SECTION 03462

structural sewer manhole rehabilitationsystem for existing manholes

# GENERAL

## scope

### This specification covers structural rehabilitation of structures utilizing corrosion proof polymer concrete precast sections as structural inserts to eliminate corrosion and infiltration and inflow.

## 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 01300 – Shop Drawings and Submittals

#### Section 03461 – Polymer Concrete Manholes

## WORK OF THIS SECTION

### The Work of this section includes providing a structural polymer concrete manhole insert system such that manholes become structurally sound and impervious to ground water, soil, debris, and are resistant to hydrogen sulfide corrosion. Manhole rehabilitation riser sections shall be constructed of precast sections comprised of resin, sand, aggregate, and FRP bar reinforcement.

### The Contractor is cautioned that sewage will continue to flow through the manholes and by-passing of flows may be required.

### The Contractor is cautioned that the WORK must be performed under permit required for confined space entry conditions.

### The Contractor is responsible for the complete installation of the manhole insert system including the removal of all old loose material, any pre-installation surface preparation and any structural manhole insert component.

### Manholes shall be manufactured in compliance with this specification, as manufactured by Armorock Polymer Concrete or pre-approved equal.

## REFERENCE DOCUMENTS

### Manhole rehabilitation riser sections shall conform to the following design criteria:

#### ASTM C 478 – (most current) Standard Specification for Precast Reinforced Concrete Manhole Sections

#### ASTM C 579 – (most current) Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic, Surfacing, and Polymer Concretes

#### ASTM C 443 – (most current) Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets

#### ASTM C 580 – (most current) Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

#### ASTM C 857 – (most current) 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 D 648 – (most current) Test Method for Deflection Temperature of Plastics Under Flexural Load in Edgewise Position

#### ASTM D 6783 – (most current) Standard Specification for Polymer Concrete Pipe

#### ASTM D 2584 – (most current) Test Method for Ignition Loss of Cured Reinforced Resins

#### ASTM C 923 – (most current) Standard Specifications for Resilient Connectors between Concrete Manholes Structures and Pipe

#### ASTM C 990 – (most current) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections using Preformed Flexible Joint Sealants

#### ASTM C 497 – (most current) 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 9001:2015 certification

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

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

#### Materials to be used for grade adjustments

#### Materials to be used for bench area finishing

#### 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

# MATERIALS

## DESCRIPTION

### Insert system shall contain sufficient structural strength to carry all live, dead and hydrostatic loads for the installation. The original manhole that is being rehabilitated will not be repaired or rehabilitated since the insert system will be capable of providing all necessary structural support.

### Corrosion proof polymer concrete manhole insert riser, cone sections and related components shall conform to the structural intent of ASTM C – 478. ASTM C – 478 material and manufacturing is allowed compositional and dimensional differences required by a polymer product.

### Riser sections, eccentric cones and flat lids are provided with flush edge configurations assembled with the appropriate alignment guides and butyl mastic to make a continuous and uniform insert structure manhole.

### Polymer concrete structural insert manhole riser, cone, and flat lid sections are to be provided in various lengths in combination to provide correct height with the fewest joints.

### The polymer concrete structural insert will have a minimum wall thickness of 2” and an outside diameter clearance of 1.5”, assuming the existing structure is intact with original inside diameter. Additional wall thickness may be required for interior dimensions in excess of 60”.

### Surfacing shell material for invert benches shall be an epoxy provided by the structural insert manufacturer or approved equal material.

## DESIGN / DESIGN CRITERIA

### Polymer Concrete Structural Manhole risers, cones, flat lids, grade rings 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 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

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

#### 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

# EXECUTION

## INSTALLATION

### Manhole installation should strictly follow the manufactures recommended installation procedures.

#### Excavate the area around the manhole as necessary to provide for removal of existing cone and castings while preventing soil and debris from falling into the manhole.

#### Follow all requirements for safety and ventilation in accordance with all applicable federal, state and local requirements.

#### Provide means, labor and equipment to prevent solid waste contamination during construction activities. If necessary install and operate sewage diversion pumping equipment to maintain sewage flows without backup, overflow or spill.

#### Make repairs necessary to existing manhole in order to receive inserts. Power -wash / clean any loose debris from wall areas. Remove dirt, grease, and debris in bench area to prepare bench surfaces for resurfacing. Remove all debris. Repair any active leaks. Repair and level the bench to prepare for polymer insert installation. Saw cut polymer riser section if necessary to accommodate pipe entry and bench slopes.

#### Depending on invert configuration the bench area should be prepared by building up the bench section with a Portland cement and sand mixture to provide a clean level surface to receive the riser. This build up should allow for a level surface above the existing top of the highest pipe. If pipe inverts are severely staggered the initial polymer sleeve can be modified in the field to accommodate the difference in bench slopes. After grout has set, lower the first riser section, clean and wipe down the polymer riser wall above the bench to allow for application of the epoxy coating.

#### When the new bench configuration is sufficiently dry and clean, a shell coating of epoxy will be built over the bench. The epoxy shell should continue 4”-6” up the polymer riser face to allow for polymer interlinking. No additional surface coating is required as the riser sections are structural and corrosive proof throughout.

#### All non-booted or flexible coupler pipe entry areas will be grouted by an epoxy patch kit provided by the manufacturer.

#### After the initial bottom seal has cured the additional remaining riser sections and cone shall be installed using the appropriate wall alignment guides, gaskets and/or mastic. The risers will be offloaded and lifted into place with approved manufacturer’s lifting device. No other handling apparatus will be acceptable for handling material.

#### Fill the annular space between old and new structure with a one sack slurry mix / mixed fill, stabilized sand or stone (85% standard proctor) or a backfill material shall be subject to approval by engineer / owner.

#### Install grade rings and frame and cover. Level to grade. Grout where required with the manufacturers grout kit.

#### Finish the remainder of the backfill, remove any deleterious materials and debris from the manhole and replace pavement if required.

#### Upon completion of the installation process the contractor shall remove all surplus materials, protective coverings, accumulated rubbish, and thoroughly clean all surfaces and repair any other installation related damage as required by owner. All external surface areas shall be repaired and returned to its original or required condition. All debris shall be collected and hauled off to a proper disposal site as required by local, state and federal regulations.

## CERTIFICATION / WARRANTY / INSPECTION

### When requested by owner, a certification can be made the basis of acceptance. This will require the material supplier to provide a copy of the appropriate test results that show that the polymer material meets the requirements listed in this specification and for any other qualified specification required by the owner for that particular project at time of bid.

#### Facility Quality Control should be maintained by adhering to ISO 9001:2015 for manufacturing. All manufacturers will be ISO 9001:2008 certified. All fabrication will take place in an all polymer concrete production facility. Manufacturer 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

#### The installing contractor shall demonstrate applicable experience and performance history by submitting references from a minimum of 3 other rehabilitation projects or shall have a minimum of five years’ experience installing standard sanitary sewer manholes and a certification of training from the manufacturer on a structural manhole insert system.

#### The polymer concrete structural insert riser, cone and flat lid sections shall be subject to inspection and approval by the owner or the owner’s engineer representative. At the time of inspection all material will be examined for specification compliance and approved drawings. Any sections damaged after delivery and not deemed repairable by the Manufacturer’s Representative and owner representative - will be removed and replaced at contractor’s expense.

#### Manufacturer shall provide owner with a 50 year corrosion warranty on the structural inserts at close of project with date of installation and other project information clearly shown.

## manufacturer

### Per the Approved Materials List.

END OF SECTION