



DENVER

THE MILE HIGH CITY

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**

15.3 High Build Novolac Epoxy

15.3.1 General

The work described within this specification details a complete program for trowel applied liner coating for sewer piping and manholes for new construction and remedial work.

15.3.2 Referenced Standards

ASTM D638 – Standard Test Method for Tensile Properties of Plastic.

ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastic.

ASTM C722 – Standard Specification for Chemical Resistant Resin Monolithic Surfaces.

ASTM D790 – Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

ASTM D1763 – Standard Specifications for Epoxy Resins.

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

ICRI Guidelines NO. 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

15.3.3 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 15.3.4 – Quality Assurance.
6. Test Reports: Submit test reports from an independent testing laboratory confirming chemical resistance.
7. Plan to prevent debris from entering sewer line

15.3.4 Quality Assurance

- A. Applicator Qualifications: Trained and certified by Liner Coating Manufacturer. The coating applicator shall submit three (3) references relating to the quality of workmanship performed on other projects using one or more of the coatings listed below, or an approved equivalent coating.

15.3.5 Materials

Product shall be Sewer-Shield® 100 or Sewer-Shield ®150 as manufactured by Environmental Coatings 4702 E. Virginia St., Mesa, Arizona 85215-9101, (480) 984-7608.

- A. Trowel Applied Liner Coating:
 1. Acid Resistance:
 - a. Resistant to 98% sulfuric acid with maximum weight loss in 18 months no greater than 0.08 percent. (Sewershield® 100)
 - b. Resistant to 50% Sulfuric Acid (Sewershield® 150)
 2. Gel Time: 15 minimum minutes at 75 degrees Fahrenheit using a 200 gram mass. Shorter gel times are not acceptable since they will not allow for proper adhesion to substrate.
 3. Fillers:
 - a. Description: Chemical resistant, non wicking type. Fiberglass filler/roving is not acceptable.
 - b. Size: Pass 40 mesh screen.
 - c. Quantity: Not to exceed 20% (+/- 1%) in volume.

4. Thickness:
 - a. Typical: 3/16 inch.
 - b. Material shall be capable of being applied up to 3/8 inch thickness in one application without sagging.
6. Tack Free Time: Obtained in minimum one hour, and maximum 6 hours at 75 degrees Fahrenheit.

15.3.5.1 Accessories

- A. Water Stop Grout:
 1. Material: Hydrophobic polyurethane liquid which when mixed with catalyst, expands when it meets water or moisture.
 2. Acceptable Manufacturer and Product: **Mountain Grout® - Regular** as manufactured by Green Mountain, Inc. and distributed by Environmental Coatings, 4702 E. Virginia St., Mesa, Arizona 85215-9101, (480) 984-7608 is an acceptable product, or an approved equal.
- B. Patching Compound: Sewer-Shield® Products may require structural build-back using C-120 Calcium Aluminates mortar.
 1. Material: Calcium aluminate cement.
 2. Thickness:
 - a. Typical: 0.75 inches to 2 inches.
 - b. Material shall be capable of being applied up to 4 inches thick.
 3. Acceptable Manufacturer and Product: **Sewer-Shield® C-120 Acid - Resistant Underlayment** as manufactured by Environmental Coatings, 4702 E. Virginia St., Mesa, Arizona 85215-9101, (480) 984-7608 is an acceptable product, or approved equal.
 4. Refer to Section 02942 – Calcium Aluminate Mortar.
- C. Curing Primer:
 1. Material: 100% solids, solvent free epoxy curing primer designed to act as a curing compound for "green" concrete.
 2. Acceptable Manufacturer and Product: **Corro-Cure®** as manufactured by Environmental Coatings, 4702 E. Virginia St., Mesa, Arizona 85215-9101, (480) 984-7608 is an acceptable product, or approved equal.

15.3.6 EXECUTION

15.3.6.1 Initial Inspection

- A. Verification of Conditions:
 1. Examine subsurfaces to receive Work and report detrimental conditions in writing to Construction Project Manager. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work, which affects, connects with, or will be concealed by this Work.

15.3.6.2 Surface Preparation

- A. Water Infiltration Remediation (if required): Mix and install specified Water Stop Grout in accordance with manufacturer's instructions if required to fill fissures or voids which are allowing water to infiltrate or exfiltrate into unwanted areas.
- B. Cleaning: Pipes and manholes surfaces to receive liner coatings shall be cleaned with high-pressure water vacuum equipment to remove debris. Recommended minimum cleaning pressure is 4,000 psi for Patching Compound.
- C. Surface Preparation:
 - 1. Concrete and masonry substrates:
 - a. Power wash surfaces using a minimum of 4,000 psi. Sandblast to sound concrete or masonry and to expose "bug holes."
 - b. If required, apply specified manufacturer's approved Patching Compound from 3/4 inch to 2 inches thick (4 inch maximum) to provide a smooth surface.
 - c. Green Concrete (less than 28 days old): Apply specified Curing Primer in accordance with manufacturer's printed instructions.
 - 2. Apply epoxy primer/sealer coat or specified Curing Primer to fill "bug holes" and to provide a smooth surface for application of liner coating.
 - 3. Prior to application of Patching Compound, structure surface shall be adequately sand blasted and roughened. (ICRI Level 5 surface preparation).
 - 4. Surface preparation of concrete for Liner Coating applied without Patching Compound shall be determined on a case-by-case basis.
 - 5. Remove manhole steps by cutting flush with vertical face of manhole wall prior to rehabilitation product application.
 - 6. Benches, walls and floors shall be repaired or refinished as necessary to comply with Wastewater Management Division Standard Detail Drawings (Drawing No. S-502) using chemical grout, hydraulic cement or Portland type II cement. Bench areas and floors shall be lined with Sewer-Shield.
- D. Structure must be dry during product application. Infiltration & moisture must be controlled prior to application of Patching Compound, Curing Primer, and Liner Coating products.
- E. Do not allow extraneous material to enter sewer lines. Extraneous material is defined as soft concrete debris, construction debris, or other materials. Active flows shall be diverted as necessary to ensure that the liquid flow is maintained off the surfaces to be lined. Contractor shall provide submittal explaining how they will prevent debris from entering live flow.

15.3.6.3 Material Installation

- A. Trowel applied liner coating:
 - 1. Provide at benches and channel walls.
 - 2. Provide at smaller manholes that are not accessible to spray equipment.

- B. Spray application of protective coatings may be allowed if the process and spray equipment being proposed complies with coating manufacturers recommendations, and meets or exceeds quality standards as noted for trowel-applied product.

- C. Certified Applicators or approved substitution:
 - 1. Fisher Company, Inc.
Contact: Eric Fisher
P.O. Box 4238
Granby, CO 80446
970-531-6992 (phone)
970-887-3339 (fax)

 - 2. JPCI Services
Contact: Joe Nuciforo
4702 E. Virginia St.
Mesa, AZ 85215-9101
480-984-7608 (phone)
480-380-4461 (fax)

15.3.6.4 Testing and Inspection

- A. Surface preparation work shall be thoroughly inspected by Construction Project Manager prior to application of coating or lining. The Contractor may not proceed with rehabilitation product application until surface preparation work is approved by Construction Project Manager. All structures shall be inspected from the surface to ensure adequate surface preparation has been achieved. A minimum surface roughness profile equivalent to ICRI-4 is required for all coatings/linings. The Contractor is expected to cooperate and assist with the City's inspection efforts.

- B. The Construction Project Manager shall inspect all structural repairs made during the surface preparation process. Any structural repair deficiencies identified by the Construction Project Manager shall be corrected prior to rehabilitation product application.

- C. Contractor shall perform holiday (spark) test on all rehabilitated structures prior to restoration of service with test equipment and voltage appropriate for coating/lining. Voltage is to be set at a minimum of 100 volts per mil of coating/lining thickness (i.e., 12,500 volts for 125 mils). After identification of pinholes, thin areas, or other imperfections, re-apply coating/lining material

within manufacturer recommended recoat time window. Retest. Repeat until no holidays are identified. The Construction Project Manager shall verify voltage and observe final holiday testing performed by Contractor.

- D. A comprehensive visual surface inspection shall be performed by Construction Project Manager for all rehabilitated structures. The finish of the protective coating shall be smooth and uniform, pin hole free, acceptable to City inspections. Construction Project Manager may, at his/her discretion, perform additional entry inspections as deemed necessary. Construction Project Manager reserves the right to reject sub-standard workmanship.

15.3.6.5 Cleaning

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.