

SAN ANTONIO RIVER AUTHORITY
UTILITIES DEPARTMENT

SECTION 33-05-61
STANDARD SANITARY SEWER MANHOLES

PART 1 GENERAL

1.1 DESCRIPTION:

A. RELATED WORK SPECIFIED ELSEWHERE:

Section 01-33-00 – Submittals
Section 33-05-05 - Sewer Excavation, Trenching and Backfilling
Section 33-01-31 - Sewer Main TV Inspection
Section 33-05-06 - Sanitary Sewer Testing
Section 33-05-07 - Jacking, Boring or Tunneling Pipe
Section 33-31-00 - Sanitary Sewers
SAWS ITEM NO. 300 Concrete (Natural Aggregate)
SAWS ITEM NO. 301 Reinforcing Steel
SAWS ITEM NO. 550 Trench Excavation Safety Protection
SAWS ITEM NO. 851 Existing Manhole Adjustment

B. SCOPE:

This item shall govern the construction of standard sanitary sewer manholes. Manholes shall be constructed with materials and workmanship described in this specification and plan details, and at the locations shown on the plans or designated by the OWNER. All materials and construction work shall be in accordance with current *Texas Commission on Environmental Quality (TCEQ) Chapter 217 – Design Criteria for Domestic Wastewater Systems*.

C. SUBMITTALS:

Prior to the start of construction, CONTRACTOR shall submit, for OWNER'S approval, the following items being proposed for construction:

1. Manholes
2. Rings and covers
3. Gaskets
4. Pipe to manhole connectors
5. Infiltration dishes
6. Coatings

All submittals shall be in conformance with *Section 01-33-00 – Submittals*.

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PART 2 PRODUCTS

2.1 GENERAL

- A. Unless otherwise shown on the plans and details or as approved by the OWNER, standard sanitary sewer manholes shall be constructed with precast reinforced concrete manhole sections.
- B. Manholes shall be a single-maintenance entrance cylindrical structure having a uniform internal diameter of 4 feet, 5 feet or 6 feet from the base of the structure to the bottom of the diameter adjustment section or cone. The base of the structure shall include the load bearing portion beneath and outside of the structure, invert channels and the fill or bench portions adjacent to the lower sewer pipes within the structure as shown on the plan details. The vertical height of the diameter adjustment section or cone shall be between 24 inches and 36 inches. Adjustment or throat rings may be used for elevation adjustment of the manhole ring and cover.

All products shall conform to the OWNER'S Approved Products List. It is the CONTRACTOR's responsibility to request this list from the OWNER. The CONTRACTOR should review this list prior to start of construction.

2.2 PRECAST REINFORCED CONCRETE MANHOLE SECTIONS

- A. Precast reinforced concrete manhole sections shall conform to the requirements of *ASTM C478*. The precast sections shall have rubber gasket compression joints conforming to the material and performance requirements of *ASTM C443*.

2.3 PRECAST CONCRETE MANHOLE BASE WITH ANTI-FLOATING RING

- A. A steel reinforced concrete base with anti-flotation ring shall be used with precast concrete manhole sections. This base shall be furnished with confined o-ring joints in conformance with *ASTM C443*. The reinforced concrete precast manhole base shall be manufactured in accordance with *ASTM C478*. The precast base shall have formed smooth invert channels cast at the angles which are indicated on the plans. The invert channel shall, unless otherwise required by the plans and specifications, have a minimum of three (3) inches of fall from inlet to outlet. Inverts shall be designed and constructed to prevent reverse flow.

2.4 PIPE TO MANHOLE CONNECTORS

- A. Pipe to manhole joint connectors shall be installed to create a watertight seal between the manhole base and sewer line. The pipe to manhole connection shall be made with an approved product listed by the OWNER. This joint shall comply with *ASTM C923*.

2.5 GROUT

- A. Concrete Grout: All concrete grout used for patching or other similar fill-in work shall be of non-shrink type in accordance with the manufacturer's recommended formulation with Portland cement, fine aggregate, water, and water reducer to produce a compressive strengths of approximately 4,800 psi within 7 days and 7,250 psi within 28 days at a 70 °F baseline temperature.

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A non-shrinking cement additive shall be added to reduce cracking and shrinkage, refer to the approved product list.

2.6 MANHOLE RINGS AND COVERS

- A. Watertight manholes are required unless otherwise approved by OWNER. Watertight manhole rings and covers shall be cast iron with 400-pound minimum combined weight, 6 inches total height, and 30 inches minimum ring inside diameter. Covers shall contain no holes or openings except as required for bolts. Two lifting bars with slots adequate for pick insertion shall be cast into the cover for lifting purposes. Covers shall seat on a minimum $\frac{5}{16}$ -inch diameter rubber ring gasket conforming to the material requirements of *ASTM C443*. The rubber gasket shall rest in a groove cast in the ring inside of the bolts. Four $\frac{5}{8}$ -inch diameter stainless steel, hex head bolts shall be provided for each cover and two (2) bolts shall be manhole locks. The 4 bolts in the covers shall be evenly spaced and provided with a minimum of 1½ inch diameter counter sink for the bolt heads. In the fastened and bolted position, the bolt heads shall not extend beyond the surface of the cover. Gaskets of a size and material as approved by the OWNER shall be provided for the bolts to ensure air and water tightness. Alignment marks shall be cast onto watertight rings and covers for proper bolt alignment.
- B. Finished frames and covers shall have the bearing surfaces machine ground and sets of rings and covers shall be marked in such a way that they can be matched for assembly in field.
- C. All covers shall have the words “San Antonio River Authority” and “Sanitary Sewer” cast thereon, as shown on RIVER AUTHORITY *Standard Detail SD404*, Sheet 7 of 7.
- D. Manhole rings and cover shall meet the current requirements of the *American Association of State Highway and Transportation Officials (AASHTO) Designation M306-10*.
- E. Manholes shall be vented in accordance with *TCEQ Chapter 217 – Design Criteria for Domestic Wastewater Systems*. Vented manholes shall have a 1” hole in the center of the cover where applicable/or watertight/bolt down. All vented manholes shall be equipped with infiltration dishes.

2.7 INFILTRATION DISHES

- A. Infiltration dishes will be required locations designated on the project plans, or as directed by OWNER. The CONTRACTOR shall be responsible for making the necessary field measurements for the manufacturer prior to production.

2.8 CONCRETE

All concrete for manholes shall conform to the provisions of *SAWS ITEM NO. 300 Concrete (Natural Aggregate) Class A*.

2.9 REINFORCING STEEL

All reinforcing steel shall conform to the provisions of *SAWS ITEM NO. 301 Reinforcing Steel*.

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2.10 THROAT RINGS

A. REINFORCED CONCRETE THROAT RINGS

1. Throat rings shall be reinforced concrete rings having a maximum thickness of two inches (2"). The concrete ring reinforcement steel shall be a minimum of No. 2 wire. The internal diameter shall not be less than thirty inches (30") and the width shall be a minimum of five inches (5"). Concrete shall conform to the provisions of *SAWS ITEM NO. 300 Concrete (Natural Aggregate) Class A* specification. The total adjustment shall not exceed nine (9) inches in height.
2. A minimum of one and a maximum of four throat rings will be used at each manhole for adjustment.
3. If concrete throat rings are to be installed, they must be used in conjunction with a UV stabilized polyethylene liner and inflow and infiltration barrier. Field acceptance will not be issued unless inflow and infiltration barrier is installed.

B. HDPE THROAT RINGS

HDPE throat rings shall follow manufacture's installation procedure and use only recommended adhesive. A minimum of one and a maximum of four throat rings will be used at each manhole for adjustment. Due to the size variation available in HDPE rings; total adjustment shall not exceed nine (9) inches in height.

2.11 INFLOW AND INFILTRATION (I/I) BARRIER

- A. The I/I Barrier shall meet the following ASTM standards: *ASTM D790* for flexural properties; *ASTM D1505* for density; *ASTM D1238* for Melt Flow Index; *ASTM D638* for tensile strength at yield (50mm/mm); *ASTM D790* for flexural modulus; *ASTM D648* for heat deflection temperature at IGEPAL; and *ASTM D693* for EsCR, 100% IGEPAL/10% IGEPAL.

2.12 BITUMASTIC JOINT SEALANT

- A. Bitumastic Joint Sealant is to be applied between cones, risers, adjustment rings, flat tops, and between the ductile or gray cast iron ring (frame) and the uppermost adjustment ring or flat top.

2.13 EXTERNAL RUBBER SLEEVE

Before backfilling, compacting or concrete encasing any manhole joint section risers, cone sections or grade rings, they shall be wrapped with an external rubber sleeve having a minimum thickness of 60 MILs.

2.14 COATING

- A. All new manholes shall have the interior walls coated with a coating approved by OWNER.
- B. All re-constructed manholes shall be coated with a minimum of 1" thick cementitious, then epoxy

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coated with thickness specified by manufacturer.

- C. Application procedures shall be in accordance with Manufacturer's recommendation and as per the following:
1. CONTRACTOR shall ensure manhole entry complies with *OSHA, 29 CFR 1910.146*.
 2. CONTRACTOR shall notify the OWNER's inspector a minimum of 48 hours prior to the start of any field surface preparation work for manholes.

PART 3 EXECUTION

3.1 PRECAST MANHOLES

Footings or bases of manholes shall be a minimum 6 inches below the bottom of the pipe. Reinforcing steel is required to be placed in the concrete as per *SAWS ITEM NO. 301 Reinforcing Steel*. All manhole bases shall be installed as specified in *Section 330505 - Sewer Excavation, Trenching and Backfilling*.

- A. The CONTRACTOR shall level and plumb the base prior to setting the precast manhole riser sections on the precast concrete base. Concrete cradles shall not be required for precast concrete manhole bases which utilize resilient or compression joints as shown on the plans and details. Concrete cradles shall extend beyond the outside walls of the manhole a minimum of thirty-six inches (36").
- B. The top half of all sewer pipes within the invert channel or bench zone shall be removed flush to the inside manhole walls.
- C. Joints on sewer pipe shall not be cast or constructed within the wall sections of manholes. Gasket and joint surfaces on recessed O-Ring joints shall be lubricated with a lubricant suitable for use with confined rubber O-Ring concrete pipe joints. Dust, dirt and foreign matter must be removed from the joint surfaces. Lubricant can be applied with a brush, cloth pad, sponge or glove. A smooth round object should be inserted under the gasket and run around the circumference two or three times to equalize stretch in the gasket.
- D. On new sewer manhole and pipe systems and new pipe systems connecting to existing manholes, pipes entering a manhole above the lowest pipe shall project two inches (2") from the inside wall. Such pipes shall be installed with a joint a minimum of twelve inches (12") from the outside manhole wall. A concrete cradle shall be provided for the pipe extending from the manhole wall a minimum distance of thirty-six (36") on those manholes which do not utilize precast concrete manhole bases with compression or resilient joint connectors
- E. Voids between exterior pipe walls and manhole walls at all pipe connections in manholes shall be filled with a non-shrink grout, concrete or mortar as approved by the OWNER or as shown on the plan details and inspected prior to backfilling.
- F. Where connections to existing manholes are required, the adjacent pipe bedding shall be prepared

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to proper grade, the existing manhole neatly cut, and the new pipe inserted so that the end is projecting two inches (2") from the inside wall. The invert shall then be re-shaped to properly channel new flows. Debris of any kind shall be kept out of new or existing manholes or mains.

- G. Connections to existing manholes require rehabilitation of the existing manhole to current specifications, including re-encasement, re-coating, and updating manhole rings and covers.
- H. The CONTRACTOR shall be required to backfill all new manholes with an approved flowable backfill up to 1 foot above the cone section, or in accordance with the requirements of the right-of-way owner having jurisdiction. Manhole shall be inspected prior to flowable fill placement. If inspection has not been conducted, CONTRACTOR shall remove flowable fill for inspection.
- I. Throat rings shall be mortared between all bearing surfaces sufficient to provide a minimum, in place, mortar thickness of one-quarter inch (1/4"). No more than four (4) or less than two (2) throat rings may be used on any manhole.

3.2 MANHOLE RING ENCASEMENT

All manhole rings shall be encased with reinforced concrete as shown in plan details or as approved by the OWNER. Encasement shall be circular, unless approved by OWNER. Encasement shall be finished level and have a broom or smooth finish.

- A. Concrete for concrete encasement around manholes which are not in new or existing street shall conform to the provisions of *SAWS ITEM NO. 300 Concrete (Natural Aggregate) Class B concrete*.
- B. Concrete for concrete encasement around manholes which are in new or existing streets shall conform to the provisions of *SAWS ITEM NO. 300 Concrete (Natural Aggregate) Class A concrete*. See standard detail for dimensions.
- C. Manhole adjustments in new or existing streets shall be in accordance with *SAWS ITEM NO. 851 Existing Manhole Adjustment*.

3.3 DROP MANHOLES

A drop pipe of the same pipe material and size shall be provided for a sewer pipe entering a manhole more than twenty-four inches (24") above the outflow invert. The drop pipe shall be constructed on the outside of the manhole utilizing fittings per detail to provide a smooth drop and a clean out leg as shown on the detail sheet or plans. The drop pipe shall be encased with concrete conforming to the provisions of *SAWS ITEM NO. 300 Concrete (Natural Aggregate) Class B concrete*. Concrete shall extend from the bottom of the manhole base up to the bottom of the incoming sewer pipe, concrete shall also extend from the outside wall of the manhole out past the branch with a minimum of six inches (6") on each side. Drop structure shall be inspected by OWNER prior to flowable fill installation. If inspection cannot be conducted, CONTRACTOR shall remove flowable fill for inspection.

3.4 TESTING

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See *Section 33-05-06 - Sanitary Sewer Testing* for testing requirements.

PART 4 MEASUREMENT AND PAYMENT

- A. Standard Sanitary Sewer Manholes shall be complete and in place and will be measured for each manhole 0 to 6-feet deep. Manholes deeper than 6-feet shall be measured by the number of vertical feet in excess of 6-feet.
- B. Payment will be at the unit price bid and will be full compensation to complete construction. No separate payment will be made for any items of work, materials, parts, equipment, supplies or related items. Price shall include manhole ring and cover, concrete ring encasement, crushed stone, precast sections, manhole covers, precast section O-ring gaskets, lubricants, throat rings, cones, flat lids, manhole bases, pipe cradles embedment, testing, concrete, mortar, labor, tools, equipment, pipe to manhole connectors, tees, wyes, castings and all other related items required to construct, test and complete the work.

END OF SECTION