar-Mac Construction Products, Co.; or "ConWrap CS-212" supplied by Concrete Sealants, Inc.; or an approved equal. The external joint seal strip shall be installed per the joint material manufacturer's recommendations.

480.3 Submittals. Furnish submittals that have the name and types for both the gasket sealant and external seal strip materials that are to be used for sealing the box sewer joints.

480.4 Installation. Trenches shall be excavated with suitable type equipment such as ladder type trenching machines or trench hoes or other equipment that may be approved by the Engineer. Trenches for precast box sewers shall have a width below the top of the box of not less than the outside width of the box plus 18 inches and shall be wide enough to permit making up the joints.

After the trench has been excavated to the bottom, the trench shall be fine graded to the established subgrade. Any over excavation of the subgrade shall be filled with 1.5 sack per ton of cement stabilized sand. Cement stabilized sand shall be in accordance with the Item 433, "Cement Stabilized Sand Bedding and Backfill Material", at the Contractor's expense. The Contractor shall establish the grade line in the trench from grade stakes. The Contractor shall maintain this grade control a minimum of 100 feet behind and ahead of the box laying operation. The Contractor shall, at his expense, furnish and place in position all necessary stakes, grade and batter boards for locating the work.

The precast box sections shall be so laid in the trench that after the sewer is completely installed, the interior surface shall conform accurately to the grade and alignment as shown on the drawings or as established and given by the Engineer. All box sections must be laid in a straight line with the tongue end of the box section pointed downstream entering the grooved end of the previously laid box section, to full depth. Caution shall be taken to not drag cement stabilized sand or earth into the annular space. Box sections shall be fitted together and matched to achieve a finished sewer with a smooth and uniform invert.

All lifting holes shall be sealed to the satisfaction of the Engineer. Tapered lift hole plugs shall be used, and sealed both externally and

internally with non-shrink grout. Additionally, lift hole plugs shall not protrude above the top exterior surface of the box nor more than one-half inch below the soffit of the box.

Tongue and groove ends shall be primed if required, before installation of joint gasket material. Primer shall be used as recommended by the joint material manufacturer.

Before laying the box section in the trench, the gasket material shall be placed around the entire perimeter of the tapered tongue near the shoulder or groove of each box section joint. The paper wrapper shall be removed from one side only of the two-piece wrapper on the gasket and pressed firmly to the clean, dry box section joint surface.

The outside wrapper shall not be removed until immediately before pushing each box section into its final position.

When the tongue is correctly aligned with the flare of the groove, the outside wrapper on the gasket shall be removed and the box section shall be pulled or pushed home (do not push box home with backhoe bucket) with sufficient force and power (using tuggers) to cause evidence of squeeze-out of the gasket material on the inside or outside around the complete box section joint circumference. In no case shall a joint be wider than one inch, after having been pulled or pushed home. Any joint material pushed out into the interior of the box section that would tend to obstruct the flow shall be removed. Each box section shall be pulled home in a straight line with all parts of the box section on line and grade at all times.

When the atmospheric temperature is below 40°F, priming the concrete joint will improve the bonding action with the gaskets to be installed on the tongue of the joint. Priming the concrete joint will be applied if required by the joint material manufacturer. Gaskets shall then be applied to box section joints immediately prior to placing each box section in the trench, and then followed by joining with the previously laid box section.

No box sewer shall be laid in a trench in the presence of water. All water shall be removed from the trench sufficiently ahead of the sewer placing operation to insure a dry, firm bed on which to place the sewer, and if necessary, the trench will continue to be dewatered until after the sewer is bedded and backfilled as directed by the Engineer. Removal of water may be accomplished by pumping, or pumping in connection with the well point installation as the particular situation may warrant. The well point installation shall be in accordance with the Item 436 "Well Pointing". When Well Pointing is used for dewatering, then the seal slab shall be installed. Where available, Harris County will provide the Contractor with soils data; however, Harris County does not guarantee the adequacy or accuracy of the information as compared to actual field conditions at the time of construction. The Contractor may elect to do soil borings on his own, if he so desires.

Where necessary, to comply with OSHA Regulation 1926.650, the side of the trench or other excavation shall be braced and rendered secure. The bracing shall be in accordance with the Item 429, "Trench Safety System".

Following excavation of the trench to the established subgrade, the Contractor shall place a minimum of a 6 inch thickness cement stabilized sand bedding in such a manner that once the box sections are laid, the invert elevation in the box section shall conform to the drawing elevations. No voids in the bedding material shall be permitted by the Engineer. Cement stabilized sand shall be composed of a minimum of 1.5 sacks of cement per ton of material mixture as placed.

When installing concrete box culverts in an existing channel, ditch or gully, cement stabilized sand shall be placed in accordance with the "Storm Sewer Excavation, Backfill and Bedding Detail", shown on the standard construction drawings. The external joint seal strip, as previously described in the materials section, shall be wrapped around the complete external surface of the joint, with a twelve inch overlap, and installed per the seal strip manufacturer's instructions.

When installing concrete boxes in a trench condition, backfill shall consist of material in the "Storm Sewer Excavation, Backfill and Bedding Detail" shown on the standard construction drawings. Cement stabilized sand shall be installed in accordance with Item 433, "Cement Stabilized Sand". Moisture content shall be so controlled that the required moisture content to three percent above optimum moisture content. The "MacWrap", or approved equal, centered on the joint of two box sections, shall be wrapped around the complete external surface of the joint, with a twelve inch overlap, and installed per the manufacturer's instructions.

Backfill over box sections will be permitted as installation proceeds. Prior to backfilling, the Contractor shall remove all steel sheeting and/or cut off all timber sheeting a minimum of three (3) feet below finished grade as shown by the plans. Backfill shall consist of material excavated on the site and deemed adequate by the Engineer or materials obtained from a suitable borrow site.

In the event that excavation cannot be dewatered to the point where the precast box sewer subgrade is free of mud, excessive wet soil, sandy silt or clay with water, a seal slab shall be used in the trench bottom. Such seal slab shall be designed in accordance with Item 421, Structural Concrete. The seal slab shall be Class "D", 5 sacks of cement per cubic yard with a minimum compressive strength of 1,750 P.S.I. at 7 days and 2,500 P.S.I. at 28 days. The seal slab shall have minimum #4 rebar at 18 inch on centers, in each direction. A precast seal slab, minimum 6 inch thick, may be used, provided that the joints of the seal slab do not occur at the joint of the precast box sewer. Contractor shall have an option of using a three day cylinder test break at no expense to Harris County.

Precast reinforced box sewers shall be installed in accordance with the "Storm Sewer Excavation, Backfill and Bedding Detail" shown on the standard construction drawings.

Laboratory tests will be performed as the backfill proceeds. All backfill not meeting this specification shall be removed and recompacted to the satisfaction of the Engineer at no cost to Harris County.

All surplus excavated material shall be disposed of by the Contractor.

The angles in box type sewers shall be built in accordance with the plans and specifications. The cost of making these angles and all cost incidental to them shall be included in the unit price bid for box sewer. Where junction with sewers are to be made, openings may be left in the walls the size of which shall be the outside dimensions of the connecting sewer. A bond length of each reinforcing bar shall be left in the opening for connecting with the concrete collar or future sewer. Where a stub sewer is to be built, the end of the concrete of the stub sewer at the box sewer shall be at the inside face of the sewer box wall. All openings shall be closed with a 12 inch thick brick bulkhead. The cost of providing bulkheads shall be included in the unit price for the box sewer.

480.5 Quality Assurance. The Engineer shall witness the manufacture of precast reinforced concrete box sewers. When the Engineer does witness this production, tests using concrete cylinders in accordance with ASTM C39, titled "Test Method for Compressive Strength of Cylindrical Concrete Specimens", shall be acceptable.

In the event that production of boxes is not witnessed by the Engineer, select boxes shall be cored in accordance with ASTM C1433, part 10.3 and tested in accordance with ASTM C42, (wet method). All test specimens and testing shall be done by the producer of the concrete pipe.

Boxes previously approved and stamped by the Texas Department of Transportation (TxDOT), or by the TxDOT approved fabricator specific stamp, which must specify: "Fabricator certifies that this product meets TxDOT Contract, Plans, & Specifications, and DMS 7310 certification requirements, will be accepted by all laboratories and by Harris County.

The Testing Laboratory's representative will determine the moisture density relationship in accordance with ASTM D698 on material secured from the trench excavation. Samples secured from the cement stabilized sand supplier shall be blended with Portland cement in accordance with the Item 433 "Cement Stabilized Sand Bedding and Backfill", and the moisture density relationship will be determined in accordance with ASTM D558.

The Testing Laboratory's representative will determine the in-place density in accordance with ASTM D6938 or ASTM D1556 and ASTM D3017. The minimum level of testing will consist of at least one test for

each 50 linear feet of trench for bedding and per lift of backfill, or as directed by the Engineer.

- 480.6 Acceptance Requirements. The average compressive strength of all cylinders tested shall be equal to or greater than the design concrete strength and no cylinder tested shall have a compressive strength less than eighty percent of the design concrete strength. Any lot which complies with all of these requirements will be considered acceptable with regard to concrete strength. Any lot which does not meet all of these requirements will be subject to further testing by cores of hardened concrete in accordance with ASTM C1433.

Conduit which meets all the dimensional tolerances given in the appropriate ASTM C1433 specifications or further defined in this specification will be considered acceptable provided that the conduit has met the compressive strength requirement outlined above. Repaired pipe will only be acceptable if the repaired portions are visible and areas repaired were within the limitations given in this specification and ASTM C1433.

- 480.7 Measurement. All box sewers installed in accordance with the above specifications and accepted by the Engineer shall be measured by the linear foot of the size installed. Longitudinal measurements shall be made along the centerline of the box sewer from the end of the concrete box sewer to the end of the concrete box sewer. Seal slabs shall be measured by the square yard installed, along the centerline of the structure.

- 480.8 Payment. All box sewers installed in accordance with this specification and accepted by the Engineer shall be paid for at the unit price bid by the Contractor, complete in place, of the type, size and depth constructed. The unit price bid shall be full compensation for furnishing all material, including joint materials, equipment and labor for all excavation, shaping of trench bottom, jointing, laying, normal dewatering, sheeting, bracing, bedding, backfilling, and specials necessary to install the box sewers in accordance with this specification and of the size, type and depth as shown on the drawings.

Payment for seal slab shall be made at the unit price bid per square yard for class "D" concrete seal slab and shall include the price of all labor, materials and equipment necessary to complete this item.

Payment for a well point system, when used for dewatering, shall be made in accordance with the Item 436, "Well Pointing".

There are line code(s), description(s), and unit(s), for this item.

Note: This Specification Requires Drawings, that shall be incorporated into the proposed Standard Construction Drawings.

END OF ITEM 480