

SECTION 09802

POLYURETHANE MIC COATINGS

PART 1 -- GENERAL

1.01 THE REQUIREMENTS

- A. Furnish and install special coating systems in accordance with the Contract Documents.
- B. Polyurethane MIC Coating
  - 1. Install Special Concrete Coating system where shown on the structural drawings in the Digester Control Building Feed and Overflow Boxes and in the Digester (underside of dome and portion of walls delineated on the drawings).

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03250 - Concrete Accessories
- B. Section 03350 - Concrete Finishes
- C. Section 09900 - Painting

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Without limiting the generality of these Specifications the Work shall conform to the applicable requirements of the following documents:
  - 1. SSPC-SP13/NACE No. 6      Surface Preparation of Concrete
  - 2. NACE                              National Association of Corrosion Engineers
  - 3. SSPC                              The Society of Protective Coatings

1.04 SUBMITTALS

- A. Shop Drawings including the following items shall be submitted in accordance with Section 01300 – Shop Drawings.
  - 1. Manufacturer's product data and material safety data sheets for each coating product provided. Include manufacturer's color chart for each product supplied.
  - 2. Manufacturer's installation instructions and recommendations specific to environmental conditions, surface preparation, substrate conditions, and application procedures.
  - 3. Complete shop drawings including location and details for all terminations and transitions.

4. Certifications:
  - a. Furnish affidavits from the manufacturer certifying that materials furnished conform to the requirements specified.
  - b. Certify concrete repair and coating products have been checked for compatibility.
  - c. Certification from manufacturer stating the applicator and applicator's assigned personnel are certified and have received specific training for the application of the concrete coating system.
  - d. Certificate from applicator stating the assigned personnel have received specific training for the application of the concrete coating system.
  - e. Submit manufacturer's representative or independent inspector's NACE or SSPC certification.
5. Submit manufacturer's representative name, address and telephone number who will inspect work.
6. Provide list of at least 10 applications in high H<sub>2</sub>S environments in Southeast States including contact names, address, phone numbers and date of installation for both the concrete coating system and the applicator.
7. Field Data Records and Installation Reports.
8. Product Warranty.
9. Closeout Submittals:
  - a. As-built drawings which include coating application limits, transitions, and terminations.
  - b. Photos
  - c. Quality assurance records, field data records and installation reports
  - d. Test and evaluation reports including pull-off strength (adhesion) and spark testing.
  - e. Certificate of Surface Preparation
  - f. Certificate of Proper Installation
  - g. Final Report
  - h. Final Certified Warranty

#### 1.05 QUALIFICATIONS

- A. Products shall be manufactured by company specializing in manufacturing the products specified in this section with a minimum of five continuous years of experience for performance in similar applications in wastewater treatment plants or water treatment plants.
- B. The Contractor performing the work shall be fully qualified, experienced and equipped to complete this work expeditiously and in a satisfactory manner and shall be an approved installer of the concrete coating system as certified and licensed by the manufacturer. The Contractor shall have successfully installed a minimum of 5,000 square feet of the proposed system and shall have a minimum of two years service as documented by verifiable

references. The Contractor shall submit the following information to the Engineer for review and approval before any work is performed. The following information is required.

1. The number of years of experience in performing this type of specialized work and in installing the specified coating system.
2. Name of the manufacturer and supplier for this work and previous work listed below.
3. A list of municipal clients that the Contractor has performed this type of work including names, phone numbers, and square feet of material installed.
4. The Contractor shall submit a certified statement from the manufacturer that he/she is a certified and/or licensed installer of the coating system.

#### 1.06 QUALITY ASSURANCE

- A. The supplier shall be responsible for the provisions of all test requirements specified in the referenced ASTM Standards as applicable. The supplier shall also bear the cost of all tests specified in Paragraph 3.05, Field Testing and Acceptance of Coating. In addition, all coating products to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections.
- B. Inspections of the coating products and materials may also be made by the Engineer or other representatives of the Owner after delivery. The products and materials shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though samples may have been accepted as satisfactory at the place of manufacture. Materials rejected after delivery shall be marked for identification and shall be removed from the job at once.
  1. Provide adequate time and access for inspections for the following major activities:
    - a. Pre-surface preparation
    - b. Monitoring of surface preparation
    - c. Post-surface preparation
    - d. Monitoring of repair and resurfacing product application
    - e. Post repair and resurfacing products
    - f. Monitoring of coating application
    - g. Post application inspection and testing
    - h. Corrective actions and final inspection
- C. Pre-installation Meeting
  1. At least two weeks prior to beginning work, the Contractor shall conduct a Pre-installation Meeting to discuss coating procedures and submittals. Attendees shall include the Coating Applicator, Owner, Engineer, Manufacturer's Technical Representative, Testing and Inspection Agencies (if applicable), Concrete Repair subcontractor (if applicable) and the Contractor. The minimum agenda includes:
    - a. Environmental condition requirements
    - b. Surface temperature requirements

- c. Surface pH requirements
- d. Surface preparation procedures
- e. Cleaning procedures
- f. Testing procedures to determine moisture content of concrete
- g. Proper procedures to fill substrate
- h. Application equipment
- i. Proper application of primer
- j. Proper application of coating system
- k. Proper termination and transition details
- l. Inspection of coating during and after application
- m. Testing of coating.
- n. Repair methods
- o. Documentation requirements
- p. Approval Procedures

#### D. Field Data Records

1. Maintain daily Quality Assurance Records including the following:

- a. Date
- b. Atmospheric Temperature and Humidity
- c. Substrate pH
- d. Substrate Temperature
- e. Dew Point
- f. Product Batch Numbers
- g. Mixing Time for Each Part and the Combined Parts of a Coating System
- h. Pot Life
- i. Curing Time of Primer and Finish Layers
- j. Holiday Test Results and Repair Data
- k. Foreman or Supervisor's Signature

#### 1.07 SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. Provide the services of a qualified manufacturer's technical representative who shall adequately supervise the surface preparation and application of the coating and lining products. The manufacturer's representative shall be available to evaluate the coating at each step through the process and shall supervise the lining or coating application until the installer has shown through the proper surface preparation and application of the lining or coating that the system will be installed in accordance with all manufacturer recommendations.
- B. Manufacturer's technical representative or authorized inspector shall be currently certified by NACE or SSPC.
- C. The manufacturer's technical representative shall submit to the Engineer a final report, at the completion of the work, identifying the products used, verifying and certifying that surfaces and lining systems were properly applied, free of pinholes, blisters or other blemishes that will compromise the coating performance, and that the paint systems were proper for the exposure and surface. Discrepancies that are found during the final inspection shall be repaired and another inspection performed until the system is completely satisfactory.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Care shall be taken in shipping, handling and placing to avoid damaging the products. Extra care may be necessary during cold weather construction. Any product or material damaged in shipment shall be replaced as directed by the Engineer.
- B. Products shall be delivered to the site in clearly labeled unopened containers and packaging. While stored, the products shall be adequately packaged and protected. Products shall be stored in a manner as recommended by the manufacturer. Any product showing deterioration, or which has been exposed to any other adverse storage condition that may have caused damage, even though no such damage can be seen, shall be marked as rejected and removed at once from the work.

#### 1.09 WARRANTY

- A. All coatings installed shall be guaranteed by the Contractor for a period of five (5) years from the date of final acceptance. During this period, all defects discovered in the coating, as determined by the Owner or Owner's Engineer shall be repaired or replaced in a satisfactory manner by the Contractor at no cost to the Owner.
- B. The Contractor is responsible for properly preparing the structures for coating prior to the installation of the systems, including stopping all leaks, patching voids, protecting or removing and handling all mechanical equipment such as valves and valve assemblies and weirs, cleaning surfaces, removing rubble, etc.

### PART 2 – PRODUCTS

#### 2.01 PRIMER

- A. Primer shall be as recommended by the coating manufacturer to achieve a superior coating system performance. Manufacturer to select primer based on substrates moisture, environmental conditions and humidity, substrate temperature, pH, and other properties.

#### 2.02 PATCHING / RESURFACING MATERIAL

- A. Patching and resurfacing material shall be self priming, high performance, aggregate reinforced, epoxy modified cement mortar as recommended by the coating manufacturer.

#### 2.03 COATING

- A. Provide a Microbiologically Induced Corrosion (MIC) resistant Elastomeric Polyurethane Concrete Coating on surfaces indicated to receive Coatings in this specification and on drawings.
- B. The Coating shall be Reactamine 760 by Carboline, Series 406 by Tnemec, Polibrid 705 by International by International, Amerthane 490 by PPG or Approved Equal.
- C. The Coating shall be applied to a total DFT of 60 to 80 mils. In addition to Coating, fill bugholes, depressions, and irregularities in surfaces with any dimension greater than 0.0625 inch with epoxy modified cement mortar recommended by manufacturer and apply primer at 10 mils recommended by manufacturer to achieve superior performance.

- D. Coating shall meet the following minimum characteristics:
1. Total Film Thickness of System including primers shall not be less than 70 mils (unless otherwise noted).
  2. Water Vapor Permeance of 0.23 perms per ASTM E96, Method E.
  3. Concrete Tensile Pull Strength 350 psi ASTM D4541.
  4. Tensile Strength of 2,000 psi ASTM D412.
  5. Abrasion Resistance, CS17 Wheel <40mg loss, ASTM D4060, 1000 gm load/1000 cycles.
  6. Minimum Shore Hardness D of 60, ASTM D2240.
  7. Resistant to negative water infiltration.

### PART 3 -- EXECUTION

#### 3.01 PROTECTION OF IN-PLACE CONDITIONS

- A. Equipment, vehicles, buildings, and other finished items shall be protected from damage and overspray. Sensitive equipment shall be wrapped in plastic and tape.

#### 3.02 SURFACE PREPARATION

- A. Surfaces to receive coating shall be clean and free of dirt, oil, grease, and other foreign materials.
- B. Concrete and masonry surfaces shall cure for 28 days minimum prior to coating. Moisture content of concrete and masonry surfaces shall conform to manufacturer's recommended limits. Test surfaces to ensure they are within requirements of the manufacturer. Test methods shall include, but not limited to, Relative Humidity testing by drilling holes into the concrete surface. Do not begin coating work until moisture is within manufacturer's recommended range. Any leak shall be repaired as all surfaces shall be free of floating water.
- C. Minimum surface preparation of concrete shall be per SSPC 13, and provide a surface profile as required by the coating manufacturer. Remove all laitance, weak concrete, dirt, and other contaminants. Remove all fins, protrusions, and similar imperfections to allow a uniform surface after surface preparation. Under no circumstance shall surface preparation be less than manufacturer's recommendation to provide the best possible installation. Moisture levels, pH, and other surface conditions that are considered detrimental to the proper bond to the concrete shall be tested and documented and within acceptable ranges prior to application of coating.
- D. Bugholes, depressions, and irregularities in surfaces with any dimension greater than 0.0625 inch shall be filled with epoxy filler recommended by manufacturer.

- E. Skim coats of epoxy modified mortar shall be applied to restore and smooth surface irregularities to the final finished surface.
- F. Where manufacturer requires additional surface preparation, to provide best possible installation, additional requirements shall be preformed.
- G. Provided written certification on the coating manufacturer's letterhead, signed by an officer of the company that the surface preparation meets the requirements of the coating manufacturer.

### 3.03 PRIMER APPLICATION

- A. Apply moisture tolerant primer at 10 mils or as recommended by manufacturer to achieve superior performance. Test moisture and pH levels of concrete and document. Apply primer when surface is within acceptable ranges prior to application of primer.

### 3.04 COATING APPLICATION

- A. All methods, procedures of mixing, application and curing of the coating material shall be accomplished in strict accordance with manufacturer's printed instructions and recommendations.
- B. Apply Coating to a total DFT of 60 to 80 mils in strict accordance with manufacturer's printed instructions and recommendations.
- C. Application shall be by certified and experienced personnel only. Application of coating systems shall take place when the temperature of the concrete is stable or falling to ensure a minimal amount of out gassing by concrete. Use dehumidification units, fans or other means to provide an adequate environment for application and cure when the environment is not adequate for application or cure.
- D. Application shall produce at a minimum a totally bonded coating, corrosion proof, free of blisters, pinholes and any and all blemishes that may be precursors to failure. Promptly correct or remove, and repair areas that fail visual inspection or testing. Recoat time between coats shall be documented and shall not exceed manufacturer's requirements. Where recoat times are exceeded the coating shall be prepared in strict accordance with manufacturer's recommendations including scarification to provide sufficient profile.
- E. Follow manufacturer's recommendations for terminating coating into a chase and providing 1" radius inside corners, and easing outside corners. Provide cant strips or cove sealant at wall corners and wall to slab intersections as recommended by the manufacturer.

### 3.05 FIELD TESTING AND ACCEPTANCE OF COATING

- A. Field acceptance of the coating system shall be based on the Engineer's evaluation of the appropriate installation of each coat per field inspections, on observation of the measurements of the wet film thickness, and on the observation of spark testing and adhesion testing conducted on the cured liner.
- B. Pre-application testing shall be conducted by applying the Coating at 20 mil thickness over a 5 square foot area where directed to demonstrate the coating application to the inspector(s).

- C. During application of each layer of the coating, the Contractor shall measure the thickness and uniformity of the coating by the use of a wet film thickness gage meeting the requirements of ASTM D4414. The wet film thickness shall be tested continuously for the Contractor's own use. At least three such tests will be observed by the Engineer or Owner for each coat in each 500 square feet.
- D. The coating shall provide a continuous monolithic surfacing with uniform thickness throughout and be free of pinholes, slumps and drips.
- E. All surfaces shall be inspected via high voltage spark testing when all coating work is complete and the coating is hard to the touch.
  - 1. The structure environment shall be properly vented prior to testing to ensure hazardous conditions do not exist.
  - 2. High voltage spark testing shall be performed in accordance with ASTM D4787. The spark testing equipment shall be initially set at 100 volts per 1 mil of applied film thickness of the coating and then adjusted as necessary per ASTM D 4787.
  - 3. All detected holidays shall be marked and the area of the liner shall be repaired. The surface area around the coating shall first be abraded using an appropriate grit paper or other hand abrasion tool. After abrading and cleaning the area, the area shall be patched by hand application of the coating material. All repair procedures shall follow manufacturer's recommended procedures.
- F. The pull-off strength (adhesion) of the liner shall be tested using any one of the five Test Methods (A, B, C, D or E) described in ASTM D-4541. The Contractor shall propose the method and equipment to be used in the tests. The liner adhesion shall be tested in one area for each tank or each 1000 square feet of coated area. At least three replicate pull-off tests shall be performed for each area. The Contractor shall also submit his proposed method for reinstatement of the area of the coating affected by the test. Repair of test areas shall be made by the Contractor at no additional cost to the Owner.
- G. There shall be no groundwater infiltration or other leakage through the structure walls after coating. If leakage is found, it shall be eliminated with an appropriate method as recommended by the coating manufacturer and approved by the Engineer at no additional cost to the Owner.
- H. All pipe connections shall be open and clear.
- I. There shall be no cracks, voids, pinholes, uncured spots, dry spots, lifts, delaminations or other type defects in the lining.
- J. If any defective coating is discovered after it has been installed, it shall be repaired or replaced in a satisfactory manner within 72 hours and at no additional cost to the Owner. This requirement shall apply for the entire guarantee period.

- END OF SECTION -