

SECTION 19

REHABILITATION OF MANHOLES

19.01 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 repairs:

- A. Lining and sealing of manhole.
- B. Replacement of manhole frame and cover.
- C. Raising of existing manhole frame and cover to existing grade or above grade.
- D. Inflow dish.
- E. Chimney Seal.

19.02 LINING OF MANHOLES:

A. General:

The work consists of spray applying either a cement-based mix to the walls and benches of manholes, resulting in a monolithic liner of a minimum 1/2 inch thickness or a urethane-based material to the walls and benches of manholes, resulting in a monolithic liner of a minimum 1/8 inch thickness. The applicator, approved and trained, shall furnish all labor, equipment and materials for installing the lining over brick, tile, precast concrete or concrete block manholes, new or used, using approved equipment. The installation at a minimum, shall be in accordance with these Specifications or as otherwise directed by the manufacturer so that all applicable manufacturer warranties will be furnished.

B. Materials:

1. Mixture: A proprietary pre-blended mixture of acid resistant cement, chemically-active aggregates, fiberglass rods and other additives specifically selected for special properties as manufactured by StrongLite Products Corporation and designated

STRONG-SEAL MS-2C or as manufactured by Quadex Inc. and designated Quadex Aluminaliner or as manufactured by Southwestern and designated Permacast MS-10,000 or approved equal or a proprietary-formulated, urethane-based material specifically designed for manhole applications as manufactured by Sprayroq, Inc. and designated SprayWall or approved equal.

2. Water: Shall be clean and potable.
3. Other Materials: No material (other than water for cement based mix) shall be used with or added to mixture without prior approval by the Engineer.

C. Properties:

1. Physical:

Cement-based mix:

- a. Density at placement, pcf, min. 105±lbs/ft³
- b. Compressive strength, ASTM C109, minimum 28 days 5,000 psi

Urethane-based material:

- a. Tensile stress, ASTM D-638 5,000 psi
- b. Flexural stress, ASTM D-790 10,000 psi
- c. Flexural modulus, ASTM D-790 550,000 psi

2. Liner Mix

For cement-based mix, STRONG-SEAL MS-2C, Quadex Aluminaliner or Permacast MS-10,000 or approved equal shall be made with calcium aluminate cement and shall be used in accordance with the manufacturer's recommendation as approved by the Engineer. Otherwise, for urethane-based material, SprayWall or approved equal 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 voids shall be filled with MS-2C as directed by Engineer, or approved equal 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 sealed by drilling through the manhole wall and injecting grout sealant.
- e. All loose material shall be removed following the completion of preparation work.

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 a smooth surface remains after troweling for cement-based mix. The troweling of the cement-based mix shall compact material into voids and crevices and "set" the bond on the manhole surface (brick, tile, block or concrete).
- b. After the first application has taken an initial set, but not over 72 hours, a

second coat shall be spray applied to assure a minimum total thickness of 1/2 inches and trowel to a smooth finish for cement-based mix and a minimum total thickness of 1/8 inches for urethane-based material. Following the second application to the walls for the cement-based mix method, the wooden bench covers shall be removed and the bench sprayed from walls to the invert in a method to produce a bench having a gradual slope from the walls to the invert with the wall/bench intersection built up and rounded to a uniform radius the circumference of the intersection. In addition, the thickness of the bench shall be no less than 1/2 inch at the invert and shall increase in the direction of the wall to provide the required slope. For the urethane-based material, the manhole wall and bottom thicknesses shall be stipulated by ground water pressure as recommended by manufacturer.

- 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. Ambient temperatures of the mixture shall not exceed 90°F.
- d. The final application shall have a minimum of 4 hours cure time before being subjected to active flow.

E. Testing:

For cement-based mix, at least two (2) standard cylinders shall be taken from each day's work with the date, location and job recorded on each. The cylinders shall be sent to an established, local and reputable commercial testing laboratory that has been approved by the Owner where a 28-day compression test will be made. For urethane-based material, samples shall be taken and tested as recommended by manufacturer.

19.03 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 Engineer. Removing and replacing of pavement shall conform to the section of the Standard Specifications entitled "Removing and Replacing Pavement" except that no additional payment will be made for this work. New manhole frames and covers shall be provided by the Board at their 207 N. Catherine Street Warehouse. The contractor shall provide the Board sufficient notice to allow for the acquisition of manhole frames and covers. No payment will be made for obtaining frames and covers.

19.04 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 Board at all times after removal and delivered to the Board's 207 N. Catherine Street Warehouse.

Reasonable care shall be exercised to prevent unnecessary damage to the salvaged frames and covers. No additional payment will be made for this work.

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.

19.05 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 Engineer.

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 Section 12.10 of the Board's Standard Specifications.

19.06 INFLOW DISH:

Where indicated on plans or instructed in the field, manholes shall be provided with an inflow dish. "Rainstopper" or an approved equal shall be installed in the manhole to prevent excessive rainwater from entering the manhole covers. The inflow dish and components shall be manufactured of materials resistant to corrosion from atmospheres containing hydrogen sulfide and dilute sulfuric acid. The inflow dish shall allow venting of sewer gases. The inflow dish shall be stainless steel unless otherwise specified by the Engineer and shall be anchored to the manhole by a tether. Installation shall be in accordance with manufacturer's recommendations and shall not impede the proper seating of the manhole cover.

19.07 CHIMNEY SEAL:

Where indicated on plans or instructed in the field, manholes shall be provided with "Flex-Seal", or "Cretex", or "Ring Seal" or an approved chimney seal equal as specified by the Engineer. The chimney seal shall be installed in new or existing manholes to stop infiltration in the chimney area. The chimney seal shall be flexible and allow repeated vertical and horizontal movement due to traffic loading. The chimney seal shall be secured to the manhole cone. The chimney seal shall have a design life of at least 25 years. The chimney seal shall be installed in the manhole in accordance with the manufacturer's recommendation.

19.08 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 to the Board's Standard Specifications.

**19.09 MANHOLE REHABILITATION
CONTRACTOR QUALIFICATIONS:**

Manhole rehabilitation construction shall be performed in accordance with these specifications and by the methods practiced by STRONGSEAL, QUADDEX, Permacast, SprayWall, or similar system approved by the Engineer. The manhole rehabilitation contractor shall provide evidence and references for successfully installing a minimum of 1,000 manholes of the specified manhole rehabilitation in the United States of America. The Contractor shall also provide documentation that the specified material to be used has been successfully installed in 3,000 manholes in the United States of America and has been in place for a minimum of five (5) years. Documentation of the above two (2) requirements shall be included with the bid proposal.

19.10 VACUUM TESTING:

The sealant materials described in this Specification shall be installed in such a manner that the rehabilitated manhole will pass a vacuum test as described in Section 12.042 of the Standard Specifications.

**19.11 MANHOLE REHABILITATION
WARRANTY:**

Rehabilitation work performed on a manhole shall be warranted from defects and failure for a period of 5 years from the date of acceptance. If the materials and installation furnished by the Contractor fail during this period, the Contractor shall repair the manhole at no expense to the Owner.

END OF SECTION