# STANDARD SPECIFICATION SECTION 03461 PRECAST CONCRETE MANHOLES

## PART 1 - GENERAL

#### 1.01 DESCRIPTION

This section includes materials, installation, and testing of precast circular concrete manholes for sewers.

## 1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Standard Drawings.
- B. Record Drawings and Submittals: STD SPEC 01300.
- C. Earthwork: STD SPEC 02200.
- D. Trenching, Backfilling, and Compacting: STD SPEC 02233.
- E. General Concrete Construction: STD SPEC 03000.
- F. Plastic Sheet Liner: STD SPEC 09850.

#### 1.03 SUSBMITTALS

- A. Submit submittal packages in accordance with Standard Specifications Section 01300.
- B. Submit manufacturer's catalog data on precast concrete manholes, frames, and covers. Show dimensions and materials of construction by ASTM reference and grade. Show lettering on manhole covers.
- 1.04 SEWER MANHOLES
  - A. Use 48-inch diameter manholes for sewer pipe 15 inches in diameter and smaller.
  - B. Use 60-inch diameter manholes for sewer pipe 18 inches in diameter and larger.

#### 1.05 DROP MANHOLES

Use 60-inch diameter drop manholes for sewer applications and construct only at locations shown on the Drawings.

#### 1.06 CORROSION PROTECTION

Use corrosion protection lining and/or coating on the interior of manholes for sewer mains 18-inches or larger, and on all drop manholes regardless of sewer pipe size.

### 1.07 WATERPROOFING

Use waterproofing on the exterior portions of manholes when located at or below the water table, when moisture or seepage occurs, or as directed by the District's Representative.

#### 1.08 JOINT SEALING

Use joint sealant to form a continuous watertight seal on the concrete base and between successive precast concrete manhole sections.

#### 1.09 SAFETY GRATING

Use safety grating above the drain channels in manholes and drop manholes for sewer mains 18-inches and larger. Safety grating shall be installed only in locations shown on the Drawings or as directed by the District's Representative.

# 1.10 VACUUM TESTING OF MANHOLES

Use vacuum testing of manholes to demonstrate the integrity of the installed materials and construction procedures.

#### PART 2 - MATERIALS

- 2.01 PRECAST CONCRETE MANHOLES
  - A. Precast components and other appurtenant materials shall be selected from the Approved Materials List.
  - B. Precast circular concrete manholes shall comply with ASTM C478 except that the wall thickness shall be 6 inches minimum.
  - C. Manhole components shall be designed for H-20 highway wheel loading, specific site conditions, and the Standard Drawings..
  - 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 a minimum of 10 inches below the bottom of the lowest pipe and a minimum of 6 inches above the top of the largest pipe. Manhole bases for mains 18-inch or larger shall incorporate a 4-inch wide grating-support ledge, cast integrally with the drain channels, at the top of the base.
  - 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 C923. Connections to existing manholes shall utilize a boot type

connector per ASTM C923 installed in a cored opening. Cast-in-place bases shall incorporate a ring-type seal on the pipe to be embedded in the concrete.

- G. Manholes on sewer mains 18 inches or larger, and all drop manholes regardless of the size of the sewer main, shall be polyvinyl chloride (PVC) lined and polyurethane coated. Precast shaft sections, cone sections and grade rings on PVC lined manholes shall have an integrally-cast PVC T-shaped liner of 0.065-inch minimum thickness per Standard Specifications Section 09850. A 100% solids elastomeric polyurethane coating shall be applied to exposed concrete at the interior of precast and cast-in-place bases.
- 2.02 CRUSHED ROCK BASE AND BACKFILL MATERIALS

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

- 2.03 MANHOLE FRAMES AND COVERS
  - A. Manhole frames shall be either 24 inches in diameter with single cover or 36 inches in diameter with two concentric covers, made of cast iron in accordance with ASTM A48, Class 30, the Standard Drawings and the Approved Materials List. Locking frames and covers may be required as determined by the District's Representative and shall be done in accordance with the Standard Drawings.
  - B. Frames and covers shall be designed for H-20 highway wheel loading.
  - C. Covers shall have the words "OMWD" "SEWER" cast into the cover. 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 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 Standard Specifications 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 sections.

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's Representative. Repair products shall be in accordance with Standard Specifications Section 03000.

# 2.07 MORTAR

Mortar for use on joints between precast sections and for setting manhole cover frames shall be in accordance with Standard Specifications Section 03000.

### 2.08 WATERPROOFING

Waterproofing material shall be in accordance with Standard Specifications Section 03462.

## 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 Standard Specifications Sections 02200 and 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 Drawings. 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 a minimum of 10-inch below the bottom of the lowest pipe and a minimum of 6-inch above the top of the largest pipe.
- 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's Representative.

# 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, the joints will be mortared and tooled to a smooth finish, free of voids. Note that sewer manholes are to be vacuum tested following assembly of the concrete sections, but prior to mortaring the joints, or backfilling.
- B. Manhole components incorporating a PVC liner and polyurethane coating shall be installed and tested in accordance with these specifications, the manufacturer's recommendations, and the Standard Drawings. Upon assembly of the precast sections and vacuum testing as described in this section, the mortaring and finishing of joints shall be performed. The PVC liner seams at the joints shall then be welded. The PVC liner shall be secured by insertion between the uppermost grade ring and the manhole cover frame. Note that PVC lined sewer manholes are to be vacuum tested following assembly of the concrete sections, but prior to mortaring the joints, welding the seams of the PVC liner, or backfilling. The polyurethane coating of all exposed concrete on the manhole base shall follow completion of the entire installation and all construction activity within the manhole.
- C. Assemble the precast sections to the elevation required by the location of the manhole 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-inch above the existing surface where outside the limits of a traveled way. Manholes shall not be placed in roadside ditches without the prior approval of the District.
  - 4. Unpaved Easements: Top of cover shall be 12 inches above the ground surface. Guard posts around the manhole may be required in this area as directed by the District's Representative.
- D. Secure the manhole frame to the grade ring with mortar.
- E. 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.
- F. Where manholes are to be given a protective coating, they shall be free of seepage and surface moisture.
- G. Piping installation adjacent to the manhole and connection to the base or shaft sections shall be performed as shown on the Drawings and Standard Drawings. Piping installation into flexible pipe connectors shall be in accordance with the manufacturer's recommendations for assembly, lubricants and limits of deflection.

- H. 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 shall approve the specific location of these plugs. Plugs shall be removed at the time of final inspection or as directed by the District's Representative. Removal of all construction debris and water shall be completed prior to removal of plugs.
- I. Brick or mortar bulkheads shall be installed at the manhole end of all unused stub channels over 36 inches 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.
- J. 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's Representative. 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 exposed reinforcing steel. The coating shall be an epoxy resin product exhibiting a high bond strength to steel and concrete. It shall conform to ASTM C881.
- K. A concrete collar shall be poured around manhole frames in accordance with the Standard Drawings.
- L. Replacement of asphalt or concrete pavement shall be in accordance with the requirements of the agency having jurisdiction.

## 3.05 WATERPROOFING

At the discretion of the District's Representative, waterproofing material shall be applied to the exterior surfaces of manholes in accordance with the manufacturer's recommendations and Standard Specification Section 03462. Field apply two coats at a rate of 65 square feet per gallon per coat. The material shall be applied to all exterior surfaces at or below the water table or indications of seepage or moisture as directed by the District's Representative.

## 3.06 VACUUM TESTING OF MANHOLES

- A. Vacuum testing of manholes is required and shall be performed as directed in the presence of the District's Representative.
- B. Vacuum testing shall be done in accordance with ASTM C1244.
- C. Vacuum testing equipment shall be as manufactured by P.A. Glazier, Inc. or District approved equal.
- D. Manholes shall be tested after assembly and prior to mortaring the joints or backfilling. In the case of manholes incorporating a PVC liner and polyurethane coating, the testing is to take place prior to mortaring the joints, welding the liner seams between sections, applying the coating, or backfilling.
- E. All lift holes shall be plugged with an approved grout prior to testing.

- F. All pipes entering the manhole shall be plugged, and bracing installed, to prevent the plug from being drawn into the manhole.
- G. The test head shall be placed inside the top of the cone section and the seal inflated in accordance with the manufacturer's recommendations.
- H. A vacuum of 10 inches of mercury shall be drawn. The time shall be measured for the vacuum to drop to 9 inches. The manhole shall pass the test if the time taken for the drop is greater than 60 seconds for a 48-inch manhole and 75 seconds for a 60-inch manhole.
- I. 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 PULL TESTING OF PVC LINED MANHOLES

PVC lined manholes shall have field-welded joints pull tested. Field welds shall withstand a pull test of at least 100 lbs per liner inch, applied perpendicularly to the concrete surface for a period of one minute, without evidence of cracks or separations. This test shall be conducted at a temperature of 70°F to 80°F inclusive.

# 3.08 HOLIDAY TESTING OF PVC LINED MANHOLES

PVC lined and Polyurethane coated surfaces shall be holiday tested with an electrical holiday detector as manufactured by Tinker and Rasor (Model # AP-W with power pack) with the instrument set at 20,000 volts and used as directed by the District's Representative. All imperfections identified on the PVC lining and polyurethane coating shall be repaired with materials-in-kind and the test shall be repeated until no holidays are evident.

END OF SECTION