

SEWER MANHOLE REHABILITATION - STRUCTURAL POLYMER LINING  
(as provided by AP/M Permform)

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# SEWER MANHOLE REHABILITATION - STRUCTURAL POLYMER LINING

## PERMACAST® COR+ROC BY AP/M PERMAFORM®

**1 Intent:** It is the intent of this specification to provide minimum standards for materials and methods for waterproofing, sealing, structural reinforcement and corrosion protection of existing manholes, wet wells and similar underground structures from the cover to the channel. This specification offers flexibility in design by offering technologies available for repairing the various defects found in sanitary sewer structures from minor leaks to complete structural failure.

**2 Applicability:** These repair means and methods may be engineered for the depth, diameter, shape, traffic loading, groundwater pressures and condition of each manhole. It is designed as an independent structural reinforcing liner that may be applied to heavily deteriorated precast structures and to seriously weakened brick and masonry structures.

### 3 Referenced Standards

3.1	ASTM D-695	Standard Test Method for Compressive Properties of Rigid Plastics
3.2	ASTM D-790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
3.3	ASTM D-638	Standard Test Method for Tensile Properties of Plastics
3.4	ASTM C-882	Standard Test Method for Bond Strength of Epoxy Systems Used with Concrete by Slant Shear
3.5	ASTM D-4414	Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages
3.6	NACE RP0274	High Voltage Electrical Inspection of Pipeline Coating Prior to Installation
3.7	NACE 6/ SSPC-SP 13	Surface Preparation of Concrete Grouting.

### 4 Related Sections

4.1	Plastic Chimney Liner – I & I Barrier
4.2	Applied Frame – Chimney Internal Seal: Cor+Seal and Cor+Flex
4.3	Cured-in-Place Chimney Liner: CG TopSeal

### 5 Structural Polymer Lining

5.1 COR+ROC® is a two-component 100% solids epoxy gel design formulated for use in sewer systems. It may be applied robotically from the PERMACAST® patented robotic applicator for uniform distribution over the entire interior surface without requiring entry and its corresponding safety requirements. Centrifugal casting avoids air bubble entrapment. The material may also be hand applied by trowel. COR+ROC® produces a smooth, glossy and homogenous protective layer that is impervious to biological corrosion, water, oils and most chemicals.

#### 5.2 Physical Properties

Compressive Strength ASTM D-695	11,400 psi
Flexural Strength ASTM D-790	14,200 psi
Flexural Modulus ASTM D-638	845,000 psi
Tensile Strength ASTM D-638	7,000 psi
Hardness ASTM D-2240, Shore D	90
Ultimate Elongation ASTM D-638	7%
Adhesive Shear ASTM C-882	6,365 psi

The cured epoxy shall have the following HMIS Rating. Health: 0 Fire: 1 Reactivity: 0

## 5.8 Structural Polymer Installation

5.8.1 COR+ROC 100% solids epoxy shall be applied to create a vapor barrier impervious to chemical corrosion and a structural shell at the appropriate thickness for the depth, diameter, ground water pressure, shape, dynamic loads and condition. Typical applied thicknesses to provide structural reinforcement are .125 to .375 inches. It does not harden within minutes so its liner thickness can be easily verified and additional thickness applied within the set time of 20-30 min. depending upon temperatures.

### 5.8.2 Weather Considerations

5.8.2.1 Rising mortar temperatures during COR+ROC application may cause blistering and pinhole problems caused by out-gassing from fresh concrete.

5.8.2.2 Monitoring the dew point during periods of changing weather is recommended to ensure that COR+ROC is not applied over excess moisture that has condensed on the mortar surface.

5.8.2.3 Avoid applying COR+ROC during rain events that can saturate the newly prepared substrate with excess water.

5.8.2.4 See tables 5 and 6 below for optimum temperatures and conditions for COR+ROC application.

5.8.2.5 If rapid cure is required, cure times can be reduced and product performance enhanced by artificially applying heat during the curing process.

**Table 5 - COR+ROC Application Condition**

<b>Condition</b>	<b>Material</b>	<b>Surface</b>	<b>Ambient</b>	<b>Humidity</b>
<b>Optimum</b>	60°-90°F	75°F	75°F	0-95%
<b>Minimum</b>	60°F	55°F	60°F	0%
<b>Maximum</b>	95°F	115°F	100°F	95%

**Table 6 - COR+ROC Curing Schedule**

<b>Surface Temperature &amp; 50% Relative Humidity</b>	<b>Dry to Topcoat</b>	<b>Maximum Recoat Time</b>	<b>Cure for Immersion Service</b>
50°F	4 hours	24 hours	8 hours
75°F	3 Hours	18 hours	6 hours
90°F	2 Hours	12 hours	4 hours

#### 5.8.4 Mixing

5.8.4.1 Combine equal parts of A & B Components in a clean dry pail. Do not mix by hand. Mix each pail of COR+ROC using a power mixer (e.g. 1/2" drill motor and Jiffy mixer paddle). Do not incorporate air into the mix. Mix thoroughly for full 3 minutes. After mixing allow mixed components to induce (sweat-in) for 20-30 minutes at temperatures below 75°F before beginning application. Care should be taken to decrease induction time as temperatures rise above 75°F to avoid flash setting. Metered plural component epoxy pumps may also be utilized to mix and dispense the epoxy through a spray gun or SpinCaster™.

-OR-

5.8.4.2 Use plural component pumping/spraying equipment as recommended.

#### 5.8.5 Applying the Epoxy

5.8.5.1 If application is delayed beyond 24 hours it shall be rinsed to neutralize its surface and the epoxy shall then be applied.

5.8.5.2 The epoxy shall be uniformly applied onto the prepared surface before re-exposure to chemicals can contaminate the substrate. The epoxy shall be applied at a minimum thickness of 250 mils or thicker as specified by the engineer.

5.8.5.3 Sloped surfaces of the floor may be made slip resistance by broadcasting aluminum oxide or silica sand into the surface prior to gelling.

5.8.5.4 Cleanup: Upon completion, the Contractor shall clean up the work site and properly dispose any excess material or debris

## 6 Submittals

6.1 All submittals shall conform to the requirements of the Contract document.

6.2 In addition, the following items may be required of the installer to be submitted to the engineer at the sole discretion of the engineer. This Contract shall not be considered complete until receipt and acceptance of the following:

#### 6.2.1 Reference submittals

6.2.1.1 Contractor certification

6.2.1.2 Material certification

#### 6.2.2 Product data

- 6.2.2.1 Patching and plugging material
- 6.2.2.3 Structural polymer lining

## **7 Product Handling**

- 7.1 Proper protective clothing and breathing apparatus shall be used to avoid direct contact with the liquid components of COR+ROC epoxy if hand spraying or troweling COR+ROC is by man entry. When spraying COR+ROC with the spinner head, breathing apparatus is not required. Manufacturer's material safety data sheets shall be kept on site and the applicator shall ensure familiarization with this information and emergency procedures.
- 7.3 Personnel entry is not required to rebuild the interior wall of most manholes when using the PERMACAST® SpinCaster™. If personnel entry becomes necessary for any reason, OSHA standards for confined space entry shall be strictly observed.

## **8 Quality Assurance and Acceptance**

- 8.1 Visual inspection should verify a leak-free, uniform appearance.
- 8.2 Applied wet film thickness shall be verified per ASTM D-4414, Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages.
- 8.3 The protective coating shall be spark tested per NACE RP0274 at 100 volts per mil of dry film thickness. The dielectric strength of coatings will vary from manufacturer to manufacturer. If this value is unknown, it is recommended that a holiday be created in the coating and the tester be calibrated to the voltage that detects the flaw.

## **9 Measurement for Payment:**

- 9.1 Payment shall be made at the unit price per vertical or square foot of finished wall for each prescribed thickness.