RFI #0179

SECTION 33 39 17 – POLYMER CONCRETE MANHOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Work for the construction of pre-cast manholes. The Contractor shall be responsible for the correct final elevations and slopes of manholes and the proper setting and elevations of manhole rings and covers.

B. General Requirements:

1. Manholes of different diameters are required on this project. See the Plans for manhole locations and sizes.
2. The top surface of the barrel shall be constructed truly plumb and level, except where located within roadway limits where it shall match existing slopes and grades and shall have a light broom finish. There shall be no exposed aggregate on the top edge of the barrel.
3. Manholes shall use frames and covers conforming to Paragraph 2.3 of specification 33 39 17 POLYMER CONCRETE MANHOLES.

C. Related Sections:

1. Division 33.

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition.

1. ASTM A48, Standard Specification for Gray Iron Castings.
2. ASTM C361, Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
3. ASTM C443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
4. ASTM C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
5. ASTM D1248, Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

1.3 SUBMITTALS

A. Certificates: Certify that products meet or exceed specified requirements.

B. Submit design calculations sealed by a Professional Engineer in the State of Texas supporting reinforcement, thickness, and dimensions proposed for use on this project.

C. Submit design calculations sealed by a Professional Engineer in the State of Texas supporting the use of bottom anchorage and/or side friction to resist buoyancy.

PART 2 - PRODUCTS

2.1 POLYMER CONCRETE MANHOLES

A. General Requirements:

1. Provide acid resistant polymer manhole sections, base sections and related components conforming to ASTM C 478. ASTM C 478 material and manufacturing is allowed compositional and dimensional differences required by a polymer product.
2. Provide base riser section with integral floors, unless shown otherwise.
3. Provide riser sections joined with bell and spigot / ship-lap design seamed with butyl mastic (ASTM C 990) and rubber gaskets (ASTM C990) so that on assembly, manhole base, riser and top section make a continuous and uniform manhole.
4. Grade rings shall be HDPE, LadTech or approved equal, and must be drilled and anchored into the manhole to secure riser to manhole, maximum grade rings shall be no more than 18 inches.
5. Construct riser sections for polymer manholes from standard polymer manhole sections of the diameter indicated on drawings. Use various lengths of polymer concrete manhole sections in combination to provide correct height with the fewest joints unless otherwise noted on plans
6. Design wall sections for depth and loading conditions with wall thickness as required by polymer manufacturer.
7. Provide tops to support FAA loading and receiving cast iron frame covers, as indicated on drawings.
8. Where polymer transition slabs are required provide precast base sections with flat polymer slab top sections used to transition to 48-inch diameter manhole access riser sections. Transition can be concentric or eccentric as shown on drawings. Locate transition to provide minimum of 7-foot head clearance from base to underside of transition unless otherwise approved by engineer.

B. Design Criteria:

1. Polymer Concrete Manhole risers, transition slabs, cones, flat lids, grade rings and manhole base sections shall be designed by manufacturer to meet the intent of ASTM C 478 with allowable compositional and sizing differences required by a polymer product. The following design criteria apply:

    a. FAA design live loading applied to manhole cover and transition and base slabs
    b. Polymer manholes will be designed based upon live and dead load criteria in ASTM C 857 and ACI 350-06
    c. Unit soil weight of 120 pcf located above portions of manhole, including base slab projections
    d. Internal liquid pressure based on unit weight of 63 pcf
    e. Dead load of manhole sections fully supported by transition and base slabs

C. Design:

1. Polymer Concrete Manhole risers, transition slabs, cones, flat lids, grade rings and manhole base sections shall be designed, by manufacturer, to requirements of ASTM C 478, ASTM C 857, and ACI 350-06 as modified to accept polymer construction in lieu of concrete as follows:

    a. Polymer Mixture - the mixture shall consist solely of thermosetting resin sand and aggregate. No Portland cement shall be allowed as part of the mix design matrix. All sand and aggregate shall be inert in an acid environment.

b. Reinforcement – Shall use acid resistant reinforcement (FRP Bar) or steel reinforcement in accordance with ACI 440.1R-06 as applicable for polymer concrete design.
c. Required wall thickness for all members will be that stated by polymer manhole manufacturer based upon loading conditions and material properties. The wall thickness of risers and conical tops shall be not less than that prescribed by the manufacturer's design by more than 5%. A wall greater than the prescribed design shall not be cause for rejection.
d. Thermosetting Resin - The resin shall have a minimum of deflection temperature of 158° F when tested at 264 psi (1.820 mPa) following Test Method D 648. The resin content shall not be less than 7% of the weight of the sample as determined by test method D 2584. Resin selection shall be suitable for applications in the corrosive conditions to which the structures will be exposed.
e. Each manhole component shall be free of all defects, including indentations, cracks, foreign inclusions and resin starved areas that, due to their nature and degree or extent, detrimentally affect the strength and serviceability of the component part. The internal diameter of manhole components shall not vary more than 1%. Variations in height of two opposite sides of risers and conical tops shall not be more the 5/8 inch. The under run in height of a riser or conical top shall not be more than 1/4in./ft of height with a maximum of ½ inch in any one section.
f. Marketing and Identification - Each manhole shall be marked on the inside and outside with the following information - Manufacturer's name or trademark, Manufacturer's location and Production Date.
g. Manhole joints shall be assembled with a bell/spigot or shiplap butyl mastic joint so that on assembly, manhole base, riser and top section make a continuous and uniform manhole. Joint sealing surfaces shall be free of dents, gouges and other surface irregularities that would affect joint integrity.
h. Minimum clear distance between two wall penetrations shall be a minimum of 6" on 48" to 72" diameter manholes and a minimum of 8" on larger diameter manholes. A clearance of 3" is required between wall penetration and joint.
i. Construct invert channels to provide smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Invert slope through manhole is as indicated on drawings. All precast base sections to be cast monolithically. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts. Polymer bench and channel are to be constructed with all resin aggregate material – no alternative fill material is allowed. Extended base footer requirements for buoyancy concerns can be addressed with cementitious concrete material.
j. Provide resilient connectors conforming to requirements of ASTM C 923 or as a required by owner. All connectors are to be watertight. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.
k. Exceptions to ASTM C 478- components shall be designed for the intended combinations of manufacturing materials. Component designs may be as reinforced members as recommended by the manufacturer. Steel or Fiberglass reinforcement is not required for circumferential reinforcement, joint reinforcement, base slab reinforcement or hoop reinforcement, but may be placed for the purpose of product handling.

2.2 INVERTS

A. Inverts shall be formed as shown on the detail drawings to the grades specified. Manholes with inverts not conforming to these grades may be subject to removal and replacement at the Contractor's expense.

B. Concrete for inverts shall be P 6510.

2.3 BOLTED FRAMES AND COVERS

A. Manhole frame and cover shall be either Ductile Iron with zPEX Coating or CAP One manhole cover.

1. CAP manhole cover shall be 4-bolt with pick slots and a magnet below the cover for detection purposes.
2. Manhole rim shall be 9”-18” above grade.

B. Grade Rings:

1. Grade rings shall be HDPE, LadTech, or approved equal.
2. Rings shall be drilled and anchored into manhole.
3. Maximum grade ring shall be no more than 18”.
4. Bolts and washers shall be 316 stainless steel.

C. Covers shall set flush with the rim of the frame and shall have no larger than a 1/8-inch gap between the frame and cover.

D. Bearing surfaces shall be machine finished.

E. Lids shall have " SANITARY SEWER" and Manhole ID number cast on the surface.

F. The cover shall form a water-resistant seal between the frame and manhole cover surface. The cover shall have concealed pick holes and a machined bearing surface on the bottom of the casting. The cover shall conform to ASTM A48, Class 35 or better, for Gray Iron. The cover shall have a tensile strength of 35,000 psi.

2.4 MANHOLE FRAME SEALS

A. The material for the seals between the frames and concrete shall be a bitumastic gasket material, meeting, or exceeding ASTM C990. Bitumastic gasket material shall be Ram-Nek, EZ-STIK, or approved equal.

2.5 PIPE CONNECTIONS

A. Manufactured pipe-to-manhole connectors shall be installed at each opening to assure a flexible watertight seal of the pipe to the manhole.

B. The connector shall be capable of a 7-degree pipe deflection after installation without loss of sealing.

C. The connector shall be manufactured expressly for embedment in the wall of concrete manholes and shall be specifically designed for the pipe material and size being utilized on the project.

D. No adhesives or lubricants shall be employed in the installation of the connector into the manhole.

E. All stainless-steel parts of the connector shall be totally non-magnetic Series 304 Stainless except the worm screw for tightening the steel band which shall be Series 305 Stainless. The worm screw shall be torqued by a break-away type torque wrench set for 60 – 70 in/lbs.

F. The connector shall be installed in the manhole so that it shall have a minimum cover of 3- inches of concrete at all points and in strict accordance with the manufacturer's recommendations.

2.6 GROUTING

A. All materials needed for grouting and patching will be a polyester mortar compound provided by the manufacturer or an approved equal by the manufacture.

PART 3 - EXECUTION

3.1 MANHOLE CONSTRUCTION

A. Excavate to planned depth shown on the Drawings.

B. Place and compact aggregate as indicated by the detail drawings.

C. Place concrete base.

D. Place pre-cast polymer manhole in accordance with manufacturer's recommendations, plumb, and to grade.

E. Plug lifting holes on inside and outside. Grout lift holes on both sides.

F. Bolt manhole ring and cover to the manhole.

G. Place concrete and form invert.

H. Surround the outside of manhole structure from concrete base to the bottom of cone with at least 12-inches of Controlled Low Strength Material as specified in Section 31 23 23.16, Trench Backfill.

I. Bolt manhole frame to manhole as shown in details.

J. Clean the manhole frame of all dirt and debris before placing the manhole insert on the rim. The manhole insert shall be fully seated around the manhole frame rim to retard water from seeping between the cover and the manhole frame rim.

3.2 FIELD QUALITY CONTROL

A. Field Tests and Inspections

1. Perform testing in accordance with Section 33 31 23 Testing Sanitary Sewer Systems and 33 01 30.16 Closed Circuit Television.

PART 4 – MEASUREMENT AND PAYMENT

4.1 Payment for Polymer Concrete Manholes is on a unit price basis for each manhole installed, and includes backfill and subgrade.

END OF SECTION 33 39 17