

# TECHNICAL SPECIFICATIONS

## ITEM 00480 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 C789 - Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers.
- B. ASTM C850 - 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 shall be made watertight by the methods described herein. The Contractor shall be fully responsible for choosing methods, using workmanship and materials and such other precautions as may be necessary to secure the required water tightness.

Joints shall be made with a pliable joint sealer supplies in preformed strips of uniform size manufactured by Henry Company such as "Ramnek" or joint seals may be "Omni-Flex Rubber Gaskets" as manufactured by CSR Delta Pipe Products or an approved equal to "Ramnek" or "Omni-Flex Rubber Gaskets".

These seals shall be of tubular cross-section manufactured from extruded closed cellular rubber, the base polymer being a blend of nitrile and vinyl meeting the physical requirements of ASTM D1056, Class 2CL, and meeting the chemical resistance requirements of AASHTO M198. Each gasket shall be a single, continuous part conforming to the joint shape and the outer surface shall be completely covered with a natural skin.

Gasket cross-sectional diameters and installation practices shall be in accordance with the manufacturer's recommendations.

Construction fabric shall be a woven or spun fabric consisting only of long-chain polymeric filaments or yarns such as polypropylene, polyethelene, polyester, polyamide or polyvinylidene-chloride formed into a stable network such that the filaments or yarns retain their relative position to each other. High modulus is the essential characteristic for this application, hence nonwoven fabrics have been excluded. The fabric shall be inert to commonly encountered chemicals and conform to the properties in the following table:

<b>Table I</b>		
Fabric Property	Test Method	Fabric Requirements Minimum Shipment Averages
Resistance to Installation Stresses		
a. Grab Tensile Strength, lbs.	ASTM D1682	200
b. Grab Tensile Elongation, %	ASTM D1682	20
c. Burst Strength, psi	ASTM D751 (Diaphragm Method)	375
d. Trapezoid Tear Strength, lbs	ASTM D2263	100

<b>Table II</b>		
Fabric Property	Test Method	Fabric Requirements Minimum Shipment Averages
Performance Criteria During Service Life		
a. Equivalent Opening Size, U.S. Standard Sieve	CW 002215	70-100
b. Water Flow Rate gal/min/ft <sup>2</sup>	H, 20 cm to 10 cm	20
c. Water Permeability, K, cm/sec	CFMC-FEET-2	0.005
d. Modulus (Load at 10% Elongation), lbs.	ASTM D1682	110

<b>Table III</b>		
Fabric Property	Test Method	Fabric Requirements Minimum Shipment Averages
Resistance to Environmental Factors		
a. Mildew, Rot Resistance, % Strength Retention	AATCC-30	100
b. Insect, Rodent Resistance, % Strength Retention	AATC-24	100

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 00433, "Cement Stabilized Sand Bedding and Backfill Material". 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 lifting plugs shall be used, and sealed externally and internally with an acceptable cement grout. Additionally, lifting plugs shall not protrude from the box greater than one-half of an inch.

In preparing the tongue and groove joints with Ramnek type joint sealer, use a suitable primer as recommended by the manufacturer, only when conditions are wet. When using Omni-Flex Rubber Gasket Joint Sealer, a primer is not necessary.

Before laying the box section in the trench, the plastic gasket sealer shall be attached around the tapered tongue or tapered groove near the shoulder or hub 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 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 60°F, plastic joint seal gaskets shall either be stored in an area warmed to above 70°F, or artificially warmed to this temperature in a manner satisfactory to the Engineer. Gaskets shall then be applied to box section joints immediately prior to placing each box section in the trench, followed by connection to 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 Contractor shall satisfy himself as to the soil conditions to be encountered and make any investigation necessary in order to determine the need for and the type of dewatering system necessary for safe and stable pipe installation. Where available, City of La Porte will provide the Contractor with soils data; however, the City of La Porte 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 00429, "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 sand.

When installing concrete box culverts in an existing channel, ditch or gully, cement stabilized sand shall be placed up to the midpoint or widest point of the pipe or box. A six ounce per square yard

filter fabric, twenty four inches wide shall be draped over the top of the concrete box at each joint and the box shall be totally wrapped around the joint. This fabric shall be in accordance with Section 480.2, "Materials".

When installing concrete boxes in a trench condition, backfill shall consist of material excavated on the site, and deemed adequate by the Engineer, or materials obtained from a suitable borrow site, at no additional expense to the City of La Porte. Suitable materials shall be CL/CH materials as determined by the Uniform Soil Classification System that are cohesive in nature, free of debris and organic materials and acceptable to the Engineer. Backfill shall be installed in accordance with drawings HC 480-1 and HC 480-2. Cement stabilized sand shall be installed in accordance with Item 00433, "Cement Stabilized Sand". Moisture content shall be so controlled that the required moisture content to three percent above optimum moisture content. The filter fabric, twenty four (24) inches wide shall be installed in accordance with the drawings referenced above.

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 00421, 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. A precast seal slab 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 the City of La Porte.

Precast reinforced box sewers shall be installed in accordance with drawings HC 480-1 and HC 480-2.

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 the City of La Porte.

All surplus excavated material shall be disposed of by the Contractor in a legal manner.

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 Designation 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 Designation 850, part 10.3 and tested in accordance with ASTM Method 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 will be accepted by all laboratories and by the City of La Porte.

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 "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 D2922 or ASTM D1556. The minimum level of testing will consist of at least one test for each 200 linear feet of trench 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 C850 or C789.

Conduit which meets all the dimensional tolerances given in the appropriate ASTM C850 or C789 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 C850 or C789.

480.7 Method of 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 Basis of 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, equipment and labor for all excavation, shaping of trench bottom, jointing, laying, 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.