SECTION 02600

CAST-IN-PLACE CONCRETE MANHOLES

PART 1 G E N E R A L

.01 SECTION INCLUDES

A. Cast-in-place sanitary and storm sewer manholes.

.02 UNIT PRICES

A. Measurement for payment for cast-in-place manholes is on a unit price basis per manhole. Payment will be made for each manhole installed, complete in place, including manhole, drop pipe, excavation, foundation, connection to sewer pipe, and backfill.

.03 SUBMITTALS

A. Conform to requirements of all sections and provisions of these specifications.

B. Submit proposed design mix and test data for each type and strength of concrete.

C. Submit manufacturer's data and details of following items for approval:

1. Frames, grates, rings, and covers.

2. Materials to be used in fabricating drop connections.

3. Materials to be used for pipe connections at manhole walls.

4. Materials to be used for stubs and stub plugs.

5. Plugs to be used for sanitary sewer hydrostatic testing.

PART 2 P R O D U C T S

.01 CONCRETE

A. Conform to requirements of Section 03305 - Concrete for Utility Construction.

B. Manholes - Class A concrete with minimum compressive strength of 4000 psi unless otherwise indicated on Drawings or approved by the Owner Representative for use on extra depth units.

.02 REINFORCING STEEL

A. Conform to requirements of Section 03305 - Concrete for Utility Construction.

.03 MORTAR

A. Conform to requirements of ASTM C 270, Type S using Portland cement.

.04 MISCELLANEOUS METALS

A. Provide cast-iron frames, grates, rings, and covers conforming to City Details.

.05 DROP CONNECTIONS AND STUBS

A. Drop connections and stubs shall conform to the same pipe material requirements used in the main pipe, unless otherwise indicated on the Drawings.

.06 PIPE CONNECTIONS

A. Use resilient connectors conforming to requirements of ASTM C 923. Metallic mechanical devices as defined in ASTM C 923 shall be made of the following materials:

1. External clamps: Type 304 stainless steel

2. Internal, expandable clamps on standard manholes: Type 304 stainless steel, 11 gage minimum.

3. Internal, expandable clamps on corrosion-resistant manholes:

a. Type 316 stainless steel, 11 gage minimum , or

b. Type 304 stainless steel, 11 gage minimum, coated with minimum 16 mil fusion-bonded epoxy conforming to AWWA C 213.

B. Where rigid joints between pipe and a cast-in-place manhole base are specified or shown on the Drawings, use polyethylene-isoprene waterstop meeting the physical property requirements of ASTM C 923, Press-Seal WS Series, or equal.

C. Storm sewer pipe connections:

1. Connections acceptable for sanitary sewers.

2. Line pipe grouted in place with mortar.

.07 SEALANT MATERIALS

A. Sealing materials between precast concrete adjustment ring and manhole cover frame shall be Adeka Ultraseal P201, or approved equal.

.08 CORROSION RESISTANT MANHOLE MATERIALS

A. Manholes shall be corrosion resistant only if stated on the drawings. The materials shall be applied by an approved certified applicator. Acceptable material is:

1. Raven 405 as manufactured by Raven Lining Systems, Inc., Tulsa, Oklahoma. The corrosion resistant barrier shall be spray applied as per the manufacturer's recommendation and shall have a minimum finished dry film thickness of 100 mils.

B. The Contractor shall have manufacturer's representative present on site at all times during the installation of corrosion resistant barrier

C. The Contractor shall make provisions in his unit price bid for each structure to maintain dry conditions for the corrosion resistant liner application and subsequent curing as per manufacturer's recommendations.

.09 BACKFILL MATERIALS

A. Backfill materials shall conform to the requirements of Section 02227 - Excavation and Backfill for Utilities.

.10 NON-SHRINK GROUT

A. For non-shrink grout, use prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. It shall meet the requirements of ASTM C 1107 and shall have a minimum 28-day compressive strength of 7000 psi.

PART 3 E X E C U T I O N

.01 EXAMINATION

A. Verify lines and grades are correct.

B. Determine if the subgrade, when scarified and recompacted, can be compacted to 95 percent of maximum Standard Proctor Density according to ASTM D 698 prior to placement of foundation material and base section. If it cannot be compacted to that density, the subgrade shall be moisture conditioned until that density can be reached or shall be treated as an unstable subgrade.

C. Do not build sanitary sewer manholes in ditches, swales, or drainage paths unless approved by the Owner Representative.

.02 MANHOLES

A. Construct manholes to dimensions shown on Drawings. Commence construction as soon as possible after pipes are laid. On monolithic sewers, construct manholes at same time sewer is being constructed.

B. Unstable Subgrade Treatment: When unstable subgrade is encountered the subgrade will be examined by the Owner Representative to determine if the subgrade has heaved upwards after being excavated. If heaving has not occurred, the subgrade shall be over-excavated to allow for a 24-inch thick layer of crushed stone wrapped in filter fabric as the foundation material under the manhole base. If there is evidence of heaving, a pile-supported concrete foundation, as detailed on the Drawings, shall be provided under the manhole base, when indicated by the Owner Representative.

C. Cast manhole foundations and walls monolithically. A cold joint with approved water stop will be allowed when the manhole flow line depth exceeds 12 feet. No other joints will be allowed unless shown on Drawings or approved by the Owner Representative.

D. Place, finish and cure concrete for manholes following the procedures given in Section 03305 - Concrete for Utility Construction, for concrete containing microsilica admixtures.

E. All manholes in pavement shall have blockouts.

.03 PIPE CONNECTIONS AT MANHOLE

A. Install approved resilient connectors at each pipe entering and exiting sanitary sewer manholes in accordance with manufacturer's instructions.

B. Ensure that no concrete, cement stabilized sand, fill, or other rigid material is allowed to enter the space between the pipe and the edge of the wall opening at and around the resilient connector on either the interior or exterior of the manhole. If necessary, fill the space with a compressible material to guarantee the full flexibility provided by the resilient connector.

C. Where a new manhole is to be constructed on an existing sewer, install a waterstop gasket around the existing pipe at the center of the cast-in-place wall. Join ends of split waterstop material at the pipe springline using an adhesive recommended and supplied by the waterstop manufacturer.

D. Do not construct joints on sanitary sewer pipe within wall sections of manholes. Use approved connection material.

E. Construct pipe stubs with resilient connectors for future connections at locations and with material indicated on Drawings. Install approved stub plugs at interior of manhole.

F. Test connection for watertight seal before backfilling.

.04 INVERTS FOR SANITARY SEWERS

A. Construct invert channels to provide a smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Conform to following criteria:

1. Slope of invert bench: 1 inch per foot minimum; 1-1/2 inch per foot maximum.

2. Depth of bench to invert:

a. Pipes smaller than 15-inches: one-half largest pipe diameter

b. Pipes 15 to 24-inches: three-fourths the largest pipe diameter

c. Pipes larger than 24-inches: equal to the largest pipe diameter

3. Invert slope through manhole: 0.10-foot drop across manhole with smooth transition of invert through manhole, unless otherwise indicated on Drawings.

B. Form invert channels with class A concrete if not integral with manhole base. For direction changes of mains, construct channels tangent to mains with maximum possible radius of curvature. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts.

.05 DROP CONNECTIONS FOR SANITARY SEWERS

A. Construct drop connections with same materials used in main pipe unless otherwise indicated on Drawings or approved by the Owner Representative. Install a drop connection with a sewer line enters a manhole higher than 30-inches above the invert of the manhole.

B. Encase drop assembly with class A concrete to form a solid mass. Extend concrete outside of bells a minimum of 4 inches. Cast base of encasement monolithically with manhole base and ensure concrete bonds to exterior manhole wall.

C. Terminate encasement of blind drops a minimum of 5 inches below top of bell and not less than 12 inches above top of next lower bell. Install approved plug at bell.

.06 MANHOLE FRAME AND ADJUSTMENT RINGS

A. Combine precast concrete adjustment rings so that the elevation of the installed casting cover is 3/8 inch below the pavement surface. Seal between adjustment ring and the manhole top with non-shrink grout; do not use mortar between adjustment rings. Apply a latex-based bonding agent to concrete surfaces to be joined with non-shrink grout. Set the cast iron frame on the adjustment ring in a bed of approved sealant. The sealant bed shall consist of two beads of sealant, each bead having minimum dimensions of 1/2-inch and 3/4-inch wide.

B. For manholes in unpaved areas, top of frame shall be set a minimum of 6 inches above existing ground line unless otherwise indicated on Drawings. In unpaved areas, encase the manhole frame in mortar or non-shrink grout placed flush with the face of the manhole ring and the top edge of the frame. Provide a rounded corner around the perimeter

.07 BACKFILL

A. Place and compact backfill materials in the area of excavation surrounding manholes in accordance with requirements of Section 02227 - Excavation and Backfill for Utilities. Use embedment zone backfill material, as specified for the adjacent utilities, from manhole foundation up to an elevation 12 inches over each pipe connected to the manhole. Provide trench zone backfill, as specified for the adjacent utilities, above the embedment zone backfill.

B. Where rigid joints are used for connecting existing sewers to the manhole, backfill under the existing sewer up to the springline of the pipe with Class B concrete or flowable fill.

C. In unpaved areas, provide positive drainage away from manhole frame to natural grade. Provide a minimum of 4 inches of topsoil conforming to requirements of Section 02920 - Topsoil. Seed in accordance with Section 02932 - Hydromulch Seeding. If shown on Drawings, sod disturbed areas in accordance with Section 02935 - Sodding.

.08 FIELD QUALITY CONTROL

A. Conduct leakage testing of manholes in accordance with requirements of Section 02732 - Acceptance Testing for Sanitary Sewers.

.09 PROTECTION

A. Protect manholes from damage until subsequent work has been accepted. Repair or replace damaged elements of manholes at no additional cost to the Owner.

END OF SECTION