STANDARD SPECIFICATIONS FOR
CONSTRUCTING SANITARY SEWER FACILITIES

DIVISION III - CONSTRUCTION SPECIFICATIONS

SECTION 4
URETHANE/EPOXY REHABILITATION OF MANHOLES

4.01 SCOPE

It is the intent of this Specification to cover all aspects of rehabilitation of manholes including types of repair, methods of repair, materials and equipment.

Sanitary sewer manhole rehabilitation covers the following type of repairs:

A. Lining and sealing of manhole.

B. Replacement of manhole frame and cover.

C. Raising of existing manhole frame and cover to existing or above grade.

D. Inflow Dish.

E. Chimney Seal.

4.02 LINING OF MANHOLES

A. General: The work consists of spray applying an urethane/epoxy-based material to the walls, inverts, and benches of manholes, resulting in a monolithic liner of a minimum 1/8 inch thickness or more, as determined by the manufacturer for the specific depth and water table. The applicator, approved and trained, shall furnish all labor, equipment and materials for installing the lining over brick, tile, pre-cast concrete, or concrete block manholes, new or used, using approved equipment. The installation shall be in accordance with the following Contract Specifications along with manufacturer's recommendations.

If the rehabilitation of sanitary sewer manhole necessities the use of cement based product only the following are general guidelines. However the Owner shall be contacted to confirm the current standards and practices along with use prior to beginning work. The manhole shall be rehabilitated by spray applying a proprietary pre-blended mixture of acid-resistant calcium aluminate cement-based material to the walls, inverts, and benches of sanitary sewer manholes, resulting in a monolithic liner with a minimum thickness of 1/2- inch (500 mils). The thickness shall be increased in accordance with the manufacturer’s recommendations to account for the dimensions and existing condition of the manhole and to withstand the forces arising from the manhole’s specific depth and service conditions including groundwater hydrostatic pressures and traffic loading.

Where the level of the water table is not known, it shall be assumed that the water table level is equal to the grade elevation surrounding the manhole being rehabilitated. The water used for the rehabilitation process shall be clean and potable. No other material shall be used or added to mixture without prior approval by the OWNER. The applicator, approved and trained, shall furnish all labor, equipment and materials for installing the lining over brick, tile, pre-cast concrete, or concrete block manholes, new or used, using approved equipment. The installation shall be in accordance with manufacturer's recommendations.

Physical Properties shall be at a minimum the following: Compressive Strength, ASTM C-109, 7,000 psi at 28 days; Flexural Strength, ASTM C-293, 1,200 psi at 28 days and Bond Strength, ASTM C882, 2,000 psi. The liner mix shall be made with manufacturer's recommendations for sanitary sewer manhole applications.

B. Materials:

1. Mixture: The proprietary urethane/epoxy-based materials specifically designed for manhole applications are approved to be used where directed by the Owner are listed in the Appendix or Owner approved equal. The product shall be corrosion resistant to the ingredients of the sanitary sewer environment and shall be designed to bond to wet (not running) surfaces. Certain field conditions may require that only certain approved products be utilized at the discretion of the Owner.

2. Water: Shall be clean and potable.

3. Other Materials: No material shall be used with or added to mixture without prior approval by the Owner.

C. Properties:

1. Physical:

a. Tensile stress, ASTM D-638 6,500 psi

b. Flexural stress, ASTM D-790 10,000 psi

c. Flexural modules, ASTM D-790 550,000 psi

2. Liner Mix shall be made with manufacturer's recommendations for manhole applications.

D. Application:

1. Preparation:

a. Place covers over invert before prepping.

b. All foreign materials shall be removed from the manhole walls and bench using high-pressure water spray (minimum 1,200 psi). Loose and protruding brick, mortar and concrete shall be removed using a masons hammer and chisel. All non-leaking voids shall be filled with a nonshrink cement-based material containing hydraulic cement, as approved and directed by the Owner at least 1 hour prior to spray application of the first coat of liner.

c. Active leaks shall be stopped using products specifically for that purpose and according to manufacturer's recommendations. Grouting with chemically resistant cement-based material shall be used to cease inflow into manholes.

d. Excessively leaking manholes shall be drilled through the manhole wall and injected with grout sealant only after the event that normal leak stoppage methods are not effective and it is approved by the Owner.

e. All loose material shall be removed following the completion of preparation work.

f. The sanitary sewer shall be diverted to perform the required manhole rehabilitation.

g. Manhole inverts and steps shall be protected during rehabilitation application.

2. Spraying:

a. The surface prior to spraying shall be damp without noticeable free water droplets or running water. Material shall be spray applied to a minimum uniform thickness to insure that all voids and crevices are filled and smooth.

b. The application of the liner shall provide a monolithic liner of a minimum of 1/8”. The liner shall be applied to the invert, bench and wall and shall all be equal in thickness as determined by the water table and the product manufacturer. The manhole invert and bench shall be smooth and sloped in the direction of the flow. The manhole bench shall have a gradual slope to the invert. The invert transition to the pipe shall be smooth and shall not impair the flow.

c. No application shall be made when ambient temperatures are less than 40°F and when freezing is expected within 24 hours unless specific recommendations are made by the manufacturer.

d. A minimum of 30 minutes cure time or more as required by the product manufacturer shall be allowed before returning to active flow.

E. Testing: Two standard samples shall be taken from each day's work with the date, location and job recorded for each sample. The samples shall be sent to an established, local, and reputable commercial testing laboratory that has been approved by the Owner to determine if lining materials meet minimum requirements specified herein.

4.03 LINING OF MANHOLES USING CURED-IN-PLACE EPOXY RESIN LINER

A. General: The work consists of lowering the cured-in-place epoxy resin liner into the manhole resulting in a monolithic liner of a minimum 1/8 inch thickness or more, as determined by the manufacturer for the specific depth and water table, including the walls, inverts and benches of manhole. The applicator, approved and trained, shall furnish all labor, equipment and materials for installing the liner over brick, tile, precast concrete, or concrete block manholes, new or used, using approved equipment. The installation shall be in accordance with the following Contract Specifications along with manufacturer's recommendations.

B. Materials:

1. Mixture: A proprietary cured-in-place epoxy resin liner material specifically designed for manhole applications shall be Poly-TriPlex Liner System manufactured by SunCoast Environmental International, Inc. or engineer approved equal. The product shall be corrosion resistant to the ingredients of the sanitary sewer environment and shall be designed to bond to wet (not running) surfaces.

2. Water: Shall be clean and potable.

3. Other Materials: No material shall be used with or added to mixture without prior approval by the Owner.

C. Properties:

1. Physical:

a. Tensile stress, ASTM D-638 12,900 psi

b. Flexural stress, ASTM D-790 17,400 psi

c. Flexural modules, ASTM D-790 550,000 psi

2. Liner Mix shall be made with manufacturer's recommendations for manhole applications.

D. Application:

1. Preparation:

a. Place covers over invert before prepping.

b. All foreign materials shall be removed from the manhole walls and bench using high pressure water spray (minimum 1,200 psi). Loose and protruding brick, mortar and concrete shall be removed using a masons hammer and chisel. All non-leaking voids shall be filled with a nonshrink cement-based material containing hydraulic cement, as approved and directed by the Owner at least 1 hour prior to spray application of the first coat of liner.

c. Active leaks shall be stopped using products specifically for that purpose and according to manufacturer's recommendations. Grouting with chemically resistant cement-based material shall be used to cease inflow into manholes.

d. Excessively leaking manholes shall be drilled through the manhole wall and injected with grout sealant. Payment for this item shall be at unit price bid only after the event that normal leak stoppage methods are not effective and it is approved by the Owner.

e. All loose material shall be removed following the completion of preparation work.

f. The sanitary sewer shall be diverted to perform the required manhole rehabilitation.

g. Manhole inverts and steps shall be protected during rehabilitation application. In the event that the manhole steps require removal, the Contract shall reinstall the steps as directed by the Owner. This shall be incidental to the lining of the manhole.

2. Lining:

a. The surface prior to lining shall be damp without noticeable free water droplets or running water. The saturated resin liner shall be a minimum uniform thickness to insure that all voids and crevices are filled and smooth.

b. The application of the liner shall provide a monolithic liner of a minimum of 1/8”. The liner shall be applied to the invert, bench and wall and shall all be equal in thickness as determined by the water table and the product manufacturer. The manhole invert and bench shall be smooth and sloped in the direction of the flow. The manhole bench shall have a gradual slope to the invert. The invert transition to the pipe shall be smooth and shall not impair the flow.

c. No application shall be made when ambient temperatures are less than 40°F and when freezing is expected within 24 hours unless specific recommendations are made by the manufacturer.

d. A minimum of two hours cure time or more as required by the product manufacturer shall be allowed before returning to active flow.

E. Testing: Two standard samples shall be taken from each day's work with the date, location and job recorded for each sample. The samples shall be sent to an established, local, and reputable commercial testing laboratory that has been approved by the Owner to determine if lining materials meet minimum requirements specified herein.

4.04 REPLACEMENT OF MANHOLE FRAME AND COVER

A. General: This section deals with the replacement of existing manhole frames and covers when new manhole frames and covers are required.

1. New Manhole Frame and Cover: Existing manhole frame and covers will normally be cleaned and reinstalled. Where required, the existing manhole frame and cover shall be removed and salvaged and a new manhole frame and cover installed and adjusted by the Contractor as directed by the Owner. Removing and replacement of pavement shall conform to the section of the specifications herein. New manhole frames and covers shall be provided by Owner. The contractor shall provide the Owner sufficient notice to allow for the acquisition of manhole frames and covers.

4.05 SALVAGING MANHOLE FRAME AND COVER

All existing undamaged manhole frames and covers removed from the manholes shall be considered as salvaged frames and covers. These salvaged frames and covers shall remain the property of the Owner at all times after removal and delivered to the Owner.

Reasonable care shall be exercised to prevent unnecessary damage to the salvaged frames and covers.

The Contractor shall, upon removal of frame and cover, remove all grout from the salvaged frame and cover. The cover shall then be tied to the frame using a minimum of two (2) or more pieces of six (6) gauge wire.

4.06 RAISING OF EXISTING MANHOLE FRAME AND COVER

Existing manholes below grade shall be raised to grade using either cast iron riser ring, brick and mortar, concrete “donut” riser, or manhole riser section as directed by the Owner.

When adjusting with brick, a maximum of 16 inches will be allowed. The mortar shall be troweled to a smooth finish. The brick shall conform to specifications herein.

4.07 INFLOW DISH

An inflow dish shall be installed when required by the Owner in manholes requiring rehabilitation. Inflow dishes shall be as specified herein.

4.08 CHIMNEY SEAL

A chimney seal shall be installed when required by the Owner in manholes requiring rehabilitation. Chimney seals shall be as specified herein.

4.09 MANHOLES LACKING BENCHES AND INVERTS

Manholes lacking benches and inverts shall require building of the bench and invert prior to performing any rehabilitation. Measurement and payment shall be determined by the cubic yards of concrete used to complete the bench and invert.

4.10 WARRANTY

All lining installations shall be warranted to be free from defects in materials and workmanship for a period of five (5) years from the date of project acceptance. Should a defect occur during this five (5) year period that is attributable to the lining installation or materials, then this defect shall be repaired within four (4) weeks from the date of defect notification to the contractor at no additional cost to the Owner.

The contractor shall be responsible for all required repair costs associated with a lining failure during the warranty period including all cost associated with backups and all other property damage.

END OF SECTION