

ITEM 471

PRECAST CONCRETE MANHOLES

471.1 Description. This item shall govern for the manufacture and construction of precast concrete manholes, including the materials used therein and the furnishing of frames, rings and covers. Junction boxes shall be constructed as specified herein, and as shown on the plans.

471.2 Design Loads. Design loads shall consist of dead load, live load, impact and in addition loads due to water table and any other loads which may be imposed on the structure.

Live load shall be H-20 and/or H-20-S16 per the AASHTO Standard Specifications for Highway Bridges, with revisions. Design wheel loads shall be 18-kips equivalent single axle loads. The live load shall be that loading which produces the maximum shears and bending moments in the structure.

471.3 Materials. All cement shall be Portland cement conforming to ASTM C150 "Standard Specification for Portland Cement." Cement content shall be sufficient to produce minimum compression strengths of 4,000 psi in 28-days, per Harris County Spec. Item 421.

Cast iron shall conform to ASTM A48 "Standard Specification for Gray Iron Castings", Class 35B - Cast iron manhole frames and covers shall be heavy duty and shall be manufactured to the dimensions shown on the attached drawing. As-cast dimensions may vary in accordance with AASHTO M306, "Drainage Sewer, Utility and Related Castings." Casting shall be free from sand or blow holes and other defects. Holes in cover shall be free from plugs and burrs. The machined bearing surfaces of manhole frames and covers shall obtain even bearing cast wording "Storm Sewer." Thirty-two (32) inch manhole covers will be used on all manholes. The cover shall not rock when rotated to any position in the frame.

The minimum steel requirement in the walls and cone of a cast-in-place manhole will be one or two lines of steel, the total area per vertical foot shall be not less than 0.0025 times the inside diameter in inches. The steel requirement in the base section shall have a minimum area of 0.12 square inches per linear foot in both directions.

471.4 Manufacture. Precast concrete manholes shall be manufactured in accordance with ASTM C478, "Standard Specification for Precast Reinforced Concrete Manhole Sections."

471.5 Submittals

Product Data – For standard or special precast manholes, the Contractor shall submit the manufacturer's product data showing the dimensions,

location and size of steel reinforcement and certify that the manholes and all accessories meet or exceed the applicable requirements listed in this specification. The manufacturer shall certify that such products and all accessories meet ASTM specifications.

Shop Drawings

The Contractor shall submit shop drawings for special precast manholes for approval by the Engineer prior to fabrication of the units. These drawings shall show complete design installation including dimensions, steel reinforcement size/placement as well as supporting engineering design calculations.

471.6 Quality Assurance

Plant Testing

The Contractor shall notify the Engineer in advance of the date and plant location so that an independent testing laboratory can monitor the manufacturing of the units.

471.7 Installation. The Contractor shall prepare a hole large enough to accommodate the outside dimensions of the manhole. Prior to setting, the Contractor shall provide a base of 6 inch thickness cement stabilized sand, per Item 433, suitable to receive the manhole, unless otherwise shown on the drawings. The base material shall be compacted and graded level at proper elevation to receive the manhole in relation to the conduit grade. The cement stabilized sand shall be in accordance with the Item 433, "Cement Stabilized Sand Bedding and Backfill Material".

Sealants used between the joints of the manhole are to be as recommended by the precast manufacturer. If grout is used, it shall be a non-shrink grout. The grout shall be poured in a water soaked groove and filled to the top of the groove in the previously set section. Grade rings where used shall have ½" thick non-shrink grout coat inside and outside, or the grade rings shall be installed with non-shrink grout to provide a sealed grade ring area. Alternately, the grade rings may be sealed from outside with Infi-Shield Uniband or approved equal.

After the installation of the precast manhole sections to the proper elevation the cast iron manhole cover frame shall be set in a full mortar bed. Alternatively, the Contractor may set pre-cast manhole cover slab in full mortar bed and adjust to the required elevation. Unless otherwise shown on the drawings, the top of cast iron casting is to be flush with adjacent finished surface or to the elevation established by the Engineer.

The inverts of the sewer line or several sewer lines entering the manhole at or near the flow line elevation of the manhole shall be shaped and routed across the floor of the manhole using mortar to obtain the proper contour.

Where the main sewer (lowest line) passes straight through the manhole or the degrees of deflection of the main sewer is less than 5-degrees, and no other line or stub out is shown entering the manhole below the centerline of the main sewer, lay the sewer continuously through the manhole. After the pre-cast manhole sections have been installed above the top of the sewer, breakout and remove the top half of the barrel of the sewer pipe that was previously laid through the manhole. Use concrete with a 1-inch thick mortar topping and construct the invert as shown in the attached drawing.

Where the main sewer (lowest line) alignment deflects greater than 5-degrees at manhole or where another sewer or stub out enters at or below the centerline of the main sewer, terminate main sewer pipe, by laying it in such a manner that pipe ends flush at the inside of the manhole. Construct the invert with concrete and top with 1-inch of mortar. Shape invert for smooth flow across floor of manhole and slope the sides as shown to obtain proper contour.

When installing precast square or rectangular manhole structures, construct invert channels to provide smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Slope of invert bench shall be 1 inch per foot minimum, or 1-1/2 inches per foot maximum. The depth of bench to invert shall be one half of the largest pipe diameter.

Before inserting the pipe into the wall opening, apply non-shrink grout on the inside curvature of the wall centered at the bottom 25 percent of the wall opening of the manhole.

Use non-shrink grout (applied per manufacturers recommendations) to attain a water tight seal at the opening of the manhole wall with the pipe. For box culverts and arch-pipe (all non-circular applications) use non-shrink grout to ensure a water tight seal.

Stub outs shall be installed, where shown, to the lines and grades. Use one full joint of pipe, of the size indicated, for stub out. Seal stub out with plug. Install the plug in such a manner as to prevent seepage or leakage through stub outs. The plugs shall be installed so that they may be easily removed in the future, without damaging the end of the stub out. When inlet leads, lateral sewer pipe, stub outs and drop connections enter manholes, cut off ends of protruding pipe flush with inside of manhole wall. Point up any irregularities with mortar.

Backfill around manholes shall be placed immediately after mortar and concrete has set, and in accordance with the Construction Section of Specification Item 430, "Construction of Underground Utilities." Where proposed sewer lines connect to existing manholes at grade, reshape invert of existing manhole, so that no turbulence is created in the manhole as a result of the connection.

471.8 Submittal Required. All shipment shall include certification from the appropriate foundry. This certificate shall also state that all samples representing each lot have been tested, inspected, and have been found to meet the requirements of this specification and the applicable ASTM material specifications.

Submit certification from the manufacturer that the manhole has been tested and meets this specification requirements. Sealants used between the joints of the manhole are to be as recommended by the precast manufacturer, and approved by the Engineer.

471.9 Marking. Each individual casting shall be identified by the foundry showing the following:

- Name of producing foundry.
- AASHTO or ASTM number.
- Class by a number followed by a letter indicating the minimum tensile strength and size of test bar.
- Casting as required by the drawings.

471.10 Measurement. Manhole depths shall be measured by the linear foot of vertical distance from flow line of manhole to top of manhole casting and shall be classified per each manhole TYPE as follows:

1. Shallow manhole - a manhole with depth less than 5-feet.
2. Standard manhole – a manhole with depth equal to or greater than 5-feet and/or less than or equal to 10-feet.
3. Extra depth manhole – a manhole with a depth greater than 10-feet.

471.11 Payment. Payment for complete precast concrete manholes, as shown on the plans, will be made at the unit price bid per each TYPE of manhole at various depths, complete in-place. Payment, as provided, shall be full compensation for furnishing all reinforcing steel, concrete, jointing, rings and covers, cement stabilized sand, non-shrink grout, and all other materials, including bedding, tools, equipment, and incidentals required to complete the installation.

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 471