

SECTION 02430

MANHOLES

PART 1 - GENERAL

1.1 Description

- A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals necessary to provide all manholes shown, specified and otherwise required to complete the Work.
- B. General:
 - 1. Structures shall conform in shape, size, dimensions, material, and other respects to the details shown on the Contract Drawings.
 - 2. Pipe penetrations, inverts, shall conform to the details shown on the Contract Drawings. Side inverts shall be curved and main inverts, where direction changes, shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipelines.
- C. Related Work Specified Elsewhere:
 - 1. Section 02200, Earthwork.
 - 2. Section 03200, Reinforcing Steel.
 - 3. Section 03300, Cast-In-Place Concrete.

1.2 Quality Assurance

- A. General:
 - 1. The Contractor must give the Engineer twenty-four hour's written notice plus travel time prior to the commencement of any manufacturing process or testing sequence for manhole components made of precast concrete.
 - 2. At the place of manufacture of precast concrete components the Engineer reserves the right at all times:
 - a. To inspect the materials, the processes of manufacture, and the records of analysis and tests.
 - b. To select test specimens.
 - c. To inspect and test manhole components, accessories and joint material.
 - d. To inspect and test cast-in-place concrete.
 - 3. Upon delivery to the site the Engineer reserves the right to inspect and test:
 - a. Manhole components, accessories and joint material.
 - b. Cast-in-place concrete.
 - 4. All manhole components made of precast concrete delivered to the site shall be clearly marked at the factory with the date of manufacture and the manufacturer's identification. Omission of this information may be cause for rejection of the manhole components.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
 - 1. ASTM C 32, Sewer and Manhole Brick (made from Clay or Shale).
 - 2. ASTM C 139, Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - 3. ASTM C 140, Sampling and Testing Concrete Masonry Units.
 - 4. ASTM C 207, Hydrated Lime for Masonry Purposes.
 - 5. ASTM C 478, Precast Reinforced Concrete Manhole

Sections.

- 6. ASTM C 923, Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
 - 7. ASTM D 543, Test for Resistance of Plastics to Chemical Reagents.
 - 8. ASTM D 1248, Specification for Polyethylene Plastics Molding and Extrusion Materials.
- C. Manufacturer's Testing:
 - 1. Tests on reinforced concrete manhole components shall be in accordance with the "Physical Requirements" section of ASTM C 478.
 - 2. The Contractor shall ensure that the manufacturer furnishing manholes under these Specifications shall be fully equipped with testing facilities of the approved type and capacity. The Contractor shall furnish the required number of specimens of manhole components at no additional cost to the Owner.
 - 3. Absorption Test:
 - a. For every 100 manhole bases and manhole riser sections manufactured, one specimen shall be selected for an absorption test. As a minimum, one specimen representing a manhole base and manhole riser section shall be tested. The absorption test shall be performed in accordance with the requirements of ASTM C 478.
 - b. In the event any specimen fails to meet any of the requirements of the absorption test, then two additional test specimens shall be selected for each specimen that failed, from the lot represented by the specimen that failed. The additional specimens shall be tested; and should any one of these fail to meet the requirements specified, the entire lot represented by these tests shall be rejected.
 - 4. Compression Test:
 - a. For each of the four manhole components made of precast and cast-in-place concrete (manhole base, manhole riser section, transition slab and top slab) compression tests shall be made on standard rodded concrete cylinders. A minimum of four concrete cylinders shall be molded for each day's production of a particular manhole component. Each cylinder representing a particular manhole component shall be molded from the same concrete batch utilized for the manufacture of the component. The concrete cylinders shall be tested in accordance with the specifications of ASTM C 478 except for the required strengths of the cylinders, which shall be as follows: The strength of precast concrete shall be considered satisfactory if both of the following requirements are met:
 - 1) The average at 28 days of three consecutive strength tests equals or exceeds 4000 psi.
 - 2) No individual strength test falls below required strength by more than five hundred psi.
 - b. In the event a concrete cylinder's compressive strength is unsatisfactory the manufacturer shall select one of the following two options:
 - 1) The entire day's production of the manhole component represented by the test cylinder

shall be rejected.

- 2) The manufacturer shall have the option to drill two cores from manhole components represented by the unsatisfactory test cylinder and perform compression tests on the cores. The manhole component sampled shall be selected by the Engineer. Should the compression tests on these core samples meet the strength requirements as specified in this Section, the Engineer shall determine the acceptability of all manhole components represented by the test, considering the results of the tests on the concrete cylinders as well. Based on the Engineer's evaluation, if the compression test for the cores is determined to be unacceptable the entire day's production of the manhole component represented by the core sample shall be rejected. The Engineer's decision shall be considered final.

5. Top and Transition Slabs:

- a. In lieu of a proof of design test for the top and transition slabs the Contractor shall submit in the Shop Drawings top slab and transition slab design calculations and Drawings for approval by the Engineer.
- b. The design calculations shall be in accordance with requirements specified in this Section.

1.3 Submittals

- A. Submit for approval samples of brick and all accessories required for the manholes.
- B. For all manholes submit Shop Drawings for approval. Shop Drawings shall include, but not be limited to, the following information:
 1. Size and spacing of steel reinforcement.
 2. Wall and slab thicknesses.
 3. Concrete cover over steel reinforcement.
 4. Joint design between component manhole sections, show all dimensions.
 5. Concrete mix design including design compressive strength.
 6. Design of flexible manhole seal assemblies and/or specified seal arrangement
 7. Final grade elevation at manhole.
 8. All pipe penetrations into manhole.
 9. Plan of manhole base invert.
 10. Certificates of compliance with referenced standards.
 11. Certified test results.

1.4 Product Delivery, Storage and Handling

- A. Manhole components shall not be shipped until the 28 day strength is reached.
- B. Handle all manhole components carefully with approved handling devices. Manhole components shall be kept completely free from dirt and foreign matter.
- C. Manhole components with damaged "O" ring or sealing grooves will not be approved.
- D. Contractor shall clearly mark and immediately remove all damaged manhole components.
- E. Certified copies of all test results shall accompany each manhole component shipment and shall be furnished to the ENGINEER with each shipment.

PART 2 - PRODUCTS

2.1 General

- A. Manholes shall conform to the details shown. All concrete manhole bases, transition slabs, riser sections and top slabs shall be precast, unless otherwise approved.
- B. Except where otherwise specified manhole components shall conform to ASTM C 478.
- C. Mark date of manufacture and name or trademark of manufacturer on all precast concrete items.
- D. Unless shown otherwise on the Drawings, joints for all precast concrete manhole components shall be of the bell and spigot type with a round "O" ring rubber gasket meeting the requirement of ASTM C443, or a preformed plastic sealing compound as specified in the Federal Specifications SS-S-210A. Joints shall be formed so that adjacent manhole sections will fit and seal properly.
- E. All lifting holes shall be sealed tight with a solid rubber plug driven into the holes and the remaining void filled with 1 to 2 cement-sand mortar.

2.2 Castings

- A. General: All manhole frames and covers (standard and oversize) unless otherwise shown or required, shall be locking type and watertight. All manhole frames shall be of the non-adjustable type, with frames suitable for installation over manholes.
 1. Material: Cast iron conforming to ASTM A48, Class 30.
 2. Size: As shown on the Drawings suitable for slab type penetrations or manholes as required and specified.
 3. Construction: All manhole castings shall be heavy duty watertight nonadjustable consisting of frame and cover. Bearing surfaces between frame and cover shall be machined, fitted together, and match marked to prevent rocking. Gasket shall be 1/4" minimum neoprene. Casting cover shall include the Owners Name, as directed by the Engineer.
 4. Product and Manufacturer: Manhole frames and covers shall be as manufactured by:
 - a. Campbell Foundry.
 - b. LeBaron Foundry Company.
 - c. Or equal.
- B. Terminal or Flush Manholes: Manhole covers equipped with vent holes shall be installed on all terminal or flush type manholes (not applicable).
- C. Oversize Manhole Frame and Cover: Oversized manhole frames and covers, as shown on the Drawings, shall be furnished and installed on all manholes.

2.3 Concrete

- A. Concrete shall conform to the requirements of Section 03300, Cast-In-Place Concrete.

2.4 Brick Masonry

- A. Brick: All brick used as specified under this Section shall meet the requirements stated in ASTM C32.
- B. Mortar and Plaster: All mortar and plaster required to complete brick masonry as shown on the Drawings or as specified herein shall be in conformance with ASTM C150 Type II.

2.5 Steel Reinforcement

- A. Steel reinforcement shall be placed in all concrete manhole components as shown on the Drawings and as specified herein. The reinforcing shown on the Drawings is the minimum amount required. All steel reinforcement shall meet the requirements specified in Section 03200, Reinforcing Steel.

2.6 Top Slabs and Transition Slabs

- A. Each top slab placed on the top of the manhole riser sections shall be manufactured in accordance with the Drawings and as specified herein.
- B. Concrete slab thicknesses shall not be less than the dimensions shown on the Drawings.
- C. Each top slab and transition slab shall be of acceptable design and of sufficient strength to safely support an AASHTO H-20 loading.

2.7 Manhole Bases and Manhole Riser Sections

- A. The minimum diameter or size for each manhole base shall be as shown on the Drawings.
- B. Manhole base sections minimum slab and wall thicknesses shall be as shown on the Drawings.
- C. Manhole base sections slotted to fit over existing sewer pipes shall be installed on cast-in-place base slab as shown on Drawings.
- D. Manhole bases shall be cast monolithically to at least 12 inches above the top of the highest pipe entering the manhole.
- E. Manhole riser sections shall have a minimum wall thickness of 6 inches and the same internal diameter as the manhole base (unless otherwise shown).
- F. Manhole riser sections shall be constructed of various lengths to provide the correct height with the fewest joints. No pipe penetrations shall be located at a joint.

2.8 Pipe Connections

- A. Each manhole base shall be provided with circular or slotted openings at the required locations and elevations for the proper connection of all pipes. The circular pipe connections shall be sealed with a flexible modular seal assembly; slotted openings shall be sealed with nonshrink grout.
- B. The flexible modular seal assembly shall be installed in accordance with the recommendations of the seal assembly manufacturer. Flexible modular seal assemblies shall maintain a watertight connection. The flexible modular seal assembly shall be manufactured by:
 - 1. Kop-N-Seal (Dukor Co., Milford, N.H.)
 - 2. Or equal.
- C. When a nonshrink grout is used to seal the pipe connection, the concrete bonding agent and nonshrink grout used to seal the pipe connections in the slotted manhole base section openings shall be in accordance with Section 03300.
- D. The existing pipe within the slotted manhole base shall be saw cut and removed as shown on the Drawings after grouting the pipe penetrations into the manhole base section.

PART 3 - EXECUTION

3.1 Preparation

- A. Excavation: All excavation required for the construction of manholes shall be performed as specified in Section 02200, Earthwork.
- B. Shoring: Shoring of all excavations shall be provided as specified in Section 02200, Earthwork.
- C. Dewatering: Dewatering shall be performed as specified.

3.2 Installation

- A. No manhole components shall be installed prior to the acceptance of all test results by the Engineer.
- B. Manhole Bases, Base slab for slotted manhole Base Section: During excavation the soil below each base shall not be disturbed. Over-excavated areas shall be backfilled with crushed stone and compacted as specified in Section 02200, Earthwork. Manhole bases and base slab shall be checked for proper bearing on the subgrade and proper elevation. Orientation of manhole bases shall be set to receive the incoming and outgoing pipes at the designated elevations. Special care shall be taken in placing concrete supports around the bottom of the pipes in manhole bases to obtain a waterproof structure.
- C. Manhole Riser Sections:
 - 1. Set sections vertical with sections in true alignment.
 - 2. Install sections, joints and gaskets in accordance with manufacturers' recommendations.
- D. Joints:
 - 1. Joints between manhole components shall be made with the materials specified in Paragraph 2.1.D. of this Section.
 - 2. Gaps between sections shall not exceed 3/8-inch.
- E. Manhole Watertightness: All manholes shall be free of visible leakage. Exfiltration/infiltration testing shall be performed for each manhole installed as specified with the pipe testing. Each manhole shall be periodically inspected for leaks, and all leaks shall be repaired in a manner subject to the Engineer's approval.
- F. Brick Masonry:
 - 1. Brick masonry may be utilized to close up openings in manhole walls where existing pipes have been removed during construction. Installation of bricked up openings shall not interrupt maintenance of sewage flow.
 - 2. Brick shall be satisfactorily wet when being laid and each brick shall be laid in mortar so as to form full bed, end and side joints in one operation. The joints shall not be wider than 3/8-inch.
 - 3. Following the placement of the brickwork, a one half inch layer of cement mortar shall be applied to the exterior surface of the brick and troweled to a smooth finish.
- G. Covers for Manholes: Installation shall be as shown on the Contract Drawings.