SECTION 09 97 23

IMMERSION-GRADE CONCRETE COATINGS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes providing and installing an Immersion-Grade Concrete Coating.

B. Coating is intended to be in contact and immersed in un-treated, and partially treated waste water.

1.2 PRICES

A. Perform work on a cost per square foot basis.

1.3 SUBMITTALS

A. Letter from manufacturer stating that system is appropriate for use in this service environment and the requested warranty can be provided.

B. Product Data.

C. Installation instructions (information only).

D. Installation field logs and reports.

1.4 QUALITY ASSURANCE

A. Pre-installation Meeting:
   1. Conduct meeting at Site.
   2. Review requirements for coating Work, including:
      a. Construction schedule.
      b. Availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
      c. Site use, access, staging, and set-up location limitations.
      d. Forecast weather conditions.
      e. Surface preparation and substrate condition and pretreatment.
      f. Application procedures.
      g. Special details and condition of other construction that will affect coating Work.
      h. Testing and inspection requirements.
      i. Temporary protection and repairs of coating Work.

B. Site-Specific Installation Plan: Manufacturer to submit site-specific installation plan for each product to be used. Plan must address temperature (ambient and substrate), humidity, and sunlight exposure conditions specific to the project site, as well as application means and methods and proposed quality control methods.

C. Applicator Qualifications: Experienced firm that has successfully completed coating work with similar materials, design, and extent to that indicated for Project. Must have successful applications of specified materials in local area in use for minimum of five years.

1. Employ foreman with minimum five years of experience as foreman on similar projects, who is fluent in English, to be on Site at all times during Work.

D. Mock-ups: Prior to start of Work or purchase of material, apply a mockup area of at least 250 square feet at location determined by the Engineer, to demonstrate surface preparation, perimeter termination, crack treatment, thickness, texture, color, and standard of workmanship.
   1. Demonstrate surface preparation technique for treating exposed concrete and leveling rough surfaces.
   2. Each consecutive treatment/coating will be layered back 1 foot on the perimeter in a manner that the complete section can be reviewed.
   3. Include a minimum of 1 mock-up of each of the termination details shown on Drawings.
   4. Coordinate testing with the Engineer and have the Engineer or representative present during testing.
   5. Perform wet mil thickness measurements, adhesion pull-off testing (substrate and intercoat), and dry film thickness measurements. See Field Quality Control Testing, Section 3.6. Repair coating damaged as a result of testing.
   6. Adhesion pull-off testing must be performed for each type of substrate and proposed preparation method. Adhesion testing must achieve a minimum of 250 psi. Failure must occur in the concrete substrate.
   7. If Engineer determines mock-up does not comply with requirements, modify mockup or construct new mock-up until mock-up is approved.
   8. Maintain approved mockups in undisturbed condition during Work as standard for judging complete Work.
   9. Approved mockup may become part of completed Work if undisturbed at time of Substantial Completion.

E. Coating Inspector: Owner, at their discretion may retain a coating inspector to inspect the coating work, including performance of destructive and non-destructive testing.
   1. The coating inspector does not have the authority to modify, change or formally interpret the requirements of the Contract Documents as those or the responsibility of the Engineer and/or Owner.
   2. Provide access to all areas of coating work as are required to be provide to the Owner and Engineer.
   3. Work performed by the coating inspector does not relieve the Contractor from performance of any quality assurance or quality control activities outlined herein, or generally required to complete the Work.

1.5 WARRANTY

A. Manufacturer's Warranty:
   1. Written warranty, signed by coating manufacturer, including:
      a. Repair or replace of coating that does not comply with requirements; that fails in adhesion, cohesion, or general durability; that experiences abrasion or tearing failure not due to misuse; that experiences surface crazing, fading or chalking; or that deteriorates in a manner not clearly specified by submitted coating manufacturer's data as an inherent quality of the material for the application indicated.
      b. Warranty Period: 5 years base bid, 5 years alternate bid. Begins after Substantial Completion date.

B. Contractor's Warranty:
   1. Written warranty, signed by Applicator, included in section 00 65 36.

2. Warranty Period: 3 years after Substantial Completion date.

PART 2 PRODUCTS

2.1 COATING MATERIALS, GENERAL

A. Material Compatibility: Provide fillers, primers, finish-coat materials, and related materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Coordinate tie-ins and laps with other coatings not specified in this Section per the recommendations of the manufacturer of the coating specified herein. Confirm compatibility of materials prior to installation.

2.2 IMMERSION-GRADE COATING

A. Provide coating specifically intended for immersion exposure to waste water, as recommended by the coating manufacturer.
   1. Must have history of four successfully similar projects installed within the last two to six years.

B. **BASE BID:** Two-component, 100% solids pure polyurea elastomer coating, with manufacturer approved primer suitable for concrete substrate with the following minimum properties.
   1. Surfacing compound: epoxy or modified urethane mortar, as recommended by epoxy primer coating manufacturer.
   2. Primer: epoxy or modified urethane, as recommended by polyurea coating manufacturer.
      a. Tensile Strength (ASTM D412), 4500 psi
      b. Solids by volume: 89 percent or greater at install.
      c. Viscosity: 25 cps or less.
      d. Adhesion to Concrete: 350 psi or greater.
      e. Color: Different than polyurea coating.
      f. Thickness: Dry film thickness (DFT) of 5 to 10 mils. Final thickness based on selected coating manufacturer.
      g. Basis of Design: Raven 175 by Raven Lining Systems.
   3. Polyurea Coating:
      a. Tensile Strength (ASTM D412 or D638): 1,800 psi or greater.
      b. Elongation (ASTM D412 or ASTM D638): 70% or greater.
      c. Hardness, Shore D (ASTM D2240) 40 to 52.
      d. Gel Time: 5 to 20 seconds.
      e. Tack-free Time: 20 to 120 seconds.
      f. Solids by volume: 100 percent.
      g. Adhesion to primer: 350 psi or greater.
      h. Color: Different than primer and finish coat.
      i. Thickness: 125 mils minimum, DFT. Final thickness based on selected coating manufacturer.
      j. Basis of Design: AquataFlex 506 by Raven Lining Systems.
   4. Finish Coat (at areas that will be exposed to UV only): Provide aliphatic finish coat recommended by polyurea coating manufacturer.
      a. Will not fade, chalk or degrade when exposed to UV.
      b. Appropriate for waste water service environment.
      c. Adhesion to polyurea: 350 psi or greater.

d. Color: Grey or tan to match concrete surface.
e. Thickness: Dry film thickness (DFT) of 3 to 8 mils. Final thickness based on selected coating manufacturer.

C. **ALTERNATE:** Elastomer immersion grade coating, with manufacturer approved surfacer and primer suitable for concrete substrate with the following minimum properties.
1. Surfacing compound: epoxy or modified urethane mortar, as recommended by epoxy primer coating manufacturer.
2. Primer: epoxy or modified urethane, as recommended by immersion coating manufacturer.
a. Solids by volume: 89 percent or greater.
b. Adhesion to Concrete: 350 psi or greater.
c. Color: Different than liner coating.
d. Thickness: Dry film thickness (DFT) of 5 to 10 mils. Final thickness based on selected coating manufacturer recommendations.
3. Liner Coating:
a. Adhesion to primer: 350 psi or greater.
b. Color: Different than primer and finish coat.
c. Thickness: 60 to 80 mils minimum, DFT. Final thickness based on selected coating manufacturer to obtain specified manufacturer's warranty.
d. Basis of design:
1) CIM 1000 manufactred by C.I.M. Industries Inc.
2) Poly-Cote 115 Elastomer Polyurethane by Sherwin Williams.
4. Finish Coat or Top Coat (at areas that will be exposed to UV only): Provide aliphatic finish coat recommended by liner coating manufacturer.
a. Will not fade, chalk or degrade when exposed to UV.
b. Approporate for waste water service environment.
c. Adhesion to immersion coating: 350 psi or greater.
d. Color: Grey or tan to closely match concrete surface.
e. Thickness: Dry film thickness (DFT) of 3 to 8 mils. Final thickness based on selected coating manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions with Applicator and coating manufacturer's representative for compliance with requirements and other conditions affecting application or performance of coating.
1. Ensure that work done by other trades is complete and ready for coating Work.
2. Proceed with coating application only after unsatisfactory conditions have been corrected and surfaces are thoroughly dry.
3. Start of coating application will be construed as Applicator's acceptance of surface conditions.

3.2 SURFACE PREPARATION

A. Cleaning: Before applying coatings or other surface treatments, clean substrates of substances that could impair bond of coating systems. Remove dirt, oil, and grease before cleaning.
1. All mineral build-up on the exposed surfaces of the concrete elements must be removed to expose sound structural concrete.
2. Do not micro-fracture or otherwise damage concrete substrate with removal operations.

3. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.

B. All concrete surfaces, existing and repaired areas, shall have been cured a minimum of 14 days prior to coating application. Additional cure may be required if surfaces do not meet moisture requirements in sub-section K, below.

C. Substrate: Clean and prepare substrate according to coating manufacturer's written instructions. Provide clean, dust-free, dry, and sound substrate for coating application.
1. Verify that substrate has cured and aged for minimum time period recommended by coating manufacturer.
2. Remove fins and projections, splatter, and other irregularities which would prevent monolithic, continuous application of coating.
3. Properly patch substrate defects (such as voids, form tie holes, honeycombing, and cracks) with latex-modified concrete or another material acceptable to coating manufacturer and Engineer.
4. Remove grease, oil, asphalt solids, form-release agents, curing compounds, and other contaminants or film-forming coatings that might impair bond of coating. If chemical removal is necessary, rinse with clean water.
5. Clean and prepare surfaces to be coated according to manufacturer's written instructions for particular substrate conditions and as specified.

D. Abrasive blasting: Abrasive blast all surfaces of the existing substrate to remove surface contaminants, such as laitance, sealers, oils, grease, coating, loose surface material, etc., from the concrete surface. Exposed concrete surfaces shall be prepared in accordance with ASTM D4259 and SSPC-SP 13, and shall conform to the following:
1. Base Bid:
    a. Wall surfaces - CSP 3 to 4 as defined in ICRI Guideline No. 310.2R.
    b. Slab surfaces - CSP 5 to 7 as defined in ICRI Guideline No. 310.2R.
2. Alternate Bid:
    a. Wall and slab surfaces - CSP 4 to 6 as defined in ICRI Guideline No. 310.2R.

E. Bugholes and excessive cavities shall be filled with specified surface filler prior to coating application. The surface of all cured surface fillers shall be abrasively blasted before applying coatings.

F. Follow abrasive blast activities by cleaning with a compressed air jet. Concentrate the air jet at cracks, control and construction joints, and repair perimeter interfaces to ensure that abrasive particles and other contaminants are removed from these crevices.

G. If prepared surfaces become contaminated after first cleaning, they shall be cleaned again at no additional expense to Owner prior to applying the coating.

H. Corner radius cove to be installed prior to coating application.

I. Surfaces other than concrete shall be prepared as required by the coating manufacturer's recommendations for immersion surface.

J. Prepare, treat, rout, and fill joints and cracks in substrates in accordance with coating manufacturer's written recommendations and as indicated in Drawings.

K. Tests: Do not apply primer or high-performance coating to concrete surface unless two or more of the flowing moisture tests confirm appropriate moisture levels for properly prepared substrates:
   1. Plastic Sheet Method (ASTM D4263): Pass/Fail. No visible moisture should be present after testing.
   2. Relative Humidity Test (ASTM F2170): Less than 90 percent relative humidity at a depth of 1-1/2 inches.
   3. Moisture vapor emission rate testing, calcium chloride test (ASTM F1869): Less than 5 pounds per 1,000 square feet per 24 hours.
   4. Radio Frequency Test (ASTM F2659): Less than 5 percent moisture.

3.3 APPLICATION

A. General: Prepare and apply materials according to coating manufacturer's written instructions, at recommended rates and coverages.
   1. Test prepared surfaces for alkalinity, moisture, and other conditions as recommended by coating manufacturer.

B. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface contamination or deterioration. Apply primer to concrete surface with brush or roller. If spray is used, backroll primer to achieve a Uniform coating free of holidays or pinholes to minimize outgassing. Apply second coat of primer if needed to obtain a pinhole free finish.

C. Allow primer to cure in accordance with manufacturer's instructions before top coating with the high-performance coating

D. Apply high-performance coating in accordance with manufacturer's instructions and SSPC PA14.
   1. Keep material containers tightly closed until ready for use.
   2. Keep equipment, air supplies, and application surfaces dry and clean
   3. Blend and mix 2-component materials in accordance with manufacturer's instructions

E. Maintain air supply for material spray application free of oil and water in accordance with ASTM D4285.

F. Apply sufficient high-performance coating to achieve final dry film thickness for containment of potable water.

G. Joint Lines:
   1. Prepare for joint lines should rain or other conditions require work stoppage or extended delay.
   2. Install joint lines clean and straight. Install overlap 6-inches minimum to ensure an impervious joint.
   3. Severely abrade with wire brush or sandpaper and apply bonding agent to all areas where the high-performance coating has cured beyond its recoat window

H. Recoating:
   1. Recoat the coating system within the recoat window to obtain maximum interlayer adhesion to build specific thickness.
   2. Immersion Service: Minimize areas to be recoated outside the recoat window, except at joint lines.

3.4 CURING

A. Cure high-performance coating in accordance with manufacturer's instructions.

B. Curing Time: Allow sufficient time for solvents to evaporate from the cured high-performance coating before placing into service or top coating.

3.5 REPAIR PROCEDURE

A. Repairs to coating may become necessary due to exposure or mechanical damage. Perform repairs as specified herein, or as otherwise required by the coating manufacturer.

B. Clean the areas in accordance within accordance with ASTM D4258, using an appropriate and effective detergent, then to abrade the damage area to sound primer, or in the case of damaged primer, to sound substrate in accordance with ASTM D4259.

C. The area immediately adjacent to the repair should also cleaned in accordance with ASTM D4258 and feather-edge abraded in accordance with ASTM D4259 and blended into the repair area; extending into the sound coating 6 inches. Ensure all areas to be coated are contaminant/chemical free.

D. The application of the coating(s) should begin in the repair area and extend into the feather-edged margin, with care being taken to keep the application within the abraded area(s).

3.6 FIELD QUALITY CONTROL

A. Contractor shall record expiration date, batch, and lot number of sealant and coating materials prior to installation.

B. Contractor to maintain a log of weather and substrate conditions (temperature, relative humidity, etc.) and time period of day for each day and area when coating is installed.

C. Contractor to perform the following testing and submit log of test results to Owner and Engineer. Notify Owner of testing schedule and provide access to test locations for Owner/Engineer review.
   1. Perform moisture content testing of prepared surfaces. Tests shall be completed within 8 hours of commencement of coating operation at a frequency not less than one test per 1,000 sq. ft. or one test for each unique structure (wall/slab) of coating application. Retest when moisture conditions in surface have substantially changed, such as after a precipitation event.
   2. Adhesion pull-off testing in accordance with ASTM D7234. Test frequency will be not less than one measurement location (average of three tests) per 1,000 sq. ft. of coating application.
      a. Minimum adhesion of 250 psi with failure at or within substrate.
      b. Repair coating at location of testing in accordance with repair procedure specified above.
   3. Verify dry film thickness of the coating using method and frequency according to ASTM D6132 and SSPC PA9.
      a. Measured dry film thickness must be in accordance with SSPC PA9 Level 2.
      b. If dry film thickness is too thin, apply additional material at no cost to Owner, or perform other remedial action recommended by coating manufacturer or Engineer.
   4. Perform holiday detection at surfaces in accordance with ASTM D4787 and in accordance with manufacturer's instructions. If pinholes or holidays are identified, apply additional

material at no cost to Owner, or perform other remedial action recommended by coating manufacturer or Engineer.

5. Contractor shall reapply coating in areas disturbed by testing.

D. Prepare adhesion test locations to be performed by engineer or coating inspector (grinding and coreing). Repair test locations performed by Engineer or coating inspector.

3.7 CLEANING

A. At end of each workday, clean Site and Work areas and place rubbish, empty cans, rags, and other discarded materials in appropriate containers.

B. After completing coating Work:
   1. Clean spillage and soiling from adjacent surfaces using cleaning agents and procedures recommended by manufacturer of affected surface. Exercise care to avoid scratching or damage to surfaces.
   2. Repair surfaces stained, marred, or otherwise damaged during coating Work.
   3. Clean up debris and surplus materials and remove from Site.

C. Waste Management:
   1. Collect surplus coating materials that cannot be reused and deliver to recycling or disposal facility.
   2. Treat materials that cannot be reused as hazardous waste and dispose of in appropriate manner.

3.8 PROTECTION

A. Protect work of other trades from damage whether being coated or not. Correct damage by cleaning, repairing, replacing, and recoating as approved by Engineer. Leave in an undamaged condition.

B. Provide “Wet Paint” signs to protect newly coated finishes. Remove temporary protective wrappings provided by others to protect their work after completing coating operations.
   1. After construction activities of other trades are complete, touch up and restore damaged or defaced coated surfaces.

END OF SECTION