

Section XXXX – POLYMER CONCRETE MANHOLES

PART 1 – GENERAL

1.1 SUMMARY

- A. This section includes the requirements for polymer concrete manholes for use in wastewater applications.

1.2 REFERENCES

- A. ASTM C33 - Standard Specification for Concrete Aggregates
- B. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets
- C. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
- D. ASTM C497 - Test Methods for Concrete Pipe, Manhole Sections, or Tile
- E. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concrete
- F. ASTM C580 - Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfaces, and Polymer Concrete
- G. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
- H. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Utility Structures
- I. ASTM C923 - Standard Specifications for Resilient Connectors between Concrete Manhole Structures and Pipe
- J. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections using Preformed Flexible Joint Sealants
- K. ASTM D2584 - Standard Test Method for Ignition Loss of Cured Reinforced Resins
- L. ASTM D6783 - Standard Specification for Polymer Concrete Pipe
- M. ACI 350-06 - Code Requirement for Environmental Engineering Concrete Structures & Commentary
- N. ACI 548.6R-96 - Polymer Concrete-Structural Applications State-of-the-Art Report

1.3 SUBMITTALS

- A. Submit as specified in Section XX.

B. Submittals shall include:

1. Manufacturer's warranty description.
2. Manufacturer's current ISO 9001:2015 Certification.
3. Shop drawings for each manhole or wet well including structure number, location, rim and invert elevations, joint details, and dimensions.
4. Sealed calculations by a Professional Engineer demonstrating the structure meets the established design criteria, including the requirements set forth in ASTM C 478, ASTM C 857, and ACI 350-06.
5. Manufacturer's certification for frames, rings, grates, covers, and hatches.
6. Materials to be used for section jointing.
7. Materials to be used for pipe connections.

1.4 WARRANTY

- A. The manufacturer shall warrant that all installed polymer products shall be free from defect and will not corrode, decompose, or disintegrate for a period of 50 years from the date of install.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Polymer Concrete

1. The manufacturer shall use only polyester or vinyl ester resin systems with under 1% VOC content and no styrene monomer.
2. Resin content shall be a minimum of 7% by weight as determined by ASTM D2584.
3. The resin shall have a minimum deflection temperature of 158° F when tested at 264 psi following ASTM D648.
4. All aggregate and sand shall meet the requirements of ASTM C33, with exception for grading.
5. All aggregate and sand shall be inert in an acidic environment.
6. Portland cement shall not be included in the polymer concrete mix.
7. Polymer Concrete shall have a minimum compressive strength of 11,000 psi when tested according to ASTM C579 or ASTM C497.

8. Polymer Concrete shall have a minimum flexural strength of 1,500 psi when tested according to ASTM C580.

10. Polymer Concrete shall meet all relevant requirements of ASTM D6783, including Hydrostatic Pressure, Compressive Strength, and Chemical Resistance requirements.

B. Joint Sealant

1. Riser joints will be assembled with a butyl mastic sealant meeting the requirements of ASTM C990.

C. Reinforcement

1. Reinforcement shall be steel and meet the requirements of ASTM C478.

D. Pipe Connections

1. Pipe connections at manholes shall meet the requirements of ASTM C923.

2.2 FABRICATION

A. Provide manhole sections, and related components conforming to design, testing, and tolerance requirements of ASTM C478, ASTM C857, and ACI 350-6 as adjusted for polymer concrete application.

B. Provide base riser with factory cast polymer concrete invert channels to provide smooth flow transition with minimal disruption at pipe connections unless plans call for doghouse, Tee, or other style base with no invert.

C. Provide riser sections joined with bell and spigot design and seamed with butyl mastic conforming to ASTM C990. Use various lengths of riser section to achieve the correct height with minimal joints. Diameter shall be as indicated on the drawings, and wall thickness shall be per design requirements.

D. Provide eccentric cones and flat lids to support live and dead loads as described in project specifications.

E. Each manhole component shall be marked with the manufacturer's name or trademark and component ID.

F. Each manhole component shall be free of defects, including indentations, cracks, and foreign inclusions that detrimentally affect the strength or functionality of the component. Cosmetic defect shall not be cause for rejection.

2.3 DESIGN REQUIREMENTS

A. Traffic load shall be per project specifications.

B. Live and dead load criteria shall conform to ASTM C857 and ACI 350-6.

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 polymer concrete manhole base.
- F. Manholes shall be designed with sufficient bottom anchorage and side friction to resist buoyancy. Field cast concrete flotation collars are acceptable.
- G. Manholes wall thickness shall be designed to resist hydrostatic pressures with a minimum safety factor of 2.0 for full depth conditions from grade to invert.

2.4 QUALITY CONTROL

- A. All fabrication will take place in an all polymer concrete facility.
- B. Manufacturer will have at least 5 years of experience producing polymer concrete structures.
- C. Manufacturer will provide references for at least 5 completed projects.
- D. Manufacturer will provide ISO 9001:2015 certification.

2.5 MANUFACTURER

- A. Polymer concrete manholes shall be manufactured by P3 Polymers, LLC, or pre-approved equal.

PART 3 – EXECUTION

3.1 GENERAL

- A. Contractor shall install the system outlined herein in accordance with the manufacturer's shop drawings and instructions.
- B. The equipment shall be installed properly to provide a complete working system. Installation shall follow the supplier's recommendations.

3.2 EXAMINATION

- A. Verify that dimensions are correct and project conditions are suitable for installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Installation of polymer concrete manholes shall be performed by contractor in accordance with manufacturer's instructions.
- B. Properly rated slings and spreader bar shall be used for lifting. Rigging type and method shall be per manufacturer's recommendation.
- C. Jointing

1. Sealing surfaces and joint components shall be inspected for damage and cleaned of all debris.
 2. Place and knead butyl rope as per manufacturer's instructions.
 3. Use suitable equipment to handle setting manhole sections.
- D. Departure from and return to true vertical from the established manhole alignment shall not exceed ½ inch per 10 feet, up to 2 inches for the total manhole depth.

3.4 TESTING

- A. All manholes shall be tested per Section XX

END OF SECTION