

ITEM 910
Manhole Rehabilitation Specification

910.1 DESCRIPTION: This item shall govern rehabilitation of manholes complete and in place and the materials used therein, including cleaning, interior surface restoration, priming the prepared surface and coating (including bench and invert of the manhole). It shall also include all required by-pass pumping necessary to complete the work.

910.2 REFERENCED STANDARDS: Reference standards cited in this Specification Item No. 910 refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification Item No. 910 unless a date is specifically cited.

1. AASHTO – American Association of State Highway and Transportation Officials:
 - a. M306: Standard Specification for Drainage, Sewer, Utility, and Related Castings.
2. ASTM – American Society for Testing and Materials:
 - a. A536: Standard Specification for Ductile Iron Castings.
 - b. C478: Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
 - c. D638: Test Method for Tensile Properties of Plastics.
 - d. D648: Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edgewise Position.
 - e. D790: Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - f. D1238: Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
 - g. D1505: Standard Test Method for Density of Plastics by the Density-Gradient Technique.
 - h. D1693: Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.
 - i. ASTM C 109 – Standard Test Method for Compressive Strength of Hydraulic Cement
 - j. Mortars (Using 2-in. or [50-mm] Cube Specimens)
 - k. ASTM C 293 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)
 - l. ASTM C 490 - Standard Practice for Use of Apparatus for the Determination of Length Change of Hardened Cement Paste, Mortar, and Concrete
 - m. ASTM C 496 – Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
 - n. ASTM C 882 – Standard Test Method for Bond Strength of Epoxy-Resin Systems Used
 - o. With Concrete By Slant Shear
 - p. ASTM C 1140 - Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panels.
3. COSA – City of San Antonio:
 - a. Utility Excavation Criteria Manual.
4. TCEQ – Texas Commission on Environmental Quality:

- a. Design Criteria for Sewage Systems (30 TCEQ § 217).
- b. Edwards Aquifer Recharge Zone (30 TCEQ § 213).

910.3 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Engineer's requirements and submittals shall be approved by the Engineer prior to delivery.

- 1 Submit proposed methods, equipment, materials and sequence of operations for sewer construction.
- 2 Plan operations so as to minimize disruption of utilities to occupied facilities or adjacent property.
- 3 Submit test reports.
- 4 Submit pre and post construction videos.
- 5 Videos become property of SAWS.
- 6 Manufacturer shall certify that Applicator has been trained and approved in the handling, mixing and application of the products to be used.
- 7 Equipment to be used for applying the products by the Applicator shall be certified and approved by the Manufacturer.
8. Only manhole rehabilitation products approved by the SAWS Standards Committee shall be used.
9. The Contractor shall submit descriptive information including technical data sheets and ASTM test results on each product proposed indicating that the product conforms to and it is suitable for its intended use per these specifications.

910.4 MATERIALS:

1. Concrete: Concrete shall conform to City of San Antonio (CoSA) Standard Specifications for Public Works Constructed. Item 300- Concrete (concrete class "A").
2. Mortar shall be composed of one part Portland Cement, one part masonry cement (or ¼ part hydrated lime) and masonry sand equal to 2-1/2 to 3 times the sum of the volumes of the cements and lime used.
3. Unless otherwise specified, all grouting shall be done with non-shrinking grout.
 - a. Non-shrinking grout shall be furnished factory premixed so only water is added at the job site.
 - b. Grout shall be mixed in a mechanical mixer.
 - c. No more water shall be used than is necessary to produce a flowable grout.
 - d. All proportioning and mixing of the components shall be in accordance with manufacturer's recommendations.
4. Reinforcement: Reinforcing steel shall conform to the requirements of COSA Item 301- Reinforcing Steel.
5. Replacement brick for ring adjustment courses shall be of first quality, sound, kiln fired, new unbroken brick
6. For rehabilitation of existing manholes; first, apply a combination of cementitious coatings followed by an approved epoxy coating. SewperCoat 2000 HS and PG and APM MS-10,000 with ConShield, applied at the required one inch thick application, APM Permacast MS-10,000 with conshield is the only products approved which does not require a subsequent epoxy coating.

7. Other approved materials are located on SAWS website under SAWS Approved Products List. The list is periodically updated. Contractors should check the list prior to starting construction.

910.5 CONSTRUCTION: Proper surface preparation procedures must be followed to ensure adequate bond strength to any surface to be coated.

1. Applicator shall inspect all surfaces specified to receive a liner prior to surface preparation.
2. Applicator shall notify Engineer of any noticeable disparity in the surfaces which may interfere with the proper preparation or application of the repair mortar and/or liner(s).
3. Concrete that is not sound or has been damaged by chemical exposure shall be removed to a sound, concrete surface.
4. All contaminants including: all oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.
5. Surface preparation methods(s) should be based upon the conditions of the substrate and the requirements of the liner to be applied.
6. Surface to receive liner shall be cleaned and abraded to produce a sound concrete surface with adequate profile and porosity to provide a strong bond between the protective coating and substrate.
7. High pressure cleaning with a minimum of 4,000 psi, and 4 gallons per minute using a rotating pencil nozzle, shall be used to clean and free all foreign material within the manhole.
8. Detergent water and cleaning or muratic acid shall be used when grease and oil are present.
9. All materials resulting from the cleaning of the manhole shall be removed prior to application of coating.
10. Active water infiltration shall be stopped by using a cementitious water plug or hydroactive grout which is compatible with the specified coating.
11. **Prepared surfaces should be tested after cleaning but prior to application of the coating, if a specific pH or moisture content of the concrete is required according to manufacturer's recommendations.**
12. Protective-coating materials are to be handled according to their material safety data sheets. Materials are to be kept dry, protected from weather and stored under cover.
13. **Repair/under-coat materials must be accepted and approved by the protective coating manufacturer for compatibility with the specified liner and shall be used to fill voids, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the engineer and liner applicator.**
14. Application procedures shall conform to the recommendations of the liner manufacturer, including material handling, mixing, environmental controls during application, safety, and equipment.
15. The liner application equipment shall be specifically designed to accurately apply the specified liner materials and shall be regularly maintained and proper working order.
16. The liner material must be applied by a Certified Applicator of the liner manufacturer.

17. The liner shall be applied to minimum thickness or as specified by the Engineer manufacturer's recommendations.

910.6 TESTING: Contractor maybe required perform testing for manhole rehabilitation

1. Visually verify the absence of leaks.
2. Contractor maybe required to perform either a hydrostatic test or vacuum test on every manhole that is rehabilitated.
 1. Test to be coordinated with SAWS Inspector.
 2. Test to be performed as outline in Specification Item 852 Sanitary Sewer Manholes.
3. Every manhole that is rehabilitated shall be inspected using high-voltage holiday detection equipment.
 1. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method.
 2. After abrading and cleaning, additional protective coating material shall be applied to the repair area.
 3. All touch-up repair procedures shall follow the protective coating manufacturer's recommendations.
4. If a manhole fails to pass one of the above tests, it shall be repaired in accordance with the manufacturer's recommendation and re-tested.
5. It shall not be accepted until it passes all tests.
6. All repairs and re-testing shall be at no additional cost to SAWS.

910.7 MEASUREMENT: Manhole Rehabilitation shall be measured by vertical feet of manhole depth. Sewer Structure Rehabilitation (Noncircular Manholes, and Manholes Greater than 4 ft. in Diameter) shall be measured by the square feet of area to be rehabilitated.

1. The bench area of the manhole or manhole structure is considered to be subsidiary to the measurement of the rehabilitated manhole or manhole structure, and, shall be rehabilitated as necessary.

910.8 PAYMENT: This item shall be paid for by square foot at the unit price bid or by the vertical foot of depth for the unit price bid for "Manhole Rehabilitation." Payment shall be full compensation for materials, labor, equipment, tools, testing, and any incidentals necessary to complete the work including the bench, invert, and all interior surfaces of the manhole. Payment will be made under the following:

- Pay Item (910.1): Manhole Rehabilitation (Standard Manholes 4 ft diameter) per Vertical Feet.
- Pay Item (910.2): Sewer Structure Rehabilitation (Noncircular Manholes, and Manholes Greater than 4 ft. in Diameter) – per Square Feet.

End Specification