

SECTION XXXXXX – TECHNICAL SPECIFICATIONS FOR INSTALLATION OF
PROTECTIVE COATINGS FOR MANHOLES, WETWELLS, AND OTHER SANITARY
SEWER STRUCTURES

1.00 PART 1 -- GENERAL

1.01 SCOPE

- A. It is the intent of this contract to install a 100% solids epoxy monolithic coating to the walls, benches and inverts of all manholes and the specified surfaces of other structures. This specification covers work, materials, equipment and tools including specially developed application equipment as required for installation of a field applied unique monolithic interior surfacing system. The use of specialized equipment combined with rigorous surface preparation requirements shall be used to apply the products without the use of solvents. The equipment adds high heat and pressure to the monolithic surfacing system resulting in a high build and quick set of the completed system. Product application requirements and procedures described herein include surface preparation, mixing application, material handling and storage, qualification of the applicator and application quality control.
- B. The condition of the structures to receive the protective coating will be classified in accordance with the following criteria:

Condition	Description
New	New structures or structures that have not been exposed to sanitary sewer. No evidence of infiltration.
A	Minimal damage. Minimal evidence of exposure to sanitary sewer gases. No evidence of infiltration.
B	Moderate damage such as missing mortar between bricks in brick manholes, some exposed aggregates in concrete structures. Moderate evidence of exposure to sanitary sewer gases. Evidence of minimal infiltration.
C	Severe damage such as missing bricks in brick manholes, severe exposed aggregates or exposed reinforcing steel in concrete structures. Severe evidence of exposure to sewer gases. Evidence of moderate infiltration.

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C. The minimum coating thickness shall be as described in the following table:

Type of Structure	Condition	Minimum Coating Thickness (mils)
Manhole (precast)	New	80
Manhole (precast) with force main discharge and next 3 downstream manholes	New	125
Manhole (precast)	A	150
Manhole (brick)	A	200
Manhole (precast)	B	175
Manhole (brick)	B	250
Manhole (precast)	C	300
Manhole (brick)	C	350
Wetwell or Lift Station	New	125
Wetwell or Lift Station	A	200
Wetwell or Lift Station	B	250
Wetwell or Lift Station	C	350

1.02 REFERENCES

A. The following standards are hereby incorporated into these specifications by reference:

1. ASTM D638 – Tensile Properties of Plastics
2. ASTM D790 – Flexural Properties of Un-reinforced and Reinforced Plastics
3. ASTM D695 – Compressive Strength of Rigid Plastics
4. ASTM D4541 – Pull-off Strength of Coatings Using a Portable Adhesion Tester
5. ASTM D2584 – Volatile Matter Content
6. ASTM D2240 – Durometer Hardness, Type D
7. ASTM D1653 – Water Vapor Transmission of Organic Coating Films
8. ASTM D543 – Resistance of Plastics to Chemical Reagents
9. ASTM C297 – Flatwise Tensile Strength of Sandwich Constructions.
10. ASTM – The published standards of the American Society for Testing and Materials, West Conshohocken, PA.
11. NACE – The published standards of the National Association of Corrosion Engineers (NACE International), Houston, TX.

1.03 SUBMITTALS

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- A. All submittals shall be submitted in accordance with the applicable portions of these specifications.
- B. The Contractor shall submit the following information to the Engineer for approval prior to beginning the installation of the protective coating.
 - 1. Manufactures data sheets for the coating materials
 - 2. Third party test results verifying the physical properties of the coating materials meet or exceed the requirements of these specifications.
 - 3. Applicator’s procedures for preparing the surface of the structure and installing the coating system.
 - 4. Documentation that the Applicator of the coating has been trained and certified by the Manufacturer and meets the experience requirements of these specifications.

2.00 PART 2 – PRODUCTS

2.01 The coating system shall be a spray-applied 100% solids epoxy monolithic surfacing system for use in coating new or existing manholes, wetwells, liftstations, treatment plants, and other structures. All products to be used on this project must be pre-approved by the Engineer prior to the bid date. The following products have been pre-approved for use on this project.

- A. S-301 by Warren Environmental, Inc
- B. ARC S1HB by A. W. Chesterton Company

2.02 In order to be considered as an equal, a product must have the following minimum physical characteristics as measured by the applicable ASTM Standards referenced herein.

- A. Minimum Compressive Strength 12,000 psi
- B. Minimum Tensile Strength 7,000 psi
- C. Minimum Flexural Strength 11,000 psi
- D. Minimum Bond Strength 500 psi
- E. Minimum corrosion resistance suitable for environments pH of 0.5 or higher.

2.03 Other manufactures or products seeking pre-approval must submit the following documentation to the Engineer a minimum of two weeks prior to bid date. This time frame allows the Engineer ample time to determine if the proposed product is an acceptable alternative.

- A. Documentation that the proposed product meets the above minimum physical characteristics including results of testing performed by a bonded, third party testing company.
- B. An affidavit attesting to the successful use of the product as a protective coating for concrete or masonry structures for a minimum continuous period

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of five (5) years in wastewater conditions recognized as corrosive or otherwise detrimental to concrete and masonry.

- C. A verifiable list of references that document the successful installation and use of the product in a minimum of 750,000 square feet of sanitary sewer structures.

2.04 All additional products that are pre-approved by the Engineer shall be identified in an addendum issued prior to the bid date.

3.00 PART 3 – EXECUTION

3.01 INSTALLER QUALIFICATIONS

- A. All products must be installed by an Installer that has been trained and certified by the manufacturer.
- B. The Installer must provide verifiable documentation of the above certification and the successful installation of 250,000 square feet of the product in sanitary sewer structures.

3.02 QUALITY ASSURANCE

- A. Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM standards.
- B. Applicator shall use an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts. These workmen shall be completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- C. Applicator shall use approved specialty equipment adequate in size, capacity and number sufficient to accomplish the work of this Section in a timely manner.

3.03 SAFETY

- A. Applicator shall perform his work in a manner to protect the health and safety of all workmen and the public.
- B. All work shall be in accordance with standard industry safety practices.
- C. All work, including entry into confined spaces shall be performed in strict compliance with current OSHA regulations.

3.04 PRE-COAT INSPECTION

- A. The applicator's vehicles and equipment must be able to access the structures to be coated under their own power.
- B. Active flows shall be dammed, plugged or diverted as required to ensure that the liquid flow is maintained below the surfaces to be coated.

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- C. Installation of the protective coating shall not commence on any surfaces containing freshly poured concrete until the concrete substrate has properly cured, and in no case less than 28 days.

3.05 SURFACE PREPARATION

- A. Applicator shall inspect all surfaces specified to receive the monolithic surfacing system prior to surface preparation. Applicator shall promptly notify Owner of any noticeable disparity in the surfaces that may interfere with the proper preparation or application of the monolithic surfacing system.
- B. All concrete that is not sound or has been damaged by chemical exposure shall be restored to a sound concrete surface. All contaminants including all oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.
- C. Surfaces to receive protective coating shall be cleaned to produce a sound concrete or masonry surface with adequate profile and porosity to provide a strong bond between the monolithic surfacing system and the substrate. Surface preparation methods shall be based upon the conditions of the substrate and the requirements of the monolithic surfacing system to be applied, but as a minimum, shall be in accordance with the procedures listed below.
 - 1. Clean all surfaces with high pressure water to remove all loose or contaminated debris. Other equipment and methods may be required to remove all unsound material.
 - 2. When all loose, contaminated, and unsound debris has been removed, the surface shall be etched with a solution of 20% muratic acid to clean and open the pores of the substrate.
 - 3. The surface shall be washed again and the wash water shall contain a dilute solution of chlorine to diminish microbiological bacteria growth and to kill any bacteria residing on the surface.
 - 4. The surface shall be tested with litmus paper at various points throughout the structure to ensure that the pH is within acceptable limits (not to exceed 8.5). If the surface does not meet the pH requirements, the above steps shall be repeated until the surface pH is within acceptable limits. All tests results will be retained for review by the Engineer.
 - 5. Active water infiltration shall be stopped by using a cementitious water plug that is compatible and suitable for top coating with the specified monolithic surfacing system.
 - 6. If pre-installation inspection reveals infiltration (defined as visible and consistent movement of water) though the wall of the structure, a collapse in an area of the wall, a bench that needs to be rebuilt/repared, a necessity for sandblasting (if necessary after surface preparation as described in specification) or anything that will require

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more than typical preparation of the structure, the contractor will advise the Owner's representative. Such extra work will be approved in writing between the Owner and the contractor prior to the commencement of the work and shall be considered as a separate pay item.

D. APPLICATION

1. The interior surfacing system shall be applied to the chimney, walls, bench, and invert of all manholes and to the specified surfaces of all other structures.
2. The interior surfacing system shall be continuously bonded to all brick, mortar, concrete, chemical sealant, grout, pipe and other surfaces inside the manhole according to ASTM C882 testing and therefore shall be designed for hydrostatic loading.
3. The cured surfacing shall be monolithic with proper sealing connections to all un-surfaced areas and shall be placed and cured in conformance with the recommendations of the monolithic surfacing system manufacturer.
4. When cured, the system shall form a continuous, tight-fitting, hard, impermeable surfacing that is suitable for sewer system service and chemically resistant to any chemicals, bacteria or vapors normally found in domestic sewage.
5. The system shall effectively seal the interior surfaces of the manhole and prevent any penetration or leakage of groundwater infiltration.
6. The system shall be compatible with the thermal conditions of the existing sewer manhole surfaces.
7. Heated, plural component, specially designed equipment for use in the spray or spin-cast application of the specified system approved for use by the monolithic surfacing system manufacturer.
8. Application procedures shall conform to the recommendations of the interior surfacing system manufacturer, including material handling, mixing, and environmental controls during application, safety, and equipment.
9. The equipment shall be specially designated to accurately ratio and apply the specified materials and shall be regularly maintained and in proper working order.
10. The specified materials must be applied by an approved installer of the monolithic surfacing system.
11. The walls and bench and invert of the structure shall be lined with the monolithic surfacing system to provide a thickness as previously specified based on the condition of the existing structure. The cured surfacing shall be monolithic with proper sealing connections to all un-surfaced areas and shall be placed and cured in accordance with the recommendations of the monolithic surfacing system manufacturer.

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12. Specially designed spray and/or spin-cast application equipment shall be used to apply each coat of the system.

E. QUALITY ASSURANCE

1. Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM standards.
2. Applicator shall use an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts. These workmen shall be completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
3. Applicator shall use approved specialty equipment adequate in size, capacity and number sufficient to accomplish the work of this Section in a timely manner.

F. TESTING AND INSPECTION

1. During application a wet film thickness gage, such as those available through Paul N. Gardner Company, Inc. meeting ASTM D4414 – Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used to ensure a monolithic coating and uniform thickness during application.
2. The Engineer and Applicator shall make a final visual inspection. Any deficiencies in the finished system shall be marked and repaired according to the procedures set forth herein by Applicator.

4.00 PART 4 – WARRANTY

4.01 TEN YEAR WARRANTY

- A. All approved products must provide a ten-year performance limited warranty that the installed product will:
1. Stop deterioration of the lined surfaces by sewer gas induced corrosion.
 2. Prevent infiltration of ground water into the collection system through the lined surfaces.
 3. Stop root intrusion through the lined surfaces.

5.00 PART 5 – MEASUREMENT AND PAYMENT

5.01 MEASUREMENT

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- A. Measurement for new and rehabilitated manholes shall be per vertical foot for each designated diameter and shall be measured from the invert to the top of the frame.
- B. Measurement for new and rehabilitated wetwells, pumpstations, and other structures shall be per square foot and shall be measured as the total area that receives the protective coating.

5.02 PAYMENT

A. PAYMENT

Payment will be made under:

____ Dia. Precast Manhole Coating (New)	- per VF
____ Dia. Type ____ (Precast/Brick) Manhole Rehabilitation	- per VF
(Wetwell/Structure) Coating (New)	- per SF
(Wetwell/Structure) Type ____ Rehabilitation	- per SF