SECTION 03461

polymer concrete manholes

# GENERAL

## SCOPE

### This specification covers polymer concrete manholes intended for use in sanitary sewers, storm sewers and water lines where corrosion resistance is required.

## related work specified elsewhere

### The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work

#### Section 01000 – General Requirements

#### Section 09801 – Manhole Lining

## REFERENCES

### ASTM C478 - Standard Specifications for Precast Reinforced Concrete Manhole Sections

### ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic, Surfacing, and Polymer Concretes

### ASTM C443 - Standard Specifications for Joints for Concrete Pipe and Manholes Using Rubber Gaskets

### ASTM C580 - Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing’s and Polymer Concretes

### ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Utility Structures

### ACI 350-06 - Code Requirements for Environmental Engineering Concrete Structures & Commentary

### ACI 440.1R-15 - Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer (FRP) Bars

### ACI 548.6R-96 - Polymer Concrete-Structural Applications State-of-the-Art Report

### ASTM D648 - Test Method of Deflection Temperature of Plastics

Under Flexural Load in Edgewise Position

### ASTM D6783 - Standard Specification for Polymer Concrete Pipe

### ASTM D2584 - Test Method for Ignition Loss of Cured Reinforced Resins

### ASTM C923 - Standard Specifications for Resilient Connectors between

Concrete Manholes Structures and Pipe

### ASTM C990 - Standard Specification for Joints for Concrete Pipe,

Manholes and Precast Box Sections using Preformed Flexible Joint Sealants

### ASTM C497 - Test Methods for Concrete Pipe, Manhole Sections, or Tile

### California Greenbook Standard Specifications for Public Works Construction Section 211-2

## SUBMITTALS

### Conform to bid document requirements.

### Submit manufacturer’s data and details of following items for approval:

#### Shop drawings of manhole sections, base units and construction details, jointing methods, materials, and dimensions.

#### Summary of criteria used in manhole design including, as minimum, material properties, loading criteria, and dimensions assumed. Include certification from manufacturer that polymer concrete manhole design meets or exceeds the load and strength requirements of ASTM C 478 and ASTM C 857, reinforced in accordance with ACI 440.1R-15. Include current ISO 9001:2008 certification.

#### Frames, grates, rings, and covers.

#### Materials to be used in fabricating pipe drop connections.

#### Materials to be used for pipe connections.

#### Materials to be used for stubs and stub plugs, if required.

#### Proof of independent Chemical Resistance testing conducted in

#### Accordance with the Standard Specifications for Public Works

#### Construction (California Greenbook) Section 211-2.

### Submitted sealed drawings by a registered Professional Engineer in state of construction.

# PRODUCTS

## POLYMER CONCRETE MANHOLES

### Provide polymer concrete manhole sections, monolithic base sections and related components referencing to ASTM C 478. ASTM C 478 material and manufacturing is allowed compositional and dimensional differences required by a polymer concrete product.

### Provide base riser section with monolithic floors, unless shown otherwise.

### Provide riser sections joined with bell and spigot / ship-lap design seamed with butyl mastic and or rubber gaskets (ASTM C 990) so that on assembly, manhole base, riser and top section make a continuous and uniform manhole structure.

### Construct riser sections for polymer concrete manholes from standard polymer concrete 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.

### Design wall sections for depth and loading conditions with wall thickness as designed by polymer concrete manufacturer.

### Provide tops to support [AASHTO HS-20] or [HL-93] or vehicle loading or loads as required and receiving cast iron frame covers or hatches, as indicated on drawings.

[Note to the Engineer: Specify in section 2.01F the loading rating required.]

## DESIGN CRITERIA:

### Polymer Concrete Manhole risers, 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 as designed by the polymer concrete manufacturer.

#### AASHTO HS-20 or HL-93 design or as required loading applied to manhole cover and transition and base slabs.

#### Polymer manholes will be designed based upon live and dead load criteria in ASTM C 857 and ACI 350-06.

#### Unit soil weight of 120 pcf located above portions of manhole, including base slab projections.

#### Internal liquid pressure based on unit weight of 63 pcf.

#### Dead load of manhole sections fully supported by polymer concrete manhole base.

## DESIGN:

### Polymer Concrete Manhole risers, cones, flat lids, grade rings and manhole base sections shall be designed by manufacturer to meet loading requirements of ASTM C 478, ASTM C 857 and ACI 350-06 as modified for polymer concrete manhole design as follows:

#### Polymer Concrete Mix Design shall consist 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 acidic environment.

#### Reinforcement – Shall use acid resistant reinforcement (FRP Bar) in accordance with ACI 440.1R-06 as applicable for polymer concrete design.

#### The wall thickness of polymer concrete structures shall not be less than that prescribed by the manufacturer’s design by less than 95% of stated design thickness.

#### Thermosetting Resin - The resin shall have a minimum 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 polymer concrete manhole structures will be exposed.

#### Each polymer concrete 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. Cosmetic defect shall not be cause for rejection. The nominal internal diameter of manhole components shall not vary more than 2%. Variations in height of two opposite sides of risers and cones shall not be more the 5/8 inch. The under run-in height of a riser or cone shall not be more than ¼ in/ft of height with a maximum of ½ inch in any one section.

#### Marking and Identification - Each manhole shall be marked with the following information - Manufacturer’s name or trademark, Manufacturer’s location and Production Date.

#### Manhole joints shall be assembled with a bell/spigot or shiplap butyl mastic and/or gasketed 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.

#### Minimum clearance between wall penetrations and joints shall be per manufacturer’s design.

#### Construct invert channels to provide smooth flow transition with minimal disruption of flow at pipe-manhole connections. Invert slope through manhole is as indicated on drawings. All precast base sections to be cast monolithically. Polymer bench and channel are to be constructed with all polymer concrete material. Extended ballast slab requirements for buoyancy concerns can be addressed with cementitious concrete material.

#### Provide resilient connectors conforming to requirements of ASTM C 923 or other options as available. All connectors are to be watertight. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer’s instructions.

## QUALITY CONTROL

### Facility Quality Control should be maintained by adhering to ISO 9001:2008 for manufacturing. All fabricators will be ISO 9001:2008 Certified. All fabrication will take place in an all-polymer concrete fabrication facility. At no time will the polymer concrete fabrication facility share the facility with a cementitious precast product production facility. Fabricator is also to provide references of 5 previous projects in the last 5 years performed with both owner and contractor for reference and review by owner. Polymer concrete shall be cast in a polymer only facility and shall not be manufactured in a cementitious concrete facility.

## GROUTING

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

## MANUFACTURER

### Per the Approved Materials List.

END OF SECTION