CITY AND COUNTY OF DENVER
DEPARTMENT OF PUBLIC WORKS | ENGINEERING DIVISION

Storm Drainage and Sanitary Sewer Construction Detail and Technical Specifications

Approved for Specific Capital Projects Only - Product Must Be Specifically Noted In the Contract Documents at Time of Bid

15.1 Cured-In-Place Fiberglass/Epoxy Resin Liner

15.1.1 General

The work described within this specification details a complete manhole rehabilitation using a cured-in-place, fiberglass reinforced epoxy resin liner system. The complete system will provide a corrosion resistant liner to rehabilitate deteriorated manholes and prevent any further deterioration from hydrogen sulfide and other corrosive gases/acids caused by the wastewater stream. The completed system will also eliminate all ground water infiltration into the existing manholes.

15.1.2 Referenced Standards

ASTM D63860 – Tensile Strength

ASTM D69554 – Compressive Strength

ASTM D79058T – Flexural Strength

ASTM D63860 – Ultimate Elongation

ASTM D2240 – Standard Test Method for Rubber Property-Durometer Hardness.

15.1.3 Submittals

1. A Denver Fire Department permit (Hazardous, Flammable, Hot Work, Confined Space) must be obtained by the contractor prior to beginning any work; with any material.
2. A letter to the City's Construction Project Manager requesting use of the product/system for a specific Capital Project, must be approved in writing prior to product use.
3. Product Data: Technical data sheet for each product used; Material Safety Data Sheet (MSDS); design thickness.
4. Design Variations: Description of variations from application procedures, surface preparation, application equipment, or testing.
5. Quality Assurance/Control: Submit certifications as required under Article 1.4 – Quality Assurance.

15.1.4 Quality Assurance

1. Provide certification from product manufacturer that contractor is a certified, licensed installer of the product.
2. Provide certification that the equipment to be used has been manufactured or approved by the product manufacturer.

15.1.5 Delivery, Storage, and Handling

Handle and store materials in accordance with manufacturer's recommendations and MSDS. Keep epoxy away from excessive heat to prevent premature curing.

15.1.6 Materials

1. Cured-in-Place Fiberglass Reinforced Resin Liner System: The Liner Manufacturer shall be as noted below, or an approved equal:

   Poly-Triplex Liner
   Union Station
   1701 Wynkoop Street, Suite 250
   Denver, CO 80202
   Phone: 303-893-3100
   Fax: 303-893-3102
   www.Poly-triplex.com

2. The PTLS-5600 series is a three-layered composite system with a total pre-saturated fabric weight of 56-ozs. Per square yard. Layer #1 is 18-oz. structural fiberglass impregnated with a modified epoxy resin and bonded to the existing substructure. Layer #2 is a 20-oz. non-porous membrane of specials synthetic materials bonded to layer#1 and layer #3. Layer #3 consists of 18-oz. structural fiberglass saturated with epoxy and bonded to the nonporous membrane, forming a smooth interior wall to the host structure.

3. Where active infiltration flows are more severe, pressure grouting may be required. The material for pressure grouting shall be Avanti A-220, DeNeef or approved substitute.

15.1.7 Equipment

Equipment used shall be as recommended by the liner manufacturer and adequate in size and capacity to accomplish the rehabilitation work in a timely manner.

15.1.8 Execution

1. Application shall be in strict accordance with the manufacturer's instructions (Refer to manufacturer's application instructions for additional details and recommendations not included herein). This shall include re-grouting all inlet and outlet lines and benches as needed, plus the preparation, installation, curing and finishing operation.

2. Use only skilled workmen who are trained and experienced in the installation of cured-in-place fiberglass reinforced epoxy resin liners for manhole rehabilitation. Contractor shall identify qualified personnel and ensure that these people are on site during each liner installation from start to finish.

3. All liner installations shall utilize bypass pumping. The use of flow-thru plugs and channel platforms shall only be allowed with prior approval from the Construction Engineer. Contractor shall provide individual flow diversion plans for each pumping setup.

4. No application shall be made to frozen surfaces or if freezing is expected to occur within 24 hours after application of product. No liners will be installed if outside air temperature exceeds 95 degrees F.

5. Do not allow extraneous material from entering sewer lines. Contractor will be fully responsible for any damage caused due to debris entering the sewer line during preparation work and/or liner installation activity.

6. Clean surfaces to be rehabilitated with high-pressure water spray (minimum 3500psi) to remove loose concrete or brick, biological growths, and other contaminants. If surface cannot be cleaned sufficiently with high-pressure water

spray, then use means necessary, as recommended by manufacturer. Surfaces may require the application of a 10% solution of muriatic acid or the use of a detergent or degreaser. If an acid or detergent solution is used, the surface shall be thoroughly rinsed and neutralized prior to the installation of the liner system. All surfaces shall be clean and structurally sound. Loose and protruding brick, mortar, concrete and roots shall be removed.

7. Repair mortar shall be used to fill voids, structurally reinforce or rebuild surfaces. Rebuild bench and channel areas after cleaning using mortar or other approved material to ensure adequate surface prior to liner installation.

8. Stop all active hydrostatic infiltration with cementitious grout. Excessive infiltration may require the use of pressure grout and/or heavier liner.

9. Remove manhole steps by cutting flush with vertical face of manhole wall prior to Rehabilitation product application.

10. Contractor shall make a reasonable effort to minimize odors emitting from open manholes during preparation work, liner installations, and inspections.

15.1.9 Installation

1. Rehabilitate manholes as identified on the drawings. Proper equipment shall be used at all times. Contractor shall observe OSHA confined space and safety requirements during all manhole entries.

2. Liner shall extend one (1) foot into pipelines where appropriate, to ensure adequate overlap with pipe materials unless otherwise indicated on the drawings.

3. The liner shall be installed and cured in place via a pressurization blower system with steam heat injection or equivalent process. Pressure shall be approximately 500 to 1000 lbs. per sq. ft. and steam at approximately 250 degrees Fahrenheit. Curing time shall be a minimum of two (2) hours or as recommended by the manufacturer. Liner may be rejected at the sole discretion of City's Construction Project Manager if curing process fails to meet manufacturer recommended procedures, or if installation bladder fails more than once during curing process.

4. Do not install cured-in-place fiberglass epoxy resin liners in no-round structures. Alternative lining methods will be required for the rehabilitation of vaults, diversion structures, or rectangular shaped manholes.

15.1.10 Testing

Contractor shall perform visual inspection. Hollow spots, holes, tears, or delaminations shall be promptly repaired using mastic epoxy. Repair any other defects and irregularities.