

## SECTION 609 - MANHOLE POLYURETHANE LINING (TYPE C)

### 1. GENERAL

The sewer manholes with this project shall be polyurethane lined.

The work shall consist of preparing all interior concrete surfaces and the base of the sewer manhole for the application of the epoxy primer, polyurethane lining and all incidentals necessary to complete the work contained in these technical provisions.

- A. The Contractor shall furnish all labor, material, and equipment necessary for the preparation of surfaces, application of lining, safety procedures, protection of existing surfaces and equipment, and cleanup.
- B. At the option of the Utility Engineer, the Contractor shall demonstrate the material on a sample area, which is representative of a job site application. When approved, the sample area shall serve as a standard for all further work.

### 2. CLEANING

Prior to the application of repair/resurfacing mortar and the polyurethane protective lining, the manhole shall be thoroughly cleaned by high water pressure blast at pressures of 3,000 psi minimum to 6,000 psi maximum to remove all laitance and other deleterious material, to obtain a clean, sound substrate to produce a suitable bonding surface for the polyurethane liner.

### 3. REPAIR/RESURFACING MORTAR PLACEMENT

Repair/resurfacing mortar shall be applied in continuous lifts between ½" – 2 inches in thickness as required to provide a substrate suitable for the application of the Polyurethane protective lining. Sewer flows shall be maintained unless otherwise specified.

The repair mortar shall be Strong Seal Profile Plus as manufactured by Strong Seal Systems of Pine Bluff, Arkansas.

The repair mortar application shall be performed only by workers approved by the manufacturer as trained and experienced with the specified material. The mortar shall be spray applied by low-pressure equipment approved by the mortar manufacturer. The equipment shall be in good working order to ensure correct mixing and application of components.

### 4. REPAIR/RESURFACING MORTAR CURING

Immediately following the mortar placement operation, the manhole cover shall be reinstalled to provide a moist curing environment. Where moist conditions do not exist, the contractor shall provide a water cure to the mortar.

### 5. PRIMER AND LINING MATERIALS

Prior to application of the polyurethane topcoat, all surfaces shall receive a 1 – 3 mil thickness of a 100% solids nonsolvented, moisture-tolerant, low temperature cure, epoxy primer as is manufactured by Zebron Corporation, Anaheim, CA, or equal. The primer materials shall be 100% solids, moisture tolerant epoxy capable of spray application to 1-3 mils thickness in one continuous coat.

The lining material shall be a plural-component, 3 - 1 mix ratio, 100% solid, nonsolvent hybrid polyurethane coating with a shore "D" hardness of 57 at 77 degrees Fahrenheit such as Zebron #386 as manufactured by Zebron Corporation, Anaheim, CA, or equal The material shall be the high-build type capable of application thickness, as specified, without runs or sags and shall be capable of passing ASTM D-1737 for flexibility using cylinder mandrel of 0.5 inch (12.7 millimeter). The flash point of the fluid mixture shall be 450 degrees Fahrenheit open Zahn cup.

The coating material shall meet the following resistive specifications:

<u>Solution</u>	<u>Concentration</u>
Acetic Acid	5%
Sulfuric Acid	20%
Sodium Hydroxide	5%
Ammonium Hydroxide	5%
Nitric Acid	1%
Ferric Acid	1%
Soap	0.1%
Detergent (Linear Alkyl Benzyl Sulfonite or LAS)	0.1%
Bacteriological	BOD not less than 700 PPM
Petroleum Oils and Greases	N/A
Vegetable and Animal Oils	N/A
Volumetric percentages of concentrated C.P. grade reagents	N/A

The material shall have evidence of passing the "Pickle Jar Test" as is noted in section 207-15.3 Chemical Resistance, in the "Greenbook" Standard Specifications for Public Works Construction, 2006 Edition. The material shall also meet the requirements specified in 500-2.4, and the table 500-2.4.10(A), in the "Greenbook" Standard Specifications for Public Works Construction, 2006 edition. The color shall be white or cream. The complete coating shall be impermeable to sewer gases and liquids and nonconductive to bacterial or fungus growth. The lining shall be capable of repair at any time during its life.

## 6. LINING APPLICATION

The lining application shall be performed only by workers approved by the manufacturer as trained and experienced with the specified material. The lining shall be applied by high-pressure, airless equipment approved by the lining manufacturer. The equipment shall be in good working order to ensure correct proportioning and mixing of components.

The polyurethane lining application shall take place after the repair/resurfacing mortar has cured for a minimum of 12 hours at 55.F and shall be applied to all exposed concrete surfaces down to the low flow water level and up to the base of the ring and cover.

Prior to the polyurethane application, the manhole surfaces shall be primed with the epoxy primer to a thickness of 1 – 3 mils. The polyurethane lining is installed immediately after the epoxy primer application or up to 24 hours after the epoxy primer application. The polyurethane lining shall be applied to a minimum 125 mil thickness.

During the application, the contractor shall take wet gauge film thickness readings as required to ensure correct lining thickness. The polyurethane lining shall be uniform in color, fully cured and free of pinholes, surface imperfections and blisters. All areas in question shall be removed and reworked and patched.

Application of the lining shall not take place when exposed to rain, fog or high winds. It is the contractor's responsibility to insure protection of the work for the above-mentioned conditions.

#### 7. SPARK TEST

The cured polyurethane lining shall be spark tested for pinholes with a spark tester set at 15,000 volts minimum. All pinholes shall be repaired as specified.

#### 8. REPAIR METHODS

All defects in the repair/resurfacing mortar shall be repaired as specified in 303-2. In the "Greenbook" Standard Specifications for Public Works Construction, 2006 Edition. All pinholes in the protective lining shall be highlighted with black indelible ink for the purpose of identifying them for the repair process. Using the pinhole as a center point, the area 6 inches around the pinhole must be abraded with a 60-grit paper or "equivalent". Abraded surfaces are then cleaned, primed and top coated Zebron #385 or equal hand mix. Blisters, uncured lining, and surface imperfections shall be completely removed and the areas recoated with epoxy primer and polyurethane lining to a point 6 inches beyond the repair areas at a minimum thickness of 125 mils. Where imperfections exceed an area of one square foot, the contractor shall repair as stated above using the Zebron #386 or equal spray applied polyurethane.

#### 9. MATERIAL SUBSTITUTION

Materials specified are those that have been evaluated for the specific service. Elastomeric urethane products of Zebron Corporation or equal are listed to establish a standard of quality. Standard products of manufacturers other than those specified will be considered when it is proven to the satisfaction of the Engineer they are equal in composition, durability, usefulness, and convenience for the purpose intended. Any substitutions must be approved in writing prior to the bid date. Substitution will be considered provided the following minimum conditions are met:

- A. The proposed lining system shall have a dry film thickness equal to or greater than that of the specified system.
- B. The proposed lining system shall employ an equal number of coats.
- C. The proposed lining system shall employ coating of the same generic type.
- D. The proposed lining system shall have been successfully used in 10 similar projects, all at least 3 years old, where the same proposed lining has been applied to similar exposure and application.
- E. All requests for substitution shall carry full descriptive literature and directions for application, along with complete information generic type, non-volatile content by volume.

- F. In the above-mentioned data, if it appears to be in order, the Engineer may require that the Contractor provide certified laboratory data sheets showing the results of complete spectrographic and durability tests performed on the proposed substitute. Tests shall be performed by an independent testing laboratory approved by the Engineer, and all costs incurred in the testing program shall be borne by the Contractor. The Engineer shall be sole and final judge of the acceptability of any proposed substitution. Requests for substitution must be approved in writing prior to the bid.

#### 10. ACCEPTANCE OF WORK

After the manhole lining work has been completed, the work shall be visually inspected by the Contractor in the presence of the Engineer.