SECTION 33 05 13

MANHOLES AND STRUCTURES

PART 1  GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manholes for water, storm drain and sanitary sewer systems.

B. Related Sections:
   1. Section 03 20 00 - Concrete Reinforcement.
   2. Section 03 30 00 - Cast-in-Place Concrete.
   3. Section 05 05 55 - Tamper-Proof Metal Fastenings.
   4. Section 05 50 00 - Metal Fabrications.
   5. Section 31 20 00 - Earth Moving.
   6. Section 31 23 33 - Trenching and Backfill.
   7. Section 33 41 00 - Storm Utility Drainage Piping.

1.2 REFERENCES

A. ASTM C478-09 Precast Reinforced Concrete Manhole Sections.
B. ASTM C387-10 Packaged, Dry, Combined Materials for Mortar and Concrete.
C. ASTM C14-07 Concrete Sewer, Storm Drain, and Culvert Pipe.
E. ASTM A193-10a Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service or High-Pressure Service and Other Special Purpose Applications.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00 and 01 33 23.
B. Submit details for all precast concrete units.
C. Submit data on products and materials specified.

PART 2  PRODUCTS

2.1 MANHOLES
A. The base of all manholes shall be either cast-in-place concrete or precast concrete, except for manholes housing air and vacuum release valve assemblies.
   1. Precast concrete bases shall have the base slab integral with the sidewalls. The base slab shall be 8 inches minimum thickness with No. 4 reinforcement steel bars at 8 inches on centers each way in the center of the slab. The base reinforcement steel shall be tied to the wall steel.
   2. Bases for manholes housing air and vacuum release valve assemblies shall consist of a drain gravel base and precast or cast-in-place concrete ring foundation.

B. Precast manhole sections conforming to ASTM C478 shall be 48-inch, 60-inch, 72-inch, or 84-inch internal diameter with 5-inch minimum walls or as otherwise shown for special purposes. The top and bottom of all sections shall be parallel.

C. Eccentric cones shall be provided for all manholes except as otherwise shown on the Contract Documents. Cones shall have the same wall thickness and reinforcement as the precast manhole section.

D. Manhole grade rings for extensions shall be a maximum 6 inches high. Extensions will be limited to 15 inches. Finish grade for solid covers shall be 1/2 inch below flush in concrete or asphalt concrete paved areas, and 6 inches above finish grade in unpaved areas, except flush where gated covers are specified. Grade rings shall have anchor bolt holes for bolt-down frames and covers.

E. Factory Testing: Prior to delivery of any precast manhole section, yard tests shall be conducted at the point of manufacture. Precast sections to be tested shall be selected at random from stockpiled material to be supplied for the job. All test specimens shall be mat tested, and shall meet the permeability test requirements of ASTM C14.

F. Joints of manhole sections shall be tongue-and-groove type sealed with either mortar or preformed plastic joint material.
   1. Mortar: Standard premixed mortar conforming to ASTM C387 or proportion one part portland cement to two parts clean, well-graded sand which will pass a 1/8-inch screen. Admixtures may be used not exceeding the following percentages of weight of cement: Hydrated lime, 10 percent; diatomaceous earth or other inert materials, 5 percent. Consistency of mortar shall be such that it will readily adhere to the manhole section if using the standard tongue-and-groove type joint. Mortar mixed for longer than 30 minutes shall not be used.
   2. Preformed Plastic Gaskets: Preformed plastic gaskets may be used in lieu of mortar type joints and shall be Kent-Seal No. 2 manufactured by Hamilton Kent Manufacturing Company, Box 178, Kent, OH 44240; Ram-Nek, manufactured by K. T. Snyder Company, Inc., Central National Bank Building, Houston, TX 77002; or [,] meeting all requirements of Federal Specification SS-S-00210.

G. Pipe connections to manholes shall be as specified by the pipe manufacturer. Inlet and outlet pipes shall extend through the walls of the structures for a sufficient distance beyond the outside surface to allow for connections, but shall be cut off flush with the wall on the inside surface. For concrete structures, the mortar shall be placed around these pipes so as to form a tight, neat connection.
H. Manhole steps shall be provided when manhole depth exceeds 30 inches. Manhole steps shall be copolymer polypropylene encapsulated 1/2-inch diameter Grade 60 steel rod steps. There shall be a 3-inch minimum embedment in precast concrete manhole sections and 4-1/2 inch minimum projection from the face of concrete at point of embedment. The installed steps shall be located so as to provide a continuous ladder with steps equally spaced vertically in the assembled manhole at 12 inches, plus or minus 3/4 inch. They shall be capable of withstanding a force of 350 pounds, applied at any place on the step and in any direction which projects from the point of application through a diameter of the step cross-section at that point, with no permanent deformation resulting. Steps may be cast in manhole sections by the manufacturer.

I. Manhole frames and covers shall be cast iron as detailed on the Contract Documents. Covers shall have the word “STORM DRAIN”, or “SANITARY SEWER”, or “WATER”, in 2-inch raised letters. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and all defects, and shall conform to ASTM A48, Class 30B. Plane or grind bearing surfaces to ensure flat, true surfaces. Covers shall be true and seat within ring at all points.

1. Bolt-down covers shall be used on all manholes within the double perimeter security fence and shall have either six 3/8-inch or four 1/2-inch diameter by 1-1/2 inch long capscrews with washers. Capscrews and washers shall be Type 316 stainless steel conforming to ASTM A193 and the requirements for Removable Screws in accordance with Section 05 05 55. Countersink bolt holes in cover so that the top of the capscrews are below the top plane of the cover. Bolt hole sizes shall be compatible with size of security capscrews used. Frames for bolt-down covers shall be supplied with four 3/4-inch diameter Type 316 stainless steel anchor bolts, nuts, and washer as detailed on the Contract Documents.

2. Nominal inside opening of the frame shall be 24 inches. Provide a blind pick hole or lifting lug in the cover. Do not provide lifting rings or vent holes in covers unless specifically required.


J. Fabricated Outlet Grill: ASTM A193 stainless steel, Grade 304, in manhole or inlet, as per details shown on the Contract Documents.

2.2 INLETS

A. At the option of the Contractor, approved precast units or cast-in-place units may be used. Submit details of proposed precast units for review. Precast concrete risers for extensions shall be a maximum of 6 inches high and of the same quality as the sections.

B. Grated inlets shall be fabricated of galvanized steel. Conform to Section 05 50 00. Grated inlets within the double perimeter fence shall be bolted down with ½-inch diameter removable anchor bolts conforming to Section 05 05 55. Anchor bolts, nuts, and washers shall be Type 304 stainless steel conforming to ASTM A193.
C. In each catch basin or drop inlet exceeding 30 inches deep, install steps so as to provide a continuous ladder with steps equally spaced vertically every 12 inches.

D. CMP risers shall be 12-gauge (0.109 inch minimum) galvanized corrugated steel pipe conforming to the requirements of AASHTO M36. Fabricate in accordance with Section 05 50 00.

E. Conform to the requirements of Paragraph 2.1, MANHOLES, for steps, mortar, and pipe connections.

2.3 CLEANOUTS

A. Frames and Grates: Cast iron. Castings shall be close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and all defects, and shall conform to ASTM A48, Class 30B. Plane or grind bearing surfaces to ensure flat, true surfaces. Covers shall be true and seat within frame at all points. Cleanout frames and covers shall be Pinkerton Foundry No. A-469, D&L Supply No. H-8024, or approved equal. All cleanout frames and covers within the double security fence shall be provided with either three 3/8-inch or two 1/2-inch stainless steel pentagonal head security capscrews and washers. Countersink bolt holes in cover so that the top of the capscrews are below the top plane of the cover. Bolt hole sizes shall be compatible with the size of security capscrew used.

2.4 PRECAST CONCRETE BOX

A. Precast Concrete Boxes for Blow-Off Assemblies: The box shall consist of a precast concrete top section, precast concrete extension sections as required, and a cast iron bolt-down cover. The cover shall have the word “WATER” in 2-inch raised letters. The complete box assembly shall be capable of safely supporting H-20 traffic loads. All exposed steel shall be hot-dip galvanized. Bolt-down screws shall be security-head Type 3 stainless steel. Attach covers with six 3/8” or four 1/2” diameter by 1-1/2” long capscrews. Precast concrete boxes and covers shall be equivalent to N9 Electrical Box as manufactured by Christy Concrete Products, Inc., Brooks Products, Inc., or an approved equal.

PART 3 EXECUTION

3.1 MANHOLES

A. Remove water from excavation.

B. Concrete Base: Vibrate to densify poured in-place concrete and screed so that the first precast manhole section to be placed has a level, uniform bearing for the full circumference.

C. Deposit sufficient mortar on base to assure watertight seal between base and manhole wall or place the first precast section of manhole in concrete base before concrete has set. First section shall be properly located and plumb. Carefully inspect precast manhole sections to be joined. Sections with chips or cracks in the tongue shall not be used. Clean ends of sections before assembly. Align manhole steps vertically.
1. Joints with preformed plastic gaskets shall be installed in strict conformance with the manufacturer’s recommendations. Only pipe primer furnished by the gasket manufacturer will be approved.

2. For mortar joints, thoroughly wet joint with water prior to placing mortar. Place mortar on groove of lower section. Set next section in place. Fill joint completely with mortar of the proper consistency. Trowel interior and exterior surfaces smooth on standard tongue-and-groove joints. Prevent mortar from drying out, and cure by applying an approved curing compound or comparable approved method. Chip out and replace all cracked or defective mortar.

D. Construct manhole inverts with smooth transitions to ensure an unobstructed flow through manhole. Remove all sharp edges or rough sections which tend to obstruct flow. Do not lay pipe through manholes. Trowel all mortar surfaces smooth.

E. For sanitary sewer manholes, the manhole base shall be formed with flow channels. Refer to the Contract Documents for inverts of pipes into the manholes to determine channel layouts. Channels may be formed using a continuous piece of PVC plastic pipe. No bends or wyes shall be used. Channel bottom shall not be formed using VCP.

F. For sanitary sewer drop manholes, construct drop assemblies inside of manholes and at locations indicated. The lower pipe elbow shall be supported by concrete poured monolithically with the manhole base. Attach the riser to the inside of the manhole as shown on the Contract Documents. Install drop assemblies whenever the drop through a manhole is 2 feet or greater.

G. Install frames and covers. Frames shall be set in a bed of mortar with the mortar carried over the flange of the ring. Install bolt-down manholes as shown or as recommended by manufacturer. Provide a minimum of one 6-inch high grade ring under the frame and cover. Extend anchor bolts through the grade ring to the frame. Hook the anchor bolt under the grade ring.

H. Up to 20 percent, but in no case less than 10 percent of the total project manholes shall be hydrostatically tested. Plug all inlets and outlets and fill the manhole with water to a height determined by the CDCR Representative. Leakage in each manhole shall not exceed 0.1 gallon per hour per foot of head above the invert. A manhole may be filled 24 hours prior to time of testing to permit normal absorption into the pipe walls. Repair all manholes that do not meet the leakage test. If more than 25 percent of the manholes tested fail the hydrostatic test, the contractor will be required to test all or as many manholes as the CDCR Representative may deem necessary.

3.2 CATCH BASINS AND INLETS

A. If material in bottom of trench is unsuitable for supporting unit, excavate and backfill to required grade with acceptable fill material as specified in Sections 31 23 33. Refer to Section 31 23 33 for acceptable fill requirements. Set units to grade at locations shown on Contract Documents.
B. Install extensions as required. Lay risers in mortar with sides plumb and tops to grade. Joints shall be sealed with mortar with interior and exterior troweled smooth. Prevent mortar from drying out and cure by applying a curing compound. Extensions shall be watertight.

C. Set frames and grates at elevations indicated or as determined in the field and in accordance with the Contract Documents. Frames shall be cast-in.

3.3 CLEANOUTS AND VAULTS

A. Construct in accordance with details as shown on the Contract Documents.

3.4 CLEANING

A. Construction debris and other foreign matter shall be removed to the satisfaction of the CDCR Representative.

END OF SECTION