

**SECTION 03461  
PRECAST CONCRETE MANHOLES**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

This section includes materials, testing, and installation of precast concrete manholes for sewers or for access to below grade water mains and appurtenances.

**1.02 REFERENCE STANDARDS**

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM A 48 - Gray Iron Castings  
ASTM C 478 - Precast Reinforced Concrete Manhole Sections  
ASTM C 478M - Precast Reinforced Concrete Manhole Sections [Metric]  
ASTM C 923 - Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals

**1.03 RELATED WORK SPECIFIED ELSEWHERE**

Standard Drawings S-1, S-4, S-5, S-7, S-9, S-17

Standard Specifications 01000, 02223, 03000, 09910, 15000, 15061, and 15065

**1.04 ACCESS MANHOLES FOR WATERMAINS AND APPURTENANCES**

- A. (60") diameter manholes shall be used, unless otherwise noted on the approved plans, to access water main appurtenances.
- B. A variety of manhole diameters and configurations may be utilized on various water main appurtenances and devices in accordance with the Standard Drawings and as directed by the District Engineer.

**1.05 SEWER MANHOLES**

(48") diameter manholes shall be used for sewer application where rim elevation to downstream elevation is less than 12ft. (60") diameter manholes shall be used for sewer applications where rim elevation to downstream elevation is greater than 12ft.

**1.06 DROP MANHOLES**

(60") diameter drop manholes shall be used for sewer applications and constructed only at locations shown on the approved plans.

**1.07 CORROSION PROTECTION**

A corrosion protection lining and/or coating as described in this specification shall be applied to the interior of manholes for sewer mains (18") or larger.

#### **1.08 WATERPROOFING**

A waterproof coating shall be applied to all exterior portions of manholes in accordance with Districts Standards, Specifications, Approved Material List or as directed by the District Engineer.

#### **1.09 JOINT SEALING**

Joint sealant 2 – 2" x 2" butyl rubber gasket (TYP) shall be used to form a continuous watertight seal on the concrete base and between successive precast concrete manhole or vault sections.

#### **1.10 VACUUM TESTING OF MANHOLES**

Vacuum testing of manholes is intended for testing precast concrete manhole and cast-in-place sections to demonstrate the integrity of the installed materials and construction procedures. Vacuum testing shall be in accordance with the Districts Standards and Specifications or as noted on the approved plans.

### **PART 2 MATERIALS**

#### **2.01 MANHOLES**

- A. Precast components and other appurtenant materials shall be selected from the Approved Materials List.
- B. Precast concrete manhole components shall be in accordance with ASTM C 478 and the Standard Drawings.
- C. Manhole components shall be designed for H-20 highway wheel loading and specific site conditions.
- D. Manhole bases may be either precast or cast-in-place, as appropriate for the application, with a formed recess shaped to match the first precast shaft section. The manhole base shall extend (12") below the bottom of the lowest pipe and (6") above the top of the largest pipe.
- E. Manhole shafts shall be fabricated only from precast shaft sections, eccentric cone sections and grade rings.
- F. Pipe penetrations for sewer applications shall incorporate a watertight flexible pipe connector or ring-type seal according to the method of manhole construction as shown in the Standard Drawings. Precast manholes shall utilize either an integrally cast embedded pipe connector, or a boot-type connector installed in a circular block out opening in accordance with ASTM C 923.

Connections to existing manholes shall utilize a boot-type connector or per ASTM C 923 installed in a cored opening. Cast-in-place bases shall incorporate a ring-type seal on the pipe to be embedded in the concrete per the Districts Standards and Specifications.

## **2.02 CRUSHED ROCK BASE AND BACKFILL MATERIALS**

Crushed rock base and backfill materials shall be in accordance with Section 02223.

## **2.03 MANHOLE FRAMES ANDCOVERS**

- A. Manhole frames shall be (36") in diameter with two concentric covers, made of cast-iron in accordance with ASTM A 48 Class 30, the Standard Drawings and the Approved Materials List. Covers shall incorporate a "pic-hole" for lifting purposes.
  - 1. Locking frames and covers, in accordance with the Standard Drawings, are required in areas located outside of the public right of way, in remote areas or when determined by the District Engineer.
- B. Frames and covers shall be designed for H-20 highway wheel loading.
- C. Covers shall be cast with the District's name and the words "WATER", "RECYCLED WATER" or "SEWER" as appropriate to the application. No other lettering will be permitted on the top portion of the cover.
- D. Castings shall be smooth, clean, and free from blisters, blowholes, and shrinkage. Mating surfaces of the frame and cover shall be machined to prevent movement of the lid. Frames and covers shall be match marked in sets before shipping to the site.
- E. All castings shall be dipped twice in a preparation of asphalt or coal tar and oil applied at a temperature of not less than 143.3 degrees C (290 degrees F) nor more than 154.4 degrees C (310 degrees F) and in such a manner as to form a firm and tenacious coating.

## **2.04 CONCRETE**

Concrete used for manholes and appurtenances shall be in accordance with Section 03000.

## **2.05 JOINT SEALING COMPOUND**

Joint sealing compound shall be a mastic-type material in a flexible rope or rolled form with removable wrapper sized to fit into the key of manhole or vault sections. Joint sealing compound shall be selected from the Approved Materials List. Exterior joints shall be wrapped with 6" minimum in width butyl wrap.

## **2.06 REPAIR MORTAR AND EPOXY BONDING AGENT**

Repair mortar and an epoxy bonding agent shall be used to repair minor surface damage to precast sections or cast-in-place manhole bases at the discretion of the District Engineer. Repair products shall be in accordance with Section 03300.

## **2.07 MORTAR**

Mortar for use on joints between precast sections and for setting manhole cover frames shall be in accordance with Section 03300.

## **2.08 WATERPROOFING**

Waterproofing material shall be in accordance with Approved Material List.

# **PART 3 EXECUTION**

## **3.01 WORK WITHIN EXISTING MANHOLES**

Contractor shall comply with all Federal and State regulations for confined space entry. Work inside confined spaces, as defined by the applicable regulations, shall not be undertaken until all the tests and safety provisions of the Code of Federal Regulations 1910.146, and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5159, for confined space entry have been performed and the area is verified as safe to enter. District policy prohibits entry into any confined space with Immediately Dangerous to Life and Health (IDLH) conditions except by trained emergency rescue personnel.

## **3.02 EARTHWORK**

Manhole excavation, foundation stabilization (if necessary), placement of base material, backfill and compaction shall be performed in accordance with Section 02223.

## **3.03 MANHOLE BASE**

- A. The invert of precast and cast-in-place bases shall be hand-worked to provide channels conforming in size to the inside diameter of the piping as indicated on the Approved Plans. The channels shall vary uniformly in size and shape from inlet to outlet. The concrete base shall be shaped with a wood float and shall receive a hard steel trowel finish before the concrete sets. A template shall be used to accurately form the level surface that will receive the first precast section.
- B. During construction of cast-in-place bases, all sewer mains and stub piping shall be in place, including ring-type seals, before concrete placement. Pipe grade and alignment shall be verified immediately upon placement of concrete to assure that the pipelines are in proper position prior to the concrete taking an initial set. The invert elevation and flow line of piping shall be as shown on the

Approved Plans and Standard Drawings. The manhole base shall extend (12") below the bottom of the lowest pipe and (6") above the top of the largest pipe. After completion of cast-in-place base, all residual concrete that entered the piping during placement will need to be removed prior to setting of riser shafting.

- C. Cast-in-place bases shall set a minimum of 24 hours before the manhole construction is continued. In certain critical situations, the setting time may be reduced upon approval of the District Engineer.

### 3.04 INSTALLING MANHOLE SECTIONS

- A. The concrete manhole base and successive precast sections will receive a mastic joint sealing compound prior to setting the precast sections in place as shown on the Standard Drawings. Following the vacuum testing as described in this section, all interior joints will be mortared and tooled to a smooth finish, free of voids. All exterior joints will receive a butyl wrap (6" TYP). Note that sewer manholes are to be vacuum tested following assembly of the concrete sections, but prior to mortaring the joints, or backfilling.
- B. Assemble the precast sections to the elevation required by the location of the manhole in accordance with the Standard Drawings and as follows:
  - 1. Paved Areas: Top of cover shall be flush with the finished paving surface.
  - 2. Traveled Way: Top of cover shall be flush with the existing surface where it is in a traveled way.
  - 3. Shoulder Areas: Top of cover shall be (1") above the existing surface where outside the limits of a traveled way. Vaults shall not be placed in roadside ditches without the prior approval of the District Engineer.
  - 4. Unpaved easements: Top of cover shall be (12") above the ground surface. Guard Posts around the vault may be required in this area as directed by the District Engineer.
- C. Secure the manhole frame to the grade ring with mortar in accordance with the Standard Drawings.
  - 1. Locking manholes shall have covers locked to the frame. The frame shall be attached to the top precast section by drilling four (4) 316 stainless steel, all- thread anchor bolts set in epoxy in addition to the mortar collar around the frame in accordance with the Standard Drawings.
- D. After the frame is securely set the cover shall be installed. All necessary cleaning of foreign materials from the frames and covers shall be accomplished

to ensure a satisfactory fit.

- E. Where manholes are to be given a protective coating, they shall be free of seepage and surface moisture.
- F. Piping installation adjacent to the manhole and connection to the base or shaft sections shall be performed as shown on the Standard Drawings and Approved Plans. Piping installation into flexible pipe connectors shall be in accordance with the manufacturer's recommendations for assembly, lubricants and limits of deflection.
- G. In order to prevent accidental use of the new sewer before completion and acceptance, the new inlet to existing tie-in manhole(s) and the outlet of the first new upstream manhole(s) shall be sealed with expandable plugs. The District Engineer shall approve the specific location of these plugs. Plugs shall be removed at the time of final inspection or as directed by the District Engineer. Removal of all construction debris and water shall be completed prior to removal of plugs.
- H. Brick or mortar bulkheads shall be installed by the Contractor at the manhole end of all unused stub channels over (36") beyond manhole base. The bulkheads are intended to prevent ponding of sewage and debris in the unused channels until such time as the manhole stub is connected and normal sewage flow can occur.
- I. New connections to existing manholes, where stubs have not been provided, shall be made by core drilling through the walls or base as directed by the District Engineer. Flexible seals selected from the Approved Materials List and installed in accordance with the Standard Drawings shall be used for the pipe penetration. Apply a protective epoxy coating to the cored concrete and the ends of any reinforcing steel exposed in accordance with Section 03300.
- J. A concrete ring shall be cast around manhole frames within paved and traveled areas in accordance with the Standard Drawings.
- K. Replacement of asphalt or concrete pavement shall be in accordance with the requirements of the agency having jurisdiction.

### **3.05 WATERPROOFING**

Waterproofing material shall be applied to the exterior surfaces of manholes in accordance with the manufacturer's recommendations. The material shall be applied to all exterior surfaces or as directed by the District Engineer.

### **3.06 VACUUM TESTING OF MANHOLES**

- A. Vacuum testing of manholes for water main appurtenances and sewer manholes is required and shall be performed as directed in the presence of the District Engineer.

- B. Vacuum testing equipment shall be as manufactured by P.A. Glazier, Inc. or equal.
- C. Manholes shall be tested after assembly and prior to mortaring the joints or backfilling.
- D. All lift holes shall be plugged with an approved grout prior to testing.
- E. All pipes entering the manhole shall be plugged, and bracing installed, to prevent the plug from being drawn into the manhole.
- F. The test head shall be placed inside the top or on top of the cone section and the seal inflated in accordance with the manufacturer's recommendations.
- G. A vacuum of 10psi shall be drawn. The manhole shall pass the test if the drop is no greater than 9psi after 75 seconds.
- H. If the manhole fails the test, necessary repairs shall be made and the test repeated until acceptable results are obtained. The leak(s) shall be located and repaired according to their nature with material-in-kind.

### **3.07 HOLIDAY TESTING OF PVC-LINED MANHOLES**

**END OF SECTION 03461**