480.1 Description. This Item shall govern for the furnishing and installing of precast reinforced concrete box sections of the size, type and configuration installed to the lines and grades established by the drawings.

Precast reinforced concrete box sections (RCB) shall be one of the following:

A. Conventional tongue and groove joints with preformed flexible butyl rubber (FBR) sealant. Conventional RCB has squared shoulders on both the tongue and groove ends of the section at the corners.

B. Rubber gasketed tongue and groove joints with rubber gasket seals. The rubber gasketed RCB has rounded shoulders on both the tongue and groove ends of the section at the corners. Please note, when rubber gasket RCB is selected, no external seal strip shall be required.

It is permissible to use both types of box sections within the same project as may be needed due to product supply issues, but any continuous run of RCB between structures must have the same joint type for that entire run.

480.2 Material. Precast reinforced concrete box sections shall be manufactured in accordance with the ASTM C1433 “Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers.”

In the manufacture of concrete box sections, 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 weight. Fly ash shall be Class C or Class F, conforming to the requirements of ASTM C618 "Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete."

Conventional Joints with Flexible Butyl Rubber Joint Sealant

The sealant for conventional tongue and groove joints shall be preformed flexible butyl rubber meeting the requirements of ASTM C990 “Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box
Sections Using Preformed Flexible Joint Sealants” Section 6.2 “Butyl Rubber Sealant.” The sealant shall be one of the following:

A. “RU106 - RUBR-NEK”, manufactured by Henry Company, or
B. “CS-102” manufactured by ConSeal Concrete Sealants, Inc., or
C. an approved equal.

The sealant width and thickness shall conform to its manufacturer's recommendations, and be 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 seal strip along and over the entire joint. The seal 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 conform to ASTM C877 “Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections”, Types II or III. It shall have a rubberized mastic sealer with woven polypropylene reinforcing, and heavy polyethylene backing. The seal strip shall be one of the following:

A. “MacWrap”, which is manufactured by Mar-Mac Construction Products, Co.; or
B. “ConWrap CS-212”, which is manufactured by Concrete Sealants, Inc.; or
C. an approved equal.

The external seal strip shall be installed per its manufacturer's recommendations.

Rubber Gasketed Joints

Joint seal shall be a rubber gasket meeting the requirements of ASTM C1677 “Standard Specification for Joints for Concrete Box, Using Rubber Gaskets” for the design of the gaskets and permissible variations in dimensions.

The rubber profile gaskets are glued in place by the manufacturer against the offset on the tongue end of the box sections. The rubber gasket is pre-lubricated on its inner surface. DO NOT LUBRICATE THE JOINT OR GASKET.
480.3 Submittals.

For Box Sections with Flexible Butyl Rubber Sealants –

A. Provide dimensional data for the box section barrel and joint by size.

B. Provide sealant composition data, sealant material width and thickness by box section size, and manufacturer’s installation instructions.

C. If used, joint primer type, manufacturer and installation instructions.

D. External joint seal strip manufacturer, model/type and installation instructions.

For Box Sections utilizing Rubber Gasket Joints –

A. Provide dimensional data for the box section barrel and joint by size.

B. Provide gasket composition data and dimensional data by box section size.

C. Provide joint assembly instructions.

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 sections shall have a width below the top of the box of not less than the outside width of the box plus 18 inches clear on both sides and shall be wide enough to permit making up the joints.

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".

In the event that excavation cannot be dewatered to the point where the precast box sewer trench bottom elevation 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 in accordance with Item 421 “Structural Concrete”. The 7 inch thick cast-in-place 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.

All surplus excavated material shall be disposed of by the Contractor outside the limits of the right of way, in a legal manner.

After the trench has been excavated to its bottom, the trench shall be fine graded to the required trench bottom elevations. 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 either grade stakes or by use of lasers. The Contractor shall maintain this grade control for 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 establishing and maintaining correct elevation and alignment.

Following trench excavation, the Contractor shall place cement stabilized sand bedding a minimum of 6 inches thick in such a manner that once the box sections are laid, the invert elevation of the box section shall conform to the drawing elevations. Cement stabilized sand shall be installed in accordance with Item 433 "Cement Stabilized Sand Bedding and Backfill Material". Laboratory tests will be performed as the backfill proceeds.

The precast box sections shall be so laid in the trench that, after the storm 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 and pulled fully home into the grooved end of the previously laid box section.
Caution shall be taken to not drag cement stabilized sand or earth into the annular space. Box sections shall be fitted together so that the finished storm sewer has 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 below the soffit of the box by more than one-half inch.

Conventional Joints with Flexible Butyl Rubber Joint Sealant

A. If required, tongue and groove ends shall be primed immediately before installation of sealant. Primer shall be used as recommended by the sealant manufacturer. When the atmospheric temperature is below 40°F, priming the concrete joint will improve the bonding action with the joint sealant. Primer should be applied both to the tongue end of the upstream box and the groove end of the downstream box, so that both sides of the flexible butyl rubber sealant are in contact with the primer when the joint is pulled home. The sealant shall then be applied to box section joints.

B. If required by the sealant manufacturer, lubricant shall be applied by the Contractor immediately prior to placing each box section in the trench, and then followed by joining with the previously laid box section.

C. The flexible butyl rubber sealant will come in either coils or strips with paper on both sides of the sealant.

D. Before laying the box section in the trench, the paper wrapper shall be removed from one side only of the sealant. The sealant shall then be pressed firmly to the clean, dry box section joint surface. The sealant material shall be placed around the entire perimeter of the tapered tongue near the shoulder of each box section joint in accordance with the sealant manufacturer's instructions.

E. The paper wrapper on the other side of the sealant shall not be removed until immediately before pulling each box section into its final position.

F. When the tongue is correctly aligned with the flare of the groove, the remaining paper wrapper on the joint sealant shall be removed and the box section shall be pulled (do not push box home with backhoe bucket) with sufficient force and power (using tuggers) to cause evidence of squeeze-out of the sealant on either the inside
or outside around the complete box section joint perimeter. In no case shall a joint be wider than one inch, after having been pulled home. Any sealant that extends into the interior of the box section 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.

G. The external joint seal wrap, as previously described in the materials section, shall be placed around the complete external surface of the joint, with a twelve inch overlap, and installed per the seal strip manufacturer’s instructions.

Rubber Gasketed Joints:

A. When the tongue is correctly aligned with the flare of the groove, the box section shall be pulled home (using tuggers) with sufficient force to fully home the tongue into the groove. 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 installing concrete box sections in a trench condition, backfill shall consist of material in the “Storm Sewer Construction Detail” shown on the Standard Civil Drawing. All backfill not meeting the requirements of the detail shall be removed and recompacted at no cost to Harris County.

When installing concrete box culverts in an existing channel, ditch, or gully, all bedding and backfill material shall be placed in accordance with the drawing details provided by the design Consultant.

Final backfill over box sections will be permitted as installation proceeds. Final backfill shall conform to the requirements of Item 132 “Embankment”. Prior to backfilling, the Contractor shall remove all steel sheeting and/or cut off all timber sheeting a minimum of 3 feet below finished grade or as shown by the plans. Backfill shall consist of material excavated on the site and deemed adequate by the Engineer or suitable materials obtained from a borrow site.

480.5 Quality Assurance.

If production of box sections is not witnessed by the Engineer, selected box sections shall be cored in accordance with ASTM C1433, Section 10.3 and tested in accordance with ASTM C42 “Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete”, (wet method). All test specimens and testing shall be done by the producer of the concrete box sewer.
Box sections previously approved and stamped by a Texas Department of Transportation (TxDOT) approved fabricator with specific stamp, which must state: “Certifies Specification Compliance” (i.e. compliance with TxDOT’s DMS - 7310 “Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification” 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 “Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))” on material secured from the trench excavation.

The Testing Laboratory’s representative will determine the in-place density in accordance with ASTM D6938 “Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)” or ASTM D1556 “Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.” 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.

Box sections which meet all the dimensional tolerances given in ASTM C1433 or further defined in this Item will be considered acceptable provided that the box sections have met the compressive strength requirement outlined above. Repaired box sections will only be acceptable if the repaired portions are visible and areas repaired were within the limitations given in this Item and ASTM C1433.

480.7 Measurement. All box sections 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 interior wall face of the downstream junction box to the interior wall face of the upstream junction box.

Seal slabs shall be measured by the square yard installed, along the
centerline of the RCB sewer.

480.8 Payment. All box sections installed in accordance with this Item and accepted by the Engineer shall be paid for at the unit price bid by the Contractor, complete in place, for 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 sections in accordance with this Item.

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 Item requires other Standard Specifications:

Item 132 “Embankment”
Item 421 “Structural Concrete”
Item 429 “Trench Safety System”
Item 433 “Cement Stabilized Sand Bedding and Backfill Material”
Item 436 “Well Pointing”

END OF ITEM 480