

SECTION 09900
PROTECTIVE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Examination, preparation and application requirements for protective coatings applied over various substrates, components, elements, etc.
 - 2. Material specifications for coating systems and related materials.
 - 3. General requirements for material storage handling, mixing, disposal and related items.

1.2 RELATED SECTIONS

- A. Following Work items are related to Work in this Specification, but are specified in other Specifications:
 - 1. Section 07900 – Joint Sealant and Expansion Joint Systems

1.3 DEFINITIONS & ABBREVIATIONS

- A. Abrasive – Material used for blast cleaning such as sand, shot or grit.
- B. Abrasive Blast Cleaning – Surface preparation of substrates by abrasive propelled at high speed.
- C. Applicator – CONTRACTOR and/or individual applying the coating system.
- D. Bug Holes – Small cavities resulting from entrapment of air bubbles in the surface of formed concrete during placement and compaction.
- E. Coating System Manufacturer (CSM) – The approved coating system manufacturer(s) for materials and/or systems to be installed.
- F. Dew Point – Temperature of a given air/water vapor mixture at which condensation starts.
- G. Dry Film Thickness (DFT) – Thickness of cured coating film.
- H. Drying Time – The time interval between application and curing of the material.
- I. Feather Edging – Reducing the thickness along the edge of a material.
- J. Field Coat – The application, or completion of application, of the coating system after installation of the surface at the site of work.
- K. Hold Point – A mandatory verification point requiring approval.
- L. Holiday – A discontinuity, skip, or void in a coating or coating system film that exposes the substrate.
- M. Honeycomb – Segregated condition of hardened concrete generally resulting from poor consolidation of concrete mixtures.
- N. Hydroblast – High-pressure water jetting that may be utilized to clean and/or prepare substrates.
- O. Incompatibility – Inability of a coating to perform well over existing substrates or another coating because of bleeding, poor bonding, or lifting.
- P. Immersion – A service condition in which the substrate to be coated is below the waterline or submerged in water, wastewater, or liquid materials at least intermittently.
- Q. Laitance – A layer of weak, non-durable concrete containing cement fines.
- R. Mil – A unit of measure equal to 0.001 inch.

- S. Overspray – Dry spray that failed to strike the intended surface.
- T. Pinhole – A small diameter discontinuity in a coating or coating system film.
- U. Pot Life – Time interval after mixing of components during which the coating can be satisfactorily applied.
- V. Quality Assurance Inspector – Certified and/or qualified individual(s) responsible for inspecting and/or testing Work such as conditions, materials, installations, applications, etc. to verify Work is performed in accordance with applicable specifications and requirements.
- W. Surfacer (Resurfacer / Filler) Material – A layer of cementitious and/or resin-base material used to fill or restore surface continuity to worn, or damaged, concrete surfaces.
- X. Saturated Surface Dry (SSD) – Concrete surface condition where the surface is saturated, or damp, without the presence of standing water.
- Y. Shelf Life – Maximum storage time for which a material may be stored without losing its usefulness.
- Z. Shop Coat – One or more coats applied in a shop or plant prior to shipment to the site of the work, where the field or finishing coat(s) is applied.
- AA. Spreading (Coverage) Rate – Area covered by a unit volume of coating material at a specific thickness.
- BB. Stripe Coat – A separate application of coating material applied by brush to areas where coating thickness and coverage is difficult to achieve and/or where additional protection is required such as edges, welds, pits, nuts, bolts, washers, etc.
- CC. Tie-Coat – An intermediate coat used to bond different types of coatings. Coatings are used to improve the adhesion of a succeeding coat.
- DD. Touch-Up Coating – The application of coated areas of coated surfaces to repair marks, scratches, and areas where the coating has been damaged or deteriorated to restore the coating film to an unbroken condition.
- EE. Volatile Organic Compound (VOC) – The portion of the coating that is a compound of carbon, is photochemically reactive and evaporates during drying or curing.
- FF. Wet Film Thickness (WFT) – The coating film thickness immediately following application.

1.4 REFERENCE STANDARDS

- A. Reference Standards (Refer to the latest edition):
 - 1. American National Standards Institute (ANSI):
 - a. ANSI/ASC 29.4: Abrasive Blasting Operations – Ventilation and Safe Practice
 - b. ANSI/NSF 61: Drinking Water System Components Health Effects
 - c. ANSI B74.18: Grading of Certain Abrasive Grain on Coated Abrasive Material
 - d. ASTM D16: Standard Terminology for Paint, Related Coatings, Materials, and Applications
 - 2. American Society for Testing and Materials (ASTM):
 - a. ASTM C1193: Standard Guide for Use of Joint Sealants
 - b. ASTM D16: Standard Terminology for Paint, Related Coatings, Materials, and Applications
 - c. ASTM D610: Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
 - d. ASTM D2200 (SSPC VIS1): Pictorial Surface Preparation Standards for Painting Steel Surfaces
 - e. ASTM D3960: Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
 - f. ASTM D4227: Standard Practice for Qualification of Coating Applicators for Concrete

- g. ASTM D4258: Standard Practice for Surface Cleaning Concrete for Coatings
 - h. ASTM D4259: Standard Practice for Abrading Concrete
 - i. ASTM D4262: Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces
 - j. ASTM D4263: Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
 - k. ASTM D4414: Standard Practice for Measurement of Wet Film Thickness by Notch Gages
 - l. ASTM D4417: Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
 - m. ASTM D4541: Standard Test Methods for Pull-Off Strength of Coatings On Metal Substrates Using Portable Adhesion Testers
 - n. ASTM D4787: Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates
 - o. ASTM D5043: Standard Practice for Field Identification of Coatings
 - p. ASTM D5162: Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates
 - q. ASTM D5367: Standard Practice for Evaluating Coatings Applied over Surfaces Treated with Inhibitors Used to Prevent Flash Rusting of Steel when Water or Water/Abrasive Blasted
 - r. ASTM D6132: Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Using an Ultrasonic Gage
 - s. ASTM D6237: Standard Guide for Painting Inspectors (Concrete and Masonry Substrates)
 - t. ASTM D7088: Resistance to Hydrostatic Pressure for Coatings Used in Below Grade Applications Applied to Masonry
 - u. ASTM D7234: Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
 - v. ASTM E337: Standard Test Method for Measuring Humidity With a Psychrometer
 - w. ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
3. International Concrete Repair Institute (ICRI):
 - a. ICRI Technical Guideline No. 03732: Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays
 4. National Association of Corrosion Engineers (NACE):
 - a. NACE Publication 6D-163: A Manual for Painter Safety
 - b. NACE Publication 6F-163: Surface Preparation of Steel or Concrete Tank/Interiors
 - c. NACE Publication 6G-164 A: Surface Preparation Abrasives for Industrial Maintenance Painting
 - d. NACE Standards: January 1988 Edition of the National Association of Corrosion Engineers, TPC.
 - e. NACE SP0188: Standard Practice – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
 - f. NACE SP0288: Standard Recommended Practice, Inspection of Linings on Steel and Concrete
 - g. NACE SP0892: Standard Recommended Practice, Linings Over Concrete in Immersion Service
 - h. NACE Publication TPC2: Coatings and Linings for Immersion Service
 - i. NACE SP0178: Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service
 5. National Association of Pipe Fabricators (NAPF):
 - a. NAPF 500-03: Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings
 - b. NAPF 500-03-04: Abrasive Blast Cleaning for Ductile Iron Pipe
 - c. NAPF 500-03-05: Abrasive Blast Cleaning for Cast Ductile Iron Fittings

6. Occupational Safety and Health Administration (OSHA):
 - a. OSHA 1910.144: Safety Color Code for Marking Physical Hazards
 - b. OSHA 1915.35: Standards – 29CFR - Painting
7. Painting and Decorating Contractors of America (PDCA):
 - a. PDCA P1: Touch-Up Painting and Damage Repair: Financial Responsibility and Definition of a Properly Painted Surface
8. Society for Protective Coating (SSPC):
 - a. SSPC Paint Application Specification No. 1
 - b. SSPC AB 1: Mineral and Slag Abrasives
 - c. SSPC PA 1: Shop, Field, and Maintenance Painting of Steel
 - d. SSPC PA 2: Measurement of Dry Coating Thickness with Magnetic Gages
 - e. SSPC PA 9: Measurement of Dry Coating Thickness on Cementitious Substrates Using Ultrasonic Gages
 - f. SSPC PA Guide 1: Guide for Illumination of Industrial Painting Project
 - g. SSPC PA Guide 3: A Guide to Safety in Paint Application
 - h. SSPC PA Guide 6: Guide for Containing Debris Generated During Paint Removal Operations
 - i. SSPC PA Guide 11: Guide for Coating Concrete
 - j. SSPC SP1: Solvent Cleaning
 - k. SSPC SP2: Hand Tool Cleaning
 - l. SSPC SP3: Power Tool Cleaning
 - m. SSPC SP5: White Metal Blast Cleaning
 - n. SSPC SP6: Commercial Blast Cleaning
 - o. SSPC SP7: Brush-Off Blast Cleaning
 - p. SSPC SP 10: Near-White Blast Cleaning
 - q. SSPC SP11: Power Tool Cleaning to Bare Metal
 - r. SSPC SP12: Surface Preparation and Cleaning of Steel and Other Hard Materials by High and Ultra-High Pressure Water Jetting Prior to Recoating
 - s. SSPC SP13: Surface Preparation of Concrete
 - t. SSPC TR2: Wet Abrasive Blast Cleaning
 - u. SSPC TU-3: Overcoating
 - v. SSPC Guide 15: Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates
 - w. SSPC V2: Systems and Specifications: Steel Structures Painting Manual, Volume 2
 - x. SSPC VIS 1: Visual Standard for Abrasive Blast Cleaned Steel
 - y. SSPC VIS 3: Visual Standard for Power and Hand-Tool Cleaned Steel
 - z. SSPC VIS 4: Visual Standards (Water jetting)
 - aa. SSPC VIS 5: Visual Standards (Wet Abrasive Blast Cleaning)
9. Water Pollution Control Federation (WPCF):
 - a. WPCF Manual of Practice No. 17: Paints and Protective Coatings for Wastewater Treatment Facilities. Guide and Paint Application Specifications

1.5 SUBMITTALS

- A. CONTRACTOR shall provide the following submittals, specific to this Section, to OWNER for review and/or approval:
 1. Pre-Award Submittals: Submitted as part of the Bid
 - a. CONTRACTOR and subcontractor qualifications:
 - 1) Include CONTRACTOR and individual certifications, licenses, work experience, and related documentation.
 - 2) Include evidence that the company has a minimum of 5 years of continuous experience in the application of specified materials. Submit a list of at least five completed Projects of similar scope and size, including:
 - a) Project Name.
 - b) Owner's Name.
 - c) Owner's Representative's Name, Address, and Contact Information.

- d) Description of Work.
 - e) Coatings Used.
 - f) Project Manager / Supervisor.
 - g) Total cost of Coating Work.
 - h) Start and Completion Date (Projected/Actual).
 - b. Intent to Warrant(s).
 - c. Letter and/or certifications from CSM(s) specifying that the CONTRACTOR and/or subcontractor are an approved applicator of their materials.
2. Pre-Construction Submittals: Submitted prior to Work.
- a. Product Data / Safety Data Sheets of all products and materials to reside, or be used, on-site. At a minimum, data sheets should include:
 - 1) Performance Criteria.
 - 2) Surface Preparation Requirements.
 - 3) Detailing Requirements (Terminations, Transitions, Etc.).
 - 4) Storage, Mixing, and Application Instructions.
 - 5) Thinning Instructions and Requirements.
 - 6) VOC Data.
 - 7) Safety Data and Requirements.
 - b. Letter from Coating System Manufacturer (CSM) indicating that material(s) are appropriate for the specified application.
 - 1) Include CSM-permitted cleaning and thinner solutions (if applicable)
 - 2) Include any additional CSM permissions in conflict with requirements herein and/or not indicated on CSM's data sheets and/or instructions.
 - c. Quality Control Forms:
 - 1) To be submitted as part of the Quality Control System
 - 2) Include inspections, hold points, testing, etc.
 - d. Product Samples: 5" x 7" (min) Samples for each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Include:
 - 1) Color samples.
 - 2) Stepped and cut samples defining each separate coat, including primers.
3. During Construction: Submitted at specified intervals during construction.
- a. Quality Control Documentation (weekly or as requested).
 - b. Quality Assurance Documentation performed by CONTRACTOR.
4. Closeout Documents: Submitted upon Project completion and prior to final payment.
- a. Submit a letter from the CSM indicating that a representative portion of all major steps in the coating Work was inspected by the CSM and that all that work was performed in accordance with the CSM's recommendations and instructions.
 - b. Record Documentation
 - 1) Provide as-built documentation and records of work completed including red-lined drawings, specifications, etc. indicating work performed, materials, dimensions, locations, etc.
 - c. Construction Photos (electronic).
 - d. Quality Control Documentation.
 - e. Warranty(s).

1.6 QUALITY CONTROL AND ASSURANCE REQUIREMENTS

- A. Qualifications: CONTRACTOR and Subcontractor's performing coating activities shall satisfy the following qualifications and requirements at a minimum:
 - 1. Qualified and Certified in accordance with requirements as specified herein in this specification. CSM Qualified and/or certified applicator.
 - 2. At least 5 years of continuous experience in the removal, preparation and application of specified, or equivalent, coating materials.
 - a. Employ a site superintendent and/or foreman with a minimum 5 years of experience as foremen on similar projects to be on-site at all times.

- b. Employ only personnel who have been trained, or approved, by the CSM in writing as being qualified to perform the coating system work covered herein.
- B. Quality Control:
- 1. General: The following identifies general quality control responsibilities for the CONTRACTOR performing coating Work. Refer to sections herein and the Contract Documents for additional quality control requirements:
 - a. Verify existing dimensions and details prior to substrate preparation and installation of materials. Notify OWNER of conditions found to be different than those indicated in Contract Documents. OWNER will review the situation and inform CONTRACTOR of recommended changes.
 - b. Ensure inspection tools and/or testing equipment are calibrated prior to use.
 - c. Do not use or retain contaminated, outdated, or diluted materials for coating. Do not use materials from previously opened containers.
 - d. Use only products of the approved CSM(s) in accordance with the Contract Documents. Provide the same products for repairs as for original coating work, unless otherwise specified and/or approved by OWNER.
 - e. Inspection by Quality Assurance Inspector(s) does not limit the CONTRACTOR's responsibilities for inspection and quality workmanship. Material compatibility and/or quality control as specified herein or as required by the CSM(s) instructions.
 - 1) Make available all locations and phases of the work for periodic and/or required observation and/or inspection by OWNER, OWNER'S designated representative, and/or Quality Assurance Inspector.
 - 2) Provide necessary access, support, ventilation, egress, safety, and other means required to perform and/or validate Work.
 - f. Provide daily quality control reports to OWNER on a weekly basis, or as otherwise requested by OWNER. Submit reports in Portable Document Format (PDF). At a minimum, quality control reports shall include:
 - 1) Project Identification.
 - 2) Date and Time(s).
 - 3) Atmospheric and Ambient Conditions.
 - 4) Inspector and Foreman Identification.
 - 5) Number of Workers On-Site.
 - 6) Work Area(s).
 - 7) Work Scope Performed.
 - 8) Work Progress.
 - 9) Quality Control Inspections.
 - a) Material(s), Batch No(s).
 - b) Location(s)
 - 10) Quality Assurance Inspections (Internal and By Others).
 - 11) Other Pertinent Information.
 - g. The methods of construction shall be in accordance with requirements of the Contract Documents and best trade practices unless otherwise permitted by OWNER.
- C. Mockups: For each material and/or system to be installed, prepare the surface and apply the coating system to a representative location designated by OWNER to demonstrate aesthetic effects and quality of materials and execution. Leave a portion of the prepared surface and each coating layer exposed to view. Adhere to recognized hold points for review by the Quality Assurance Inspector.
- 1. CSM and Quality Assurance Inspector shall observe mockup Work and approve, in writing, applicable hold points and final installation.
 - 2. The Quality Assurance Inspector may perform field adhesion tests of coatings as part of acceptance.
 - 3. If the Quality Assurance Inspector determines the mockup does not comply with requirements, modify the mockup or construct a new mockup until the mockup is approved. Do not proceed with Work until the mockup is approved.

4. Approved mockup will be the acceptance standard for the remainder of the Work.
 5. Approved mockup may become part of completed Work, if appropriate.
- D. Quality Assurance Testing and Inspection:
1. Quality Assurance Inspections are to be performed at critical steps throughout the Work process. Unless indicated otherwise by OWNER, the Quality Assurance Inspector shall perform inspections.
 - a. Refer to Table 1 herein for typical quality assurance testing and inspection requirements.
 - 1) Specific quality assurance inspection and testing requirements shall be determined based on the specific application. CONTRACTOR shall include applicable quality assurance inspection and testing requirements and hold points in their quality control system. CONTRACTOR shall coordinate with OWNER and/or OWNER's Quality Assurance Inspector as required to verify applicable requirements.
 - b. Refer to Checklists 1 and 2 herein for typical Quality Control/Assurance requirements and inspection activities with representative hold points. The checklist may be modified based on specific application and/or scope requirements.
 - 1) Hold Points are indicated in **bold** and represent required quality assurance inspection and/or testing. Do not proceed with Work that may make hold point inspections difficult or impossible to perform until inspection has been completed and deficiencies corrected.
 - 2) The CONTRACTOR is required to coordinate hold points with OWNER or its designated representative such that inspections and testing can be performed on a scheduled basis. CONTRACTOR shall provide OWNER and/or Quality Assurance Inspector a minimum 48-hour advanced notice for required quality assurance hold point inspections and testing.
 - c. CONTRACTOR shall reapply coating in areas disturbed by inspection and/or testing at no cost to OWNER.
 - d. If inspected Work is unacceptable, the OWNER and/or Quality Assurance Inspector will determine the remedy. CONTRACTOR shall remove and replace unacceptable coating or perform other remedial actions at no cost to OWNER. CONTRACTOR may, at their own expense, perform additional measurements and testing to determine limits of areas with unacceptable coating.

1.7 WARRANTY

- A. Contractor Warranty:
1. Repair or replace coating that does not comply with requirements; that fails in adhesion, cohesion, or general durability; that cracks, checks, fades, or chalks; where visible rust occurs; or that deteriorates in a manner not clearly specified by submitted CSM's data as inherent quality of material for application indicated.
 2. Coating re-work shall closely match the color of the existing coating. Extend new coating to reveals, surface edges, or other natural termination points to minimize differences in appearance between new and existing coating.
 3. Warranties Coverage:
 - a. Adhesive or cohesive failure of existing coating that remains in place.
 - b. Necessary surface preparation Work.
 - c. Providing access to warranty Work.
 - d. Materials
 4. Warranty Period: 1 year after quality assurance acceptance of completed system. Warranty periods extending beyond 1 year are desirable and will be considered during bid evaluation.

- a. An annual follow-up inspection shall be conducted following 12 months of service after acceptance of the coating work. Service is identified as exposure to the intended environment(s) for which the coating was selected (Example: Interior tank wall service = Exposure to process liquids for which tank is used for). The owner, CONTRACTOR's representative, and a representative of the CSM shall attend this follow-up inspection.
- B. Coating Manufacturer Warranty:
1. Submit a written material warranty, executed by the CSM, agreeing to repair or replace coatings materials that fail within the specified warranty period. Failures include, but are not limited to, water penetration through the coating, blistering, and/or peeling of the coating.
 2. Warranty Period: 3 years of service after acceptance of the coating work. Warranty periods extending beyond 3 years are desirable and will be considered during bid evaluation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Adhere to requirements herein and applicable requirements within the Contract Documents.
- B. Deliver materials to the Project site in original containers with seals unbroken, labeled with:
 1. Product name or title of material.
 2. Manufacturer's stock/batch number.
 3. Date of manufacture and shelf life, or expiration date.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Application and mixing instructions.
 6. Handling instructions and precautions.
 7. Hazardous material identification label.
- C. Store materials in original, undamaged containers and, if permitted, partially-used materials tightly covered containers in a clean, dry, well-ventilated, protected location on raised platforms with weather-protective coverings, within the temperature range required by the coating manufacturer. Protect stored materials from direct sunlight, heat, sparks, and flames.
- D. Limit stored materials on structures to safe loading of structure at the time materials are stored, and to avoid permanent deck deflection.
- E. Handle and store materials to prevent damage.
- F. Conspicuously mark damaged or opened containers, containers with contaminated materials, diluted materials, and/or expired materials, and remove them from the site as soon as possible.
- G. Empty containers used on the job shall have labels canceled and shall be marked.
- H. Dispose of materials in accordance with Federal Register 40 CFR 262.

1.9 CLEANING

- A. At the end of each workday at a minimum, clean the site and work areas and place rubbish, empty cans, rags, and other discarded materials in appropriate containers.
- B. After completing coating Work, clean spillage, overspray, and spatter from adjacent surfaces using cleaning agents and procedures recommended by the manufacturer of the affected surface. Exercise care to avoid scratching or damage to surfaces. Repair surfaces stained, marred, or otherwise damaged during coating Work.
- C. Upon completion of coating work the CONTRACTOR shall remove surplus materials, protective coverings, and accumulated rubbish, thoroughly clean all surfaces, and repair any overspray or other coating-related damage.

1.10 SAFETY

- A. Adhere to requirements herein and applicable requirements within the Contract Documents.
- B. The CONTRACTOR is required to attend a safety briefing with OWNER prior to Work.

- C. The CONTRACTOR shall ensure OWNER and CONTRACTOR personnel are aware of any hazards peculiar to the job site.
 - 1. Provide and/or identify (if available) the location(s) of first aid stations, eye wash stations and pertinent safety equipment
 - 2. Provide contact information of responsible personnel and emergency phone numbers.
 - 3. Obtain contact information for OWNER stakeholders and pertinent OWNER site personnel.
 - 4. Determine and communicate evacuation routes.
- D. Keep all work areas clean and safe.
- E. Obey all plant rules and regulations.
- F. Barricade and/or establish appropriate labeled boundaries to prevent entry to the Work location by individuals who do not have a business need to enter.
 - 1. Establish appropriate sound and/or material exposure/hazard boundaries (as required).
 - 2. Hang appropriate hazard labels and/or communicate applicable hazards to appropriate OWNER personnel.
 - 3. Ensure appropriate contact information is clearly displayed and/or communicated such that individuals may contact responsible personnel to communicate hazards and/or permit access.
- G. The CONTRACTOR shall conduct all work covered by this section in accordance with all pertinent OSHA regulations.

1.11 CHANGES IN WORK

- A. It shall be the responsibility of the CONTRACTOR to notify OWNER of any conflicts, obstructions, discrepancies, damage, deterioration and similar items at variance with the Contract Document content, specifications, instructions, field conditions, weather, etc. that could jeopardize integrity or performance of coating systems promptly upon discovery by means of a formally submitted Request for Information (RFI).
- B. CONTRACTOR shall submit proposed changes relating to Work including but not limited to scope, execution, materials, schedule, etc. to OWNER by means of a formally submitted RFI.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MATERIALS

- A. Source Limitations: For each coating system, obtain materials through one source from single coating manufacturer, or from sources approved by CSM(s).
- B. Material Compatibility: Provide sealants, surfacers, primers, intermediate coats, finish coats, and related materials that are compatible with one another and substrates indicated under conditions of application and service, as demonstrated by CSM based on testing and field experience. Compatibility shall be verified as part of the bid process.
- C. Material Quality: Provide CSM(s) quality coating materials that are factory formulated and are recommended by CSM for application indicated. Material containers not displaying CSM(s) product identification are not acceptable.
- D. Material Color Requirements:
 - 1. General:
 - a. All coating applications requiring multiple coats, stripe coating and/or similar multi-stage applications shall be required to vary colors with each respective coat. Final finish color shall be approved by OWNER.
 - 2. For Metallic Surfaces:
 - a. Immersion
 - 1) Prime Coat: Red
 - 2) Intermediate Coat: Beige
 - 3) Finish Coat: Gray
 - 4) Or OWNER approved color combination.
 - b. Atmospheric
 - 1) Prime Coat: Red
 - 2) Intermediate Coat: White
 - 3) Finish Coat: Selected by OWNER
 - 4) Or OWNER approved color combination.
- E. Use one of following systems or approved equal:
 - 1. HRSD System #1: Acrylic Latex; For Interior & Exterior Concrete, CMU and Brick Substrates Exposed to Weathering Only ; For Aesthetics ; Breathable ; Not for Exposure to Corrosive Chemicals, Immersion and/or Constant Wet/Dry Conditions:

MANUFACTURER	FILLER/ SURFACER	DFT (MIL)	BASE COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Sanitile 100	10 – 12	Carbocrylic 3359 DTM	3	Carbocrylic 3359 DTM	3	16 – 18
International	Devoe Tru-Glaze- WB 4015	10 – 11	Devoe Devcryn 1448	3 – 4	Devoe Devcryn 1448	3 – 4	16 – 19
PPG	Pitt-Glaze 16-90	10 – 13	N/A	N/A	Perma-Crete 4-110	6 – 7.2	16 – 20.2
Sherwin Williams	Heavy Duty Block Filler	10 – 18	Sher-Cryl	3 – 3.7	Sher-Cryl	3 – 3.7	16 – 25.4
Tnemec	Envirofill Series 130	10	N/A	N/A	W.B. Tneme-Crete Series 180	6 – 8	16 – 18
APPROVED EQUAL							

2. HRSD System #2: Elastomeric Acrylic; For Interior and Exterior Concrete, CMU, and Brick Substrates Exposed to Weathering and Requiring Flexibility ; For Aesthetics ; Breathable ; Not for Exposure to Corrosive Chemicals, Immersion and/or Constant Wet/Dry Conditions:

MANUFACTURER	PRIMER COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Flexxide Elastomer 100	6 – 8	Flexxide Elastomer 100	6 – 8	12 – 16
Induron	AC 403 Acrylic Elastomeric Coating	6 – 8	AC 403 Acrylic Elastomeric Coating	6 – 8	12 – 16
PPG	Perma-Crete Pitt-Flex 4-110XI	6 – 7	Perma-Crete Pitt-Flex 4- 110XI	6 – 7	12 – 14
Sherwin Williams	Loxon XP	6 – 8	Loxon XP	6 – 8	12 – 16
Tnemec	Enviro-Crete Series 156	6 – 8	Enviro-Crete Series 156	6 – 8	12 – 16
APPROVED EQUAL					

3. HRSD System #3: Cycloaliphatic Amine Epoxy; For Interior and Exterior Concrete, CMU, Brick and Ferrous Metal Substrates Exposed to Weathering, Intermittent Wetting and/or Mildly Corrosive Environments ; For Protection:

MANUFACTURER	BASE COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Carboguard 890	6 – 8	Carboguard 890	6 – 8	12 – 16
International	Devoe Bar-Rust 231	6 – 8	Devoe Bar-Rust 231	6 – 8	12 – 16
PPG	Amerlock 2 / 400	6 – 8	Amerlock 2 / 400	6 – 8	12 – 16
Sherwin Williams	Dura-Plate 235	6 – 8	Dura-Plate 235	6 – 8	12 – 16
Tnemec	H.S. Epoxy Series 104	6 – 8	H.S. Epoxy Series 104	6 – 8	12 – 16
APPROVED EQUAL					

4. HRSD System #4: Cycloaliphatic Amine Epoxy; For Interior and Exterior Concrete, CMU, Brick and Ferrous Metal Substrates Exposed to Weathering and/or Mildly Corrosive Environments:

MANUFACTURER	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Carboguard 890	6 – 8	6 – 8
International	Devoe Bar-Rust 231	6 – 8	6 – 8
PPG	Amerlock 2 / 400	6 – 8	6 – 8
Sherwin Williams	Dura-Plate 235	6 – 8	6 – 8
Tnemec	H.S. Epoxy Series 104	6 – 8	6 – 8
APPROVED EQUAL			

5. HRSD System #5: Surfacer and Reinforced Epoxy ; For Concrete Substrates with Loss of Concrete \leq 1/2-inch ; For Submerged and Intermittently Submerged Environments ; For Exposure to Process Chemicals, H₂S and MIC ; For Exposure to Abrasives:

MANUFAC.	FILLER/ SURFACER	DFT (IN)	PRIMER COAT	DFT (MIL)	BASE COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT
Carboline	Carboguard 510SG	1/2 (max)	N/A	N/A	Plasite 4500S	30 (min)	Plasite 4500S	30 (min)	1/2" (max) + 60 mil (min)
International	Ceilmote Corocrete 400MP	1/2 (max)	Ceilmote 680M Concrete Primer	5 – 6	N/A	N/A	Enviroline 376F60 Glass Reinf. Epoxy	60 (min)	1/2" (max) + 65 mil (min)
Sauereisen	Restokrete Substrate Resurfacer No. F-121	1/2 (max)	N/A	N/A	N/A	N/A	Sewergard 210S	30 (min)	1/2" (max) + 60 mil (min)
Sherwin Williams	Duraplate 2300	1/2 (max)	N/A	N/A	Duraplate 5900	30 (min)	Duraplate 5900	30 (min)	1/2" (max) + 60 mil (min)
Tnemec	Mortareclad 218	1/2 (max)	N/A	N/A	Perma-Glaze Series 435	30 (min)	Perma-Glaze Series 435	30 (min)	1/2" (max) + 60 mil (min)
APPROVED EQUAL									

6. HRSD System #6: Surfacer and Reinforced Epoxy (Spray or Trowel); For Concrete Substrates with Loss of Concrete \leq 1/2-inch ; For Submerged and Intermittently Submerged Environments ; For Exposure to Process Chemicals, H₂S and MIC ; For Exposure to Abrasives:

MANUFACTURER	SURFACER	DFT (IN)	BASE COAT	DFT (IN)	FINISH COAT	DFT (MIL)	TOTAL DFT
Carboline	Carboguard 510SG	1/2 (max)	Plasite 5371	1/8 (min)	Plasite 4500S	20 (min)	1/2" (max) + 1/8" (min) + 20 mil (min)
Sauereisen	Restokrete Substrate Resurfacer No. F-121	1/2 (max)	Sewergard 210T or 210S	1/8 (min)	Sewergard Glaze 210GL	20 (min)	1/2" (max) + 1/8" (min) + 20 mil (min)
Sherwin Williams	Duraplate 2300	1/2 (max)	Duraplate 5900 DP Mortar	1/8 (min)	Duraplate 5900	20 (min)	1/2" (max) + 1/8" (min) + 20 mil (min)
Tnemec	Mortarclad 218	1/2 (max)	Perma-Shield H ₂ S Series 434	1/8 (min)	Perma-Glaze Series 435	20 (min)	1/2" (max) + 1/8" (min) + 20 mil (min)
APPROVED EQUAL							

7. HRSD System #7: Surfacer and Reinforced Epoxy (Fast Cure); For Concrete Substrates with Loss of Concrete \leq 1/2-inch ; For Submerged and Intermittently Submerged Environments ; For Exposure to Process Chemicals, H₂S and MIC ; For Exposure to Abrasives:

MANUFACTURER	SURFACER	DFT (IN)	FINISH COAT	DFT (MIL)	TOTAL DFT
Raven Lining Systems	Raven 755	1/2 (max)	Raven 405 FS/UFS	1/8 (min)	1/2" (max) + 1/8" (min)
Sauereisen	Restokrete Substrate Resurfacer No. F-121	1/2 (max)	Sewergard 210FS	1/8 (min)	1/2" (max) + 1/8" (min)
Sherwin Williams	Duraplate 2300	1/2 (max)	Duraplate 6100 DP Mortar	1/8 (min)	1/2" (max) + 1/8" (min)
APPROVED EQUAL					

8. HRSD System #8: Surfacer and Polyurethane; For Concrete Substrates with Loss of Concrete \leq 1/2-inch; For Submerged, Intermittently Submerged and Exterior Environments; For Substrates Requiring Flexibility; Not for Substrates in Abrasive Environments:

MANUFACTURER	SURFACER	DFT (IN)	FINISH COAT	DFT (MIL)	TOTAL DFT
Carboline	Carboguard 510SG	1/2 (max)	Reactamine 760	100 (min)	1/2" (max) + 100 mil (min)
International	Ceilcote Corocrete 400MP	1/2 (max)	Polibrid 705E	100 (min)	1/2" (max) + 100 mil (min)
Sauereisen	Restokrete Substrate Resurfacer No. F-121	1/2 (max)	Conoflex Urethane No. 381	100 (min)	1/2" (max) + 100 mil (min)
Sherwin Williams	Duraplate 2300	1/2 (max)	Poly-Cote 115	100 (min)	1/2" (max) + 100 mil (min)
Tnemec	Mortarclad 218	1/2 (max)	Elasto-Shield Series 406	100 (min)	1/2" (max) + 100 mil (min)
APPROVED EQUAL					

9. HRSD System #9: Surfacer and Polyurethane; For Concrete Substrates with Loss of Concrete \leq 1/2-inch; For Submerged, Intermittently Submerged and Exterior Environments; For Substrates Requiring Flexibility; Not for Substrates in Abrasive Environments:

MANUFACTURER	SURFACER	DFT (IN)	FINISH COAT	DFT (MIL)	TOTAL DFT
Carboline	Carboguard 510SG	1/2 (max)	Reactamine 760	60 (min)	1/2" (max) + 60 mil (min)
International	Ceilmate Corocrete 400MP	1/2 (max)	Polibrid 705E	60 (min)	1/2" (max) + 60 mil (min)
PPG	Restokrete Substrate Resurfacer No. F-121	1/2 (max)	Amerthane 490	60 (min)	1/2" (max) + 60 mil (min)
Sauereisen	Restokrete Substrate Resurfacer No. F-121	1/2 (max)	Conoflex Urethane No. 381	60 (min)	1/2" (max) + 60 mil (min)
Sherwin Williams	Duraplate 2300	1/2 (max)	Poly-Cote 115	60 (min)	1/2" (max) + 60 mil (min)
Tnemec	Mortarclad 218	1/2 (max)	Elasto-Shield Series 406	60 (min)	1/2" (max) + 60 mil (min)
APPROVED EQUAL					

10. HRSD System #10: Reinforced Epoxy (Spray or Trowel); For Concrete Substrates with loss \leq 1/4-inch; For Submerged and Intermittently Submerged Environments; For Exposure to Process Chemicals, H₂S and MIC; For Exposure to Abrasion:

MANUFACTURER	BASE COAT	DFT (IN)	FINISH COAT	DFT (MIL)	TOTAL DFT
Carboline	Plasite 5371	1/8 (min)	Plasite 4500S	20 (min)	1/8" (min) + 20 mil (min)
Sauereisen	Sewergard 210T or 210S	1/8 (min)	Sewergard Glaze 210GL	20 (min)	1/8" (min) + 20 mil (min)
Sherwin Williams	Duraplate 5900 DP Mortar	1/8 (min)	Duraplate 5900	20 (min)	1/8" (min) + 20 mil (min)
Tnemec	Perma-Shield H ₂ S Series 434	1/8 (min)	Perma-Glaze Series 435	20 (min)	1/8" (min) + 20 mil (min)
APPROVED EQUAL					

11. HRSD System #11: Reinforced Epoxy (Fast Cure); For Concrete Substrates with loss \leq 1/4-inch ; For Submerged and Intermittently Submerged Environments ; For Exposure to Process Chemicals, H₂S and MIC ; For Exposure to Abrasion:

MANUFACTURER	FINISH COAT	DFT (IN)	TOTAL DFT (IN)
Raven Lining Systems	Raven 405 FS/UFS	1/8 (min)	1/8 (min)
Sauereisen	Sewergard 210FS	1/8 (min)	1/8 (min)
Sherwin Williams	Duraplate 6100 DP Mortar	1/8 (min)	1/8 (min)
APPROVED EQUAL			

12. HRSD System #12: Crystalline Cementitious Surfacers and Waterproofing; For Concrete Substrates with Loss of Concrete $\leq 7/16$ -inches; For Submerged, Intermittently Submerged and Atmospheric Environments; For Exposure to Mild Chemicals and Abrasives:

MANUFACTURER	PATCHING & REPAIR	SURFACER	DFT (IN)	FINISH COAT	DFT (IN)	TOTAL DFT (IN)
Xypex	Patch'N Plug	Megamix I	$\leq 3/8$	Concentrate	1/16	7/16 (max)
APPROVED EQUAL						

13. HRSD System #13: Crystalline Cementitious Surfacers and Waterproofing; For Concrete Substrates with Loss of Concrete ≤ 2 -inches; For Submerged, Intermittently Submerged and Atmospheric Environments; For Exposure to Mild Chemicals and Abrasives:

MANUFACTURER	PATCHING & REPAIR	SURFACER	DFT (IN)	FINISH COAT	DFT (IN)	TOTAL DFT (IN)
Xypex	Patch'N Plug	Megamix II	$3/8 < x \leq 2$	Concentrate	1/16	2 (max)
APPROVED EQUAL						

14. HRSD System #14: Epoxy; For Concrete Shop Floors; For Interior Environments; For Exposure to Heavy Loading:

MANUFACTURER	PRIMER COAT	DFT (MIL)	BASE COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Armorpoxy	ArmorPoxy II	3	N/A	N/A	ArmorUltra ARM707X	5	8 (min)
Armorpoxy	Per CSM Req.	6	ArmorUltra ARM707X	5	ArmorUltra ARM707X	12	23 (min)
PPG	NU-KLAD IMP	TBD	N/A	N/A	NU-KLAD SL	80	80
PPG	KL5129/KL5129B	2 – 4	KL5500/KL5500B	N/A	KL5500/KL5500B	35–50	37 – 54
PPG	MegaSeal HSPC Primer	TBD	MegaSeal HDSL	60 (min)	MegaSeal TF or MegaSeal HPU (Optional)	TBD	60 (min)
Sherwin Williams	Armorseal 1000HS	TBD	N/A	N/A	Armorseal 1000HS	5 – 10	5 – 10
APPROVED EQUAL							

15. HRSD System #15: Polyurethane ; For Concrete Shop Floors ; For Interior and Exterior Environments ; For Exposure to Heavy Loading:

MANUFACTURER	PRIMER / SEALER	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
PPG	MegaSeal TF	TBD	MegaSeal HPU	3 – 5	3 – 5
Sherwin Williams	33 Epoxy Primer / Sealer	TBD	HS Polyurethane	2 – 3	2 – 3
APPROVED EQUAL					

16. HRSD System #16: Reinforced Epoxy ; For Concrete and Ferrous Metal Substrates ; For Submerged and Intermittently Submerged Environments ; For Exposure to Process Chemicals, H₂S and MIC ; For Exposure to Abrasives:

MANUFACTURER	PRIMER COAT	DFT (MIL)	BASE COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Per CSM Requirements	TBD	Plasite 4500S	30 (min)	Plasite 4500S	30 (min)	60 mil (min)
International	Ceilmate 680M Concrete Primer	5 – 6	N/A	N/A	Enviroline 376F60 Glass Reinf. Epoxy	60 (min)	60 mil (min)
Sauereisen	Per CSM Requirements	TBD	N/A	N/A	Sewergard 210S	60 (min)	60 mil (min)
Sherwin Williams	Per CSM Requirements	TBD	Duraplate 5900	30 (min)	Duraplate 5900	30 (min)	60 mil (min)
Tnemec	Per CSM Requirements	TBD	Perma-Glaze Series 435	30 (min)	Perma-Glaze Series 435	30 (min)	60 mil (min)
APPROVED EQUAL							

17. HRSD System #17: Reinforced Epoxy ; For Concrete and Ferrous Metal Substrates ; For Submerged and Intermittently Submerged Environments ; For Exposure to Process Chemicals, H₂S and MIC ; For Exposure to Abrasives:

MANUFACTURER	PRIMER COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Per CSM Requirements	TBD	Plasite 4500S	30 (min)	30 (min)
International	Ceilmate 680M Primer (For Concrete Only)	5 – 6	Enviroline 376F60 Glass Reinf. Epoxy	30 (min)	35 (min)
Sauereisen	Per CSM Requirements	TBD	Sewergard 210S	30 (min)	30 (min)
Sherwin Williams	Per CSM Requirements	TBD	Duraplate 5900	30 (min)	30 (min)
Tnemec	Per CSM Requirements	TBD	Perma-Glaze Series 435	30 (min)	30 (min)
APPROVED EQUAL					

18. HRSD System #18: Glass Flake Reinforced Amine Epoxy ; For Submerged and Intermittently Submerged Ferrous Metal ; For Exposure to Mild Chemicals ; For Exposure to Abrasives:

MANUFACTURER	STRIPE COAT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Carboguard 890GF	Carboguard 890GF	20	20
International	Ceilmate 662 Flakeline	Ceilmate 662 Flakeline	20	20
PPG	Amerlock 2/400GF	Amerlock 2/400GF	20	20
Sherwin Williams	Sher-Glass FF Glass Flake Reinforced Epoxy	Sher-Glass FF Glass Flake Reinforced Epoxy	20	20
APPROVED EQUAL				

19. HRSD System #19: Polyurethane ; For Concrete and Ferrous Metal Substrates ; For Submerged, Intermittently Submerged and Exterior Environments ; For Substrates Requiring Flexibility ; Not for Substrates in Abrasive Environments:

MANUFACTURER	PRIMER COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Per CSM Requirements	TBD	Reactamine 760	100 (min)	100 (min)
International	Per CSM Requirements	TBD	Polibrid 705E	100 (min)	100 (min)
PPG	Amerlock 2/400	4 (min)	Amerthane 490	100 (min)	104 (min)
Sauereisen	ConoPrime No. 502	TBD	Conoflex Urethane No. 381	100 (min)	100 (min)
Sherwin Williams	Duraplate 235	4 (min)	Poly-Cote 115	100 (min)	104 (min)
Tnemec	Per CSM Requirements	TBD	Elasto-Shield Series 406	100 (min)	100 (min)
APPROVED EQUAL					

20. HRSD System #20: Polyurethane ; For Concrete and Ferrous Metal Substrates ; For Submerged, Intermittently Submerged and Exterior Environments ; For Substrates Requiring Flexibility ; Not for Substrates in Abrasive Environments:

MANUFACTURER	PRIMER COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Per CSM Requirements	TBD	Reactamine 760	60 (min)	60 (min)
International	Per CSM Requirements	TBD	Polibrid 705E	60 (min)	60 (min)
PPG	Amerlock 2/400	4 (min)	Amerthane 490	60 (min)	64 (min)
Sauereisen	ConoPrime No. 502	TBD	Conoflex Urethane No. 381	60 (min)	60 (min)
Sherwin Williams	Duraplate 235	4 (min)	Poly-Cote 115	60 (min)	64 (min)
Tnemec	Per CSM Requirements	TBD	Elasto-Shield Series 406	60 (min)	60 (min)
APPROVED EQUAL					

21. HRSD System #21: Coal-Tar Epoxy ; For Concrete and Ferrous Metal Substrates ; For Below-grade and Submerged Environments ; For Exposure to Mild Chemicals and Abrasives:

MANUFACTURER	STRIPE COAT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Bitumastic 300M	Bitumastic 300M	20 (min)	20 (min)
Sherwin Williams	Hi-Mil Sher-Tar Epoxy	Hi-Mil Sher-Tar Epoxy	20 (min)	20 (min)
Tnemec	Hi-Build Tneme-Tar Series 46H-413	Hi-Build Tneme-Tar Series 46H-413	20 (min)	20 (min)
APPROVED EQUAL				

22. HRSD System #22: Reinforced Epoxy Liner System ; For Chemical Containment ; For Concrete and Ferrous Metal Substrates ; For Exposure to Caustic, Ferric Chloride, Polymers and Mild Chemicals:

MANUFACTURER	PRIMER COAT	DFT (MIL)	BASE COAT	DFT (MIL)	BLEND / BROADCAST COAT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Per CSM Requirements	TBD	Semstone 140	30 (min)	20/40 Mesh Aggregate	Semstone 140	30 (min)	60 (min)
Tnemec	Epoxoprime Series 201	4 – 6	Power-Tread Series 237	63 (min)	30/50 Mesh Aggregate	Tneme-Glaze Series 281	6 – 8	73 (min)
APPROVED EQUAL								

23. HRSD System #23: Reinforced Epoxy Novolac Liner System with Fiberglass Mat ; For Chemical Containment ; For Concrete and Ferrous Metal Substrates ; For Exposure to Sulfuric Acid, Sodium Bisulfite and Organic Chemicals:

MANUFACTURER	BASE COAT	DFT (MIL)	BLEND / BROADCAST COAT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Semstone 145	30 (min)	20/40 Mesh Aggregate	Semstone 145	30 (min)	60 (min)
International	Devran 124	30 – 40	20/40 Mesh Aggregate	Devran 124	30 – 40	60 (min)
PPG	Amerlock Sealer & Novaguard 840	30 (min)	20/40 Mesh Aggregate	Novaguard 840	30 (min)	60 (min)
APPROVED EQUAL						

24. HRSD System #24: Epoxy Novolac Liner System with Fiberglass Mat; Interior and Exterior Concrete and Ferrous Metal Elements Exposed to Acids, Sodium Bisulfite, Organic Chemicals and Solvents:

MANUF.	PRIMER COAT	DFT (MIL)	BASE COAT	DFT (MIL)	BLEND / BROADCAST COAT	REINF.	SATURANT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Semstone 110	5 – 20	Semstone 145	25–35	20/40 Mesh Aggregate	1.5 oz. Fiberglass Reinf. Mat	Per CSM Requirements	Semstone 145	90–100	130 (min)
Sherwin Williams	Corobond 100 Epoxy Primer / Sealer	4 – 8	Core-Cote HCR Epoxy (Clear)	65	Type M Aggregate	1.0 oz. Glass Mat	Core-Cote HCR Epoxy (Clear)	Core-Cote HCR FF Flake Filled Epoxy	20	130 (min)
Tnemec	Epoxoprime Series 201	12	Chembloc Series 239 SC Mortar	80	Per CSM Requirements	3/4 Chopped Strand Fiberglass	Chembloc Series 239 (12 mils DFT)	Tneme-Glaze Series 282	24	128 (min)
APPROVED EQUAL										

25. HRSD System #25: Reinforced Epoxy Vinyl Ester Liner System with Fiberglass Mat ; For Chemical Containment ; For Concrete and Ferrous Metal Substrates ; For Exposure to a Wide Range of Chemicals:

MANUF.	PRIMER COAT	DFT (MIL)	BASE COAT	DFT (MIL)	BROADCAST COAT	REINF.	SATURANT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Semstone 800 Series Primer	TBD	Semstone 870	25-35	20/40 Mesh Aggregate	1.5 oz. Fiberglass Reinf. Mat	Per CSM Requirements	Semstone 870	90-100	125 (min)
International	Ceilcote 380 Primer	5	Ceilcote 6640 Ceilcrete	80	Per CSM Requirements	1.5 oz. Fiberglass Reinf. Mat	Per CSM Requirements	Ceilcote Flakeline 242	25	110 (min)
PPG	PolySpec PE-310	TBD	PermaRez 300	50-60	F-5 Powder	24 oz woven roving	PermaRez 300 (25 mil DFT)	PermaRex 300	50-60	125 (min)
Sauereisen	VEPrime No. 550	5-10	VEMatte No. 470	63	Per CSM Requirements	1.5 oz. Fiberglass Reinf. Mat	VEMatte No. 470 (63 mils DFT)	VEGlaze No. 472	10	141 (min)
Sherwin Williams	Corobond Vinyl Ester Primer	4.5	Core-Cote VEN (Clear)	65	Type M Aggregate	1.0 oz. Glass Mat	Core-Cote VEN (Clear), 30 mils DFT	Core-Cote VEN FF Flake Filled	20	119.5 (min)
Tnemec	Epoxoprime Series 201	12	Chembloc Series 239 SC Mortar	80	Per CSM Requirements	3/4 Chopped Fiberglass	Chembloc Series 239 (12 mil DFT)	Tneme-Glaze Series 282	12	116 (min)
APPROVED EQUAL										

26. HRSD System #26: Amine Cured Epoxy Novolac ; For Ferrous Metals ; For Interior, Exterior, Submerged and Intermittently Submerged Environments ; For Exposure to H₂S, Acids, Sodium Bisulfite, Polymers and Other Chemicals:

MANUFACTURER	STRIPE COAT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Plasite 4550S	Plasite 4550S	30 (min)	30 (min)
International	Enviroline 225	Enviroline 225	30 (min)	30 (min)
Sherwin Williams	Core-Cote HCR FF	Core-Cote HCR FF	30 (min)	30 (min)
APPROVED EQUAL				

27. HRSD System #27: Zinc, Cycloaliphatic Amine Epoxy and Polyurethane ; For Ferrous Metal Substrates ; For Exterior Environments ; For Exposure to Atmosphere, Weathering, UV and Mildly Corrosive Environments:

MANUF.	PRIMER COAT	DFT (MIL)	STRIPE COAT	BASE COAT	DFT (MIL)	STRIPE COAT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Carbozinc 859	3 – 5	Carboguard 890	Carboguard 890	5 – 6	Carbothane 134 HG	Carbothane 134 HG	3	11 – 14
International	Cathacoat 302H	3 – 4	Devoe Bar-Rust 231	Devoe Bar-Rust 231	5 – 8	Devthane 379	Devthane 379	3	11 – 15
PPG	Amercoat 68 HS	3 – 5	Amerlock 2/400	Amerlock 2/400	5 – 8	Amershield	Amershield	3 – 4	11 – 17
Sherwin Williams	Zinc Clad III	3 – 5	Dura-Plate 235 M-P Epoxy	Dura-Plate 235 M-P Epoxy	5 – 8	Acrolon 7300 Polyurethane	Acrolon 7300 Polyurethane	3 – 5	11 – 18
Tnemec	Tneme-Zinc Series 90-97	3–3.5	Hi-Build Epoxoline II Series N66HS or Tneme-Fascure Series 161HS	Hi-Build Epoxoline II Series N66HS or Tneme-Fascure Series 161HS	5 – 10	Endura-Shield II Series 1075	Endura-Shield II Series 1075	3 – 5	11 – 18.5
APPROVED EQUAL									

28. HRSD System #28: Cycloaliphatic Amine Epoxy and Polyurethane ; For Ferrous Metal Substrates ; For Exterior Environments ; For Exposure to Atmosphere, Weathering, UV and Mildly Corrosive Environments:

MANUF.	PRIMER COAT	DFT (MIL)	STRIPE COAT	BASE COAT	DFT (MIL)	STRIPE COAT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Carboguard 890	5 – 6	Carboguard 890	Carboguard 890	5 – 6	Carbothane 134 HG	Carbothane 134 HG	3	13 – 15
International	Devoe Bar-Rust 231	5 – 8	Devoe Bar-Rust 231	Devoe Bar-Rust 231	5 – 8	Devthane 379	Devthane 379	3	13 – 19
PPG	Amerlock 2/400	5 – 8	Amerlock 2/400	Amerlock 2/400	5 – 8	Amershield	Amershield	3 – 4	13 – 20
Sherwin Williams	Dura-Plate 235 M-P Epoxy	5 – 8	Dura-Plate 235 M-P Epoxy	Dura-Plate 235 M-P Epoxy	5 – 8	Acrolon 7300 Polyurethane	Acrolon 7300 Polyurethane	3 – 5	13 – 21
Tnemec	Hi-Build Epoxoline II Series N66HS or Tneme-Fascure Series 161HS	5 – 10	Hi-Build Epoxoline II Series N66HS or Tneme-Fascure Series 161HS	Hi-Build Epoxoline II Series N66HS or Tneme-Fascure Series 161HS	5 – 10	Endura-Shield II Series 1075	Endura-Shield II Series 1075	3 – 5	13 – 25
APPROVED EQUAL									

29. HRSD System #29: Aluminum Filled Epoxy Mastic ; For Aluminum and Galvanized Steel Substrates ; For Interior and Exterior Environments ; For Exposure to Atmosphere, UV, Weathering and Mildly Corrosive Environments:

MANUFACTURER	STRIPE COAT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Carbomastic 15	Carbomastic 15	5 – 10	5 – 10
International	Devoe Bar-Rust 231 Epoxy Mastic Aluminum	Devoe Bar-Rust 231 Epoxy Mastic Aluminum	5 – 8	5 – 8
PPG	Amerlock 400 AL	Amerlock 400 AL	5 – 8	5 – 8
Sherwin Williams	Epoxy Mastic Aluminum II	Epoxy Mastic Aluminum II	5 – 6	5 – 6
APPROVED EQUAL				

30. HRSD System #30: Silicone Hybrid ; For Ferrous Metal and Stainless Steel Substrates ; For High Temperature Exposures ≤ 1000°:

MANUFACTURER	PRIMER COAT	BASE COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Per CSM Requirements	Thermaline 4900	1.5–2	Thermaline 4900	1.5 – 2	3 – 4
International	Per CSM Requirements	Intertherm 1875	1 - 2	Intertherm 1875	1 – 2	3 – 4
PPG	Per CSM Requirements	Hi-Temp 500 V	2–2.5	Hi-Temp 500 V	2–2.5	4 – 5
Sherwin Williams	Per CSM Requirements	Heat-Flex Hi-Temp 500	2–2.5	Heat-Flex Hi-Temp 500	2–2.5	4 – 5
Tnemec	Per CSM Requirements	Endura-Heat Series 1552	2 – 3	Endura-Heat Series 1552	2 – 3	4 – 6
APPROVED EQUAL						

31. HRSD System #31: Silicone Acrylic ; For Ferrous Metal and Stainless Steel Substrates ; For High Temperature Exposures ≤ 500°:

MANUFACTURER	PRIMER COAT	BASE COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Per CSM Requirements	Thermaline 4700	2	Thermaline 4700	2	4
International	Per CSM Requirements	Intertherm 50	1	Intertherm 50	1	2
PPG	Per CSM Requirements	PPG Hi-Temp 1000 V	1.5 – 2	PPG Hi-Temp 1000 V	1.5 – 2	3 – 4
Sherwin Williams	Per CSM Requirements	Heat-Flex Hi-Temp 1000	1.5 – 2	Heat-Flex Hi-Temp 1000	1.5 – 2	3 – 4
Tnemec	Per CSM Requirements	Endura-Heat Series 1556	2 – 3	Endura-Heat Series 1556	2 – 3	4 – 6
APPROVED EQUAL						

32. HRSD System #32: Epoxy Urethane ; For FRP Substrates ; For Exterior and Intermittently Submerged Environments ; For Exposure to Atmosphere, Weathering, UV and Mildly Corrosive Environments:

MANUFACTURER	STRIPE COAT	PRIMER COAT	DFT (MIL)	STRIPE COAT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Carbocrylic 120	Carbocrylic 120	2 – 3	Carbothane 133HB	Carbothane 133HB	3 – 5	5 – 8
International	Devran 201H	Devran 201H	2 – 3	Devthane 379	Devthane 379	3	5 – 6
PPG	Pittguard 97-145 Series	Pittguard 97-145 Series	4 – 7	Durethane DTM	Durethane DTM	3 – 5	7 – 12
Sherwin Williams	Macropoxy 646 Fast Cure Epoxy	Macropoxy 646 Fast Cure Epoxy	5 – 10	Acrolon 7300 Polyurethane	Acrolon 7300 Polyurethane	3 – 6	8 – 16
Tnemec	Chembuild Series 135	Chembuild Series 135	4 – 6	Endura-Shield II Series 1075	Endura-Shield II Series 1075	3 – 5	7 – 11
APPROVED EQUAL							

33. HRSD System #33: For FRP Substrates ; For Interior, Exterior and Submerged Environments ; For Exposure to Weathering and Mildly Corrosive Environments:

MANUFACTURER	STRIPE COAT	PRIMER COAT	DFT (MIL)	STRIPE COAT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Carbocrylic 120	Carbocrylic 120	2 – 3	Carbocrylic 120	Carbocrylic 120	2 – 3	5 (min)
International	Devran 201H	Devran 201H	2 – 3	Devran 201H	Devran 201H	2 – 3	5 (min)
PPG	Per CSM Requirements	Per CSM Requirements	TBD	Pittguard 97-145 Series	Pittguard 97-145 Series	4 – 7	5 (min)
Sherwin Williams	Per CSM Requirements	Per CSM Requirements	TBD	Macropoxy 646 Fast Cure Epoxy	Macropoxy 646 Fast Cure Epoxy	5 – 10	5 (min)
Tnemec	Chembuild Series 135	Chembuild Series 135	4 – 6	Endura-Shield II Series 1075	Endura-Shield II Series 1075	3 – 5	7 – 11
APPROVED EQUAL							

34. HRSD System #34: Waterborne Acrylic ; For PVC and CPVC Substrates ; For Interior, Exterior and Intermittently Submerged Environments ; For Exposure to Atmosphere, Weathering, UV and Mildly Corrosive Environments:

MANUFACTURER	PRIMER COAT	DFT (MIL)	STRIPE COAT	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Carbocrylic 120	2	Carbocrylic 3359 DTM	Carbocrylic 3359 DTM	3	5
International	Devaryl 1440	2 – 4	Devaryl 1448	Devaryl 1448	3 – 4	5 – 8
PPG	Pitt-Tech Plus 4020PF	3–3.5	Pitt-Tech Plus	Pitt-Tech Plus	2 – 4	5 – 7.5
Sherwin Williams	DTM Acrylic Primer	2.5–5	DTM Acrylic Coating	DTM Acrylic Coating	3 – 4	5.5 – 9
Tnemec	Enduratone Series 1028	2 – 3	Enduratone Series 1028	Enduratone Series 1028	5 – 6	5 – 6

APPROVED EQUAL

35. HRSD System #35: Acrylic Latex ; For Wood Substrates : For Interior and Exterior Environments ; For Exposure to Atmosphere, Weathering and UV Environments:

MANUFACTURER	PRIMER COAT	DFT (MIL)	BASE COAT	DFT (MIL)	FINISH COAT	DFT (MIL)	TOTAL DFT (MIL)
Carboline	Carbocrylic 120	2 – 3	Carbocrylic 3359 DTM	2 – 3	Carbocrylic 3359 DTM	2 – 3	6 – 9
International	Devcryl 1440	2 – 4	Devcryl 1448	2 – 4	Devcryl 1448	2 – 4	6 – 12
Sherwin Williams	Exterior Oil-Based Wood Primer	2 – 3	DTM Acrylic Coating	2.5-4	DTM Acrylic Coating	2.5-4	7 – 11
Tnemec	Elasto-Grip FC 151-1051	1.5	Tneme-Cryl Series 6	2 – 3	Tneme-Cryl Series 6	2 – 3	6 (min)
APPROVED EQUAL							

36. HRSD System #36: Reflective White Elastomeric Acrylic ; For Built-Up Asphalt Roof (BUR), Granular Roll and Liquid Roof Substrates ; For Exterior Environments ; For Exosure to Atmosphere, Weathering and UV:

MANUFACTURER	SEALANTS	REINFORCEMENT	FILLER	PRIMER ⁽¹⁾	TOP COAT	TOTAL DFT (MIL)
ITW Polymers	E-Las-Tek #103 Crack & Joint Sealant	Tie-Tex Polyester Cold Process Roofing Fabric	E-Las-Tek #505 Puddle Plaster	Per CSM Requirements	E-Las-Tek #127 Solar One Plus	32 (min)
Tremco	Per CSM Requirements	Rapid Set Reinforcing Fabric	Per CSM Requirements	Tremprime WB	ICE Coating	32 (min)
APPROVED EQUAL						

NOTES:

1) Applicator shall verify required primer(s) based on surface materials, condition, etc.

37. HRSD System #37: 2-Part Polyurethane ; For Built-Up Asphalt Roof (BUR), Granular Roll and Liquid Roof Substrates ; For Exterior Environments ; For Exosure to Atmosphere, Weathering and UV:

MANUFACTURER	SEALANTS	REINFORCEMENT	FILLER	PRIMER ⁽¹⁾	TOP COAT	TOTAL DFT (MIL)
Tremco	Per CSM Requirements	AlphaGuard Glass Mat	Per CSM Requirements	AlphaGuard M-Prime or C-Prime	AlphaGuard BIO or MT Top Coat	80 (min)
APPROVED EQUAL						

NOTES:

1) Applicator shall verify required primer(s) based on surface materials, condition, etc.

38. HRSD System #38: Aliphatic Polyurethane ; For Built-Up Asphalt Roof (BUR), Granular Roll and Liquid Roof Substrates ; For Exterior Environments ; For Exosure to Atmosphere, Weathering and UV:

MANUFACTURER	SEALANTS	REINFORCEMENT	FILLER	PRIMER ⁽¹⁾	TOP COAT	TOTAL DFT (MIL)
ITW Polymers	ERsystems H.E.R.	Tie-Tex Polyester Cold Process Roofing Fabric	ERsystems Quicket	Polyurethane 300 Aromatic Base Coat	Polyurethane 300 Aliphatic Finish Coat	32 (min)
Tremco	Per CSM Requirements	Permafab Polyester Reinforcement	GEOGARD Seam Sealer	GEOGARD Base Coat	GEOGARD Finish Coat	32 (min)
APPROVED EQUAL						

NOTES:

1) Applicator shall verify required primer(s) based on surface materials, condition, etc.

39. HRSD System #39: Metallic Pigmented ; For Metal Roof Substrates ; For Exterior Environments ; For Exosure to Atmosphere, Weathering and UV:

MANUFACTURER	SEALANTS	REINFORCEMENT	FILLER	PRIMER ⁽¹⁾	TOP COAT	TOTAL DFT (MIL)
Tremco	Per CSM Requirements	Permafab Polyester Reinforcement	GEOGARD Seam Sealer	N/A	ALUMANATION 301	19 (min)
APPROVED EQUAL						

NOTES:

1) Applicator shall verify required primer(s) based on surface materials, condition, etc.

40. HRSD System #40: Reflective White Elastomeric Acrylic ; For Metal Roof Substrates ; For Exterior Environments ; For Exosure to Atmosphere, Weathering and UV:

MANUFACTURER	SEALANTS	REINFORCEMENT	FILLER	PRIMER ⁽¹⁾	TOP COAT	TOTAL DFT (MIL)
ITW Polymers	E-Las-Tek #103 Crack & Joint Sealant	Tie-Tex Polyester Cold Process Roofing Fabric	E-Las-Tek #505 Puddle Plaster	Per CSM Requirements	E-Las-Tek #127 Solar One Plus	17 (min)
Tremco	SOLARGAR D Hybuild	Permafab Polyester Reinforcement	SOLARGAR D Seam Sealer	SOLARGARD Ruse Primer WB	SOLARGAR D Hybuild	17 (min)
APPROVED EQUAL						

NOTES:

1) Applicator shall verify required primer(s) based on surface materials, condition, etc.

PART 3 - EXECUTION

3.1 GENERAL

- A. Coordinate Work with applicable stakeholders to ensure Work is effectively achieved without unintended obstructions, damage, interference, etc. Coordinate with:
 - 1. OWNER or OWNER'S designated representative.
 - 2. ENGINEER.
 - 3. Quality Assurance Inspector.
 - 4. Other trades to ensure that Work done by other trades is complete and ready to receive coating.
 - 5. Other trades to avoid or minimize Work in immediate vicinity of coating Work in progress or completed Work.

3.2 EXAMINATION

- A. CONTRACTOR shall examine substrates under which coating systems will be applied and report to OWNER, in writing, any conditions that would adversely affect the appearance or performance of the coating systems and which cannot be put into an acceptable condition by the preparatory work specified herein. Typical examination includes, but is not limited to:
 - 1. Verification that Work done by other trades is complete and ready to receive coating.
 - 2. Verification that areas and conditions under which Work is to be performed permit proper and timely completion of Work.
 - 3. Verification of compatibility with and suitability of substrates, including existing coatings.
- B. Do not proceed with affected Work until unsatisfactory conditions have been dispositioned and clear direction is provided.
- C. Known, measurable and/or reasonably identifiable conditions prior to award of contract shall be the CONTRACTOR's responsibility. Means and methods to control and/or correct such conditions shall come at no cost to OWNER.

3.3 WORK CONDITIONS

- A. Newly placed concrete surfaces shall be cured as recommended by the CSM prior to coating application, unless otherwise approved by OWNER and/or OWNER'S designated representative.
- B. Apply coatings only when the prevailing environmental conditions are in accordance with the CSM(s) printed instructions. The CONTRACTOR shall be responsible to create and/or control environmental conditions at Work locations including within partially enclosed structures, enclosed structures and similar environments that are not significantly affected by the atmospheric environment.

3.4 PROTECTION

- A. General:
 - 1. Rotating equipment, plant equipment, hardware, hardware accessories, nameplates, data tags, machined surfaces, sprinkler heads, electrical fixtures, and similar coated and/or uncoated items which are within, or in the vicinity of, surfaces to be coated shall be removed and reinstalled, masked and/or protected prior to surface preparation and coating operations.
 - 2. Mask off surfaces not scheduled to receive coating to protect from spillage and overspray.
 - 3. Protect Work of other trades from damage.
 - 4. Protect workers, pedestrians, other personnel, animals, plants, landscaping, adjacent structures, pavement, sidewalks, parked and moving vehicles and/or other elements in surrounding area from exposure to coating Work, including airborne materials and runoff. Correct damage as approved by OWNER, at no cost to OWNER.

5. As necessary, prevent access to Work areas or provide “Wet Paint” signs to protect newly coated surfaces. Aesthetic and/or physical damage from others in locations where adequate barricades and/or warnings are not present shall be corrected at no cost to OWNER.
 6. Remove masking and other protective measures at completion of coating Work.
 7. Correct damage by cleaning, repairing, replacing, or recoating as approved by OWNER, at no cost to OWNER. Restore damaged elements and components to original condition or better as found prior to start of Work.
- B. Wind-Borne Damage: The wind velocity and direction shall be considered as having a major impact on blasting and spraying operations. Use necessary precautions to prevent undue dispersing of material. Use wind screen/overspray nets to minimize the spillage impact on the buildings and Site. CONTRACTOR is responsible for any damage to adjacent surfaces, environment, vehicles, etc.

3.5 SURFACE PREPARATION

- A. General: The CONTRACTOR shall clean and prepare substrate(s) in accordance with the CSM’s written instructions. The following requirements herein shall apply:
1. Surfaces to be coated shall be clean and dry excluding cementitious coatings that specifically require saturated conditions. Before applying coatings, oil, grease, dirt, rust, loose mill scale, old weathered coatings, laitance and other foreign substances shall be removed unless specifically stated otherwise herein. Oil and grease shall be removed before mechanical or abrasive blast cleaning is started. Where cleaning is accomplished by blast cleaning, the abrasive used shall be washed, graded and free of contaminants which might interfere with the adhesion of the coatings or cause soluble salt contamination of the substrate.
 2. Comply with all local, state and/or federal air quality and/or emission regulations and requirements.
 - a. (As required) Provide containment, dust collectors and/or other means to control emissions and meet air quality requirements.
 3. Schedule cleaning and coating application so dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.
 4. Any solvent wash, solvent wipe, or cleaner used, including but not limited to those used for surface preparation in accordance with referenced Steel Structures Painting Council (SSPC) specifications, shall be of the emulsifying type which emits no more than 2.8 lb/gal (340 gms/l) VOCs, contains no phosphates, is biodegradable, removes no zinc, and is compatible with the specified coating material. Clean cloths and clean fluids shall be used for solvent cleaning.
 5. Spent blast abrasive shall not be reused.
 6. The compressed air used for blast cleaning or blow down cleaning shall be filtered and shall contain no condensed water or oil. Moisture traps shall be cleaned at least once every four hours or more frequently as required to prevent moisture from entering the supply air to the abrasive blasting equipment.
 7. Oil separators shall be installed just downstream of compressor discharge valves and at the discharge of the blast pot discharges. These shall be checked on the same frequency as the moisture traps.
 8. Regulators, gauges, filters, and separators in good working order shall be in use on all of the compressor air lines to blasting nozzles.
 9. An air dryer or desiccant filter drying unit shall be installed which dries the compressed air prior to blast pot connections. This dryer shall be used and maintained for the duration of all surface preparation work.
 10. A paper blotter test shall be performed to determine if compressed air used for blast cleaning or other purposes on the project is free of moisture and oil. This should be performed two to three times per shift when in operation.
 11. The abrasive blast nozzles used shall be of the venturi or other high velocity type supplied with a minimum of 100 psig air pressure and sufficient volume to obtain the blast cleaning production rates and cleanliness/specified herein.

12. Provide ventilation for airborne particulate evacuation to optimize visibility for both blast cleaning and inspection during surface preparation work.
 13. Surface cleanliness of prepared substrates shall be inspected after surface preparation, and prior to application of any coating materials. If steel surfaces are repaired, they shall be re-inspected for surface cleanliness and preparation prior to application of the coating system
 14. Test and record substrate pH using pH indicating papers. pH testing frequency should be performed once every 100 square feet of surface area to be coated.
 - a. For dry substrate spray the surface lightly with distilled, de-ionized water from a commercially available spray bottle that has been properly rinsed to preclude any dissolved solids. The spray shall wet the surface to a "shiny" appearance and water shall not run down the wall. Wait 60 seconds to allow chemical equilibria to be established and then test the pH of the water on the surface.
 15. Measure soluble salt/conductivity in accordance with SSPC Guide 15:
 - a. Conduct 5 measurements per each 1000 SF area at locations selected by OWNER and/or Quality Assurance Inspector.
 - b. Maximum threshold shall be 70 micro Siemens/cm.
 - c. CONTRACTOR shall be responsible to correct substrates not satisfying the maximum threshold at no cost to OWNER.
 16. Conduct chloride testing for immersion surfaces:
 - a. Conduct 5 measurements per each 1000 SF area at locations selected by OWNER and/or Quality Assurance Inspector.
 - b. Conduct chloride testing using a CHLOR*TEST™ kit or approved equivalent.
 - c. Maximum chloride threshold shall be no more than 3.0 ppm.
 - d. CONTRACTOR shall be responsible to correct substrates not satisfying the maximum threshold at no cost to OWNER.
- B. Cleaning, Substrate Decontamination, and Degreasing of substrates to be coated previously exposed to wastewater splash, spillage, or immersion:
1. Degrease the surfaces prior to blast cleaning. Use alkaline cleaning solutions, steam cleaning, or hot water with detergents, followed by rinsing with clean, potable water, and until all traces of degreasing/cleaning solutions have been removed. Thoroughly rinse surfaces degreased with ample clean potable water.
 - a. The CONTRACTOR shall be responsible for cleaning only substrates to be coated and not any adjacent surfaces.
 2. Decontamination shall consist of high pressure water cleaning or similar means and methods necessary to remove required contaminants to perform Work.
 - a. Decontamination must remove all wastewater solids/residues, scum, all debris such as embedded dirt, and all other substances from substrates to be coated.
 3. Remove all debris, wastewater constituents, and spent cleaning water from structures and work areas to be coated by pumping, vacuum cleaning or other appropriate means.
 - a. Initial cleaning and removal of wastewater solids/residue, scum and debris from the work area will be performed by OWNER. The purpose of initial cleaning is to provide general cleaning to permit access and improve work habitability. Detailed cleaning of elements, crevices or other areas to be coated is not included in OWNER's initial cleaning and shall be the responsibility of the CONTRACTOR.
 4. A clean substrate prior to surface preparation is achieved when substrate is free of visible oil, grease, dust, chlorides, and any other foreign material etc. when viewed without magnification.
 - a. All Immersion Steel surfaces and related areas shall have all metal surfaces cleaned per SSPC-SP WJ-4/NACE WJ-4 at pressures no less than 34 MPa (5,000 psig) and meet SSPC-SP 1 for cleanliness.
- C. Touch-Up Coating
1. When performing touch-up coating work related surface preparation, adhere to CSM recommendations and requirements.

2. At a minimum, remove loose, cracked and poorly adhered coatings. Roughen or abrade all intact well-adhered coatings. Feather all exposed edges of existing coatings at periphery of coating removal areas. Roughen or abrade more aggressively 2 inches beyond existing coating removal areas in all directions or until tightly adhered coating is obtained or reached.

D. Metallic Surfaces:

1. General: Metallic surfaces shall be prepared in accordance with the CSM requirements and applicable portions of the SSPC surface preparation specifications. The following minimum requirements shall apply unless specified otherwise:
 - a. The profile depth of the surface to be coated shall generally be 20 to 25 percent of the coating dry film thickness as measured by Method C of ASTM D4417.
 - b. Blast particle size shall be selected by the CONTRACTOR to produce the specified surface profile.
 - c. All weld splatter, slag and sharp metal burrs shall be removed by grinding or other approved means.
 - d. The minimum permissible surface preparation for immersed and/or intermittently immersed ferrous metal substrates shall be SSPC SP-10.
 - e. Blast cleaning requirements for ductile iron or cast iron substrates, galvanized steel and non-ferrous substrates shall apply unless specified otherwise by CSM(s):
 - 1) All ductile or cast-iron surfaces to be coated shall be abrasive blast cleaned to a clean, gray uniform metal appearance free of variations in color and loose materials.
 - 2) Non-ferrous metals such aluminum and stainless steel shall be sweep/brush blasted and cleaned to produce a clean surface with complete removal of all corrosion products and contaminants.
 - 3) Galvanized steel shall be sweep/brush blasted and cleaned to produce a clean surface with complete removal of all corrosion products and contaminants.
 - f. Remove all traces of grit, dust, dirt, rust scale, corrosion products and/or embedded abrasive from substrate by a combination of vacuum cleaning, compressed air and/or sweeping in accordance with ISO 8502-3 for a rating of 2, or better, before application of coatings.
 - g. Acceptable surface preparation must produce a metal surface pH of 6.0 to 9.0 to be confirmed by surface pH testing.
 - 1) If after surface preparation, the surface pH remains below 6.0, perform additional water blasting or cleaning until additional pH testing indicates an acceptable pH level.
 - h. Preparation of carbon steel surfaces shall be based upon comparison with SSPC-VIS1 (ASTM D2200).
 - i. Surface cleanliness of prepared substrates shall be inspected after surface preparation, and prior to application of any coating materials. If steel surfaces are repaired, they shall be re- inspected for surface cleanliness and preparation prior to application of the coating system
 - j. If, between final surface preparation work and coating system application, contamination of the prepared and cleaned metallic substrates occurs, or if the prepared substrates' appearance darkens or changes color, re-cleaning by water blasting or abrasive blast cleaning shall be required until the specified degree of cleanliness is reclaimed.

E. Concrete Surfaces:

1. Prior to surface preparation Work, ensure concrete substrates are sound with no evidence of surface or underlying deterioration such as spalling, soft material, cracking, erosion, etc. that may require repair or remediation prior to coating preparation Work. Notify OWNER upon discovery. Common methods to identify deterioration include:
 - a. Sounding: Using a hammer, chains or similar tools to identify “hollow” sounds which indicate potential areas of deterioration or delamination.

- b. Visual Observation.
 - c. Physical Disturbance: Using tools to disturb the surfaces to identify loose or soft materials.
2. Prior to surface preparation Work, ensure concrete is watertight. Prepare and/or apply CSM recommended hydraulic grout and/or water stop material as required.
 3. All concrete surfaces, existing and repaired areas, shall have been cured a minimum of 28 days prior to coating application, unless otherwise approved by CSM(s).
 4. Test adhesion of concrete surfaces/substrates prior to application of materials. Perform testing with a DeFelsko PosiTest AT-A adhesion tested with 50mm dollies or approved equivalent. Tests shall be performed every 100 SF, unless otherwise approved by OWNER. Pull tests shall pass a minimum 300 psi. Surfaces/substrates not meeting the required adhesion shall be removed until testing requirements are satisfied at no cost to OWNER. OWNER reserves the right to request additional pull testing upon failure to meet the psi requirements at 1 or more locations.
 5. Prepare surfaces to be coated according to coating manufacturer's written instructions for particular substrate conditions and as specified herein.
 6. Surface preparation of concrete substrates can be accomplished using methods such as dry abrasive blast cleaning, high, or ultra-high pressure water blast cleaning in accordance with SSPC-SP-13.
 - a. Do not micro-fracture or otherwise damage concrete substrate with removal operations.
 - b. Concentrate the air jet at cracks, control and construction joints, and repair perimeter interfaces to ensure that contaminants are removed from these crevices.
 7. Open up all bug holes and excessive cavities to expose their complete perimeter. Leaving shelled over, hidden air voids beneath the exposed concrete surface will not be acceptable.
 - a. Bug holes, excessive cavities, form-tie holes and similar depressions shall be excavated, prepared and/or filled with CSM's specified surface filler or repair material prior to coating application. Ensure substrate is dry prior to application.
 8. The selected preparation and cleaning method must produce the requirements set forth below:
 - a. A clean substrate free of calcium sulfate, loose coarse or fine aggregate, laitance, loose hydrated cement paste, and otherwise deleterious substances.
 - b. A concrete surface pH of 9.0 to 12.0. If after surface preparation, the surface pH remains below 9.0, perform additional water blasting, cleaning, or abrasive blast cleaning until additional pH testing indicates an acceptable pH level.
 9. Surface profile shall be verified by means of visual inspection and comparison to ICRI 03732 concrete surface profile chips at least once 50 for every square feet of area to be coated.
 10. Prepared surfaces shall be even and/or consistent. Grind flat protrusions and bumps to achieve a consistent texture and eliminate potential locations that may result in low material coverage or result in uneven transitions to the surrounding area concrete.
 11. Following quality control inspection of surface preparation by the CONTRACTOR and Quality Assurance Inspection by Quality Assurance Inspector and/or OWNER, thoroughly vacuum clean all concrete surfaces to be coated to remove all loose dirt, and spent abrasive leaving a dust free, sound concrete substrate.
 - a. Surface cleanliness of prepared concrete substrates shall be inspected after cleaning, preparation, and/or drying, but prior to application of any coating materials. If concrete surfaces are repaired, they shall be reinspected for surface cleanliness prior to application of the coating system.
 - b. If prepared surfaces become contaminated after first cleaning, they shall be cleaned again at the CONTRACTOR's expense prior to applying the coating.
- F. Masonry Surfaces:
1. Prepare masonry surfaces in general accordance with concrete surface preparation requirements above, CSM requirements and supplemental requirements below:
 - a. Prepare surfaces to remove all chalk, loose dirt, dried mortar splatter, dust, peeling or loose existing coatings, or otherwise deleterious substances to leave a clean, sound substrate.

- b. Ensure surfaces are dry prior to coating application.
 - 1) If pressure washing or low pressure water blast cleaning is used for preparation, allow the masonry to dry for at least 5 days under dry weather conditions at an ambient average temperature of 70°F.
 - 2) Coordinate with CSM and Quality Assurance Inspector to determine minimum drying time requirements based on project specific conditions.
- G. Fiberglass Reinforced Plastic (FRP) Surfaces:
 - 1. Prepare FRP surfaces in general accordance with CSM requirements supplemental requirements herein:
 - 2. Pressure wash to remove dust, dirt, contaminants and other materials.
 - 3. Prepare surfaces by sanding and/or sweep (brush) blasting to establish uniform surface roughness and to remove any gloss from the resin in the FRP.
 - 4. Remove existing coatings as specified, that are delaminating and/or do not satisfy CSM requirements for bond strength, performance and/or other performance properties.
 - 5. Pressure wash to remove all contaminants, debris, etc.
 - 6. Vacuum clean to remove all loose dust, dirt, and other materials.
 - 7. Solvent clean using clean white rags and allow solvent to completely evaporate prior to application of any coating materials.
- H. Chlorinated Polyvinyl Chloride (CPVC) and Polyvinyl Chloride (PVC) Surfaces:
 - 1. Prepare PVC and CVPV surfaces in general accordance with CSM requirements supplemental requirements herein:
 - 2. Pressure wash to remove dust, dirt, contaminants and other materials.
 - 3. Prepare surfaces by sanding and/or sweep (brush) blasting to establish uniform surface roughness.
 - 4. Remove existing coatings that are delaminating and/or do not satisfy CSM requirements for bond strength, performance and/or other performance properties.
 - 5. Pressure wash to remove all contaminants, debris, etc.
 - 6. Vacuum clean to remove all loose dust, dirt, and other materials.
 - 7. Solvent clean using clean white rags and allow solvent to completely evaporate prior to application of any coating materials.
- I. Wood Surfaces
 - 1. Prepare wood surfaces in general accordance with CSM requirements supplemental requirements herein:
 - 2. Ensure surfaces are clean and dry prior to coating application.
 - 3. Remove surface deposits, sap, protrusions, etc. by scraping or similar means.
 - 4. Seal knots, pockets, openings, etc. with CSM approved filler material.
 - 5. Sand rough spots with the grain. Begin with medium grit sandpaper and finish with fine grit sandpaper.
 - 6. Remove all sanding dust, debris, contaminants and other deleterious materials.
 - 7. Wipe surfaces clean with clean rags and CSM approved cleaners.
- J. Asphalt and Concrete Pavement:
 - 1. Prepare asphalt and concrete pavements for installation of liquid and/or preformed markings, striping, etc. in accordance with the CSM requirements and requirements herein.
 - 2. Remove all loose materials, dirt, debris and contaminants with high-pressure water blasting or other suitable means.
 - 3. Verify surfaces are free of oils and/or other detrimental contaminants that are not compatible with the selected coating systems. Adhere to manufacturer recommended cure times for new asphalt surfaces and/or sealers.

3.6 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrates per CSM's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D4258.

For cementitious waterproofing systems, refer to CSM's specific instructions for crack, joint and similar treatments. Unless otherwise specified by CSM, the following joint and crack treatment methods shall apply (at a minimum):

1. Static Cracks
 - a. Fill hairline cracks according to manufacturer's written instructions prior to coating application.
 - b. Open cracks up to 1/4- to 3/8-inch wide and 1/4-inch deep:
 - 1) Clean cracks and surrounding area removing dust, dirt, and other impurities.
 - 2) Apply crack filler primer, as recommended by CSM, with a brush to obtain uniform coverage and spread approximately 2-inches on each side of cracks.
 - 3) Fill cracks with crack filler applied with a putty knife or trowel, and allow for shrinkage. If excessive shrinkage occurs, reapply crack filler.
 - c. After filler material has cured, apply detail stripe of coating material extending 2-inches to each side of crack, including reinforcing mesh/tape as recommended by the CSM.
 2. Movement Joints and Cracks:
 - a. Coordinate with OWNER to determine crack nature (static or movement), as required.
 - b. Detail coatings at moving joints in accordance with CSM's written instructions.
 - 1) It is not permitted to bridge coatings with limited elongation and flexibility over moving joints.
 - c. Apply joint materials acceptable to CSM. Refer to Section 07900 for concrete joint material specifications and requirements.
 3. Notify OWNER if cracks larger than 3/8-inch are located.
- B. Allow sealants and/or fillers to cure before proceeding with coating installation.
- C. Do not commence coating system installation until CSM, OWNER and/or Quality Assurance Inspector approve the substrate and related conditions as suitable for receiving the coating system.

3.7 APPLICATION

- A. General:
1. Prepare and apply materials according to CSM's written instructions, at recommended rates and coverage's.
- B. Workmanship:
1. Coated surfaces shall be free from runs, drips, ridges, waves, laps, and brush marks. Coats shall be applied so as to produce an even film of uniform thickness completely coating corners and crevices. Coating work shall be performed in accordance with the requirements of SSPC Paint Application Specification No. 1.
 - a. Cementitious coating systems shall also be free of cracking, honeycombing and abnormalities. CONTRACTOR shall be responsible to repair and/or replace all locations exhibiting detrimental conditions and/or conditions that are not consistent with the intended material finish at their expense as specified in CSM's written data sheets.
 2. Honor all joints and active movement locations including control joints, expansion joints, material interfaces, etc. Adhere to CSM's requirements for proper preparation, treatment and/or application over these areas.
 3. Equipment shall be designed for application of the materials specified.
 4. Each coat of a coating system shall be applied evenly and sharply cut to line. Care shall be exercised to avoid over spraying or splattering coatings on surfaces not to be coated.
 5. Application Method: Coating applications method can be conventional or airless spray, brush or roller, or trowel based on the permitted coating system application methods, conditions and related considerations.
 6. Allow each coat to cure sufficiently, according to CSM's printed instructions, prior to recoating.
 7. Vary color for each successive coat for all coating systems, unless not viable and/or otherwise approved by OWNER.

8. Perform stripe painting on all edges, angles, weld seams, flanges, nuts, bolts, prior to application of the primer and other coats to ensure proper film build of the coating systems.
 9. Cut in edges clean and sharp in accordance with CSM recommendations where work joins other materials or colors.
- C. Atmospheric and Substrate Conditions: Apply coating when existing and forecast weather conditions permit coating to be installed according to CSM's written instructions and the following requirements:
1. Surfaces to receive coatings shall be dry excluding cementitious coatings that specifically require saturated conditions. Do not proceed with coating operations until substrates are ready to receive coatings and have been verified by the OWNER and/or Quality Assurance Inspector.
 - a. Test prepared surfaces for moisture and other conditions as recommended by CSM.
 - b. Test for excess moisture in concrete substrates using the Plastic Sheet Test in accordance with ASTM D4263.
 - c. Verify that ambient air and substrate surface temperatures, relative humidity, and dew point are within ranges recommended by CSM prior to and during coating operations.
 - 1) Measure and record ambient air and substrate temperature at the beginning and end of each shift and once every two hours of each shift using a thermometer.
 - 2) Measure and record relative humidity at the beginning and end of each shift and every two hours of each shift using a sling psychrometer in accordance with ASTM E337.
 2. Coatings shall not be applied over any substrates during rainy, misty weather, or on surfaces upon which there is frost or moisture condensation and when surface temperature is within 10° , or CSM's specified degree, of dew point, unless otherwise permitted by CSM and OWNER.
 - a. Atmospheric conditions shall be measured in areas pertinent to coating installation.
 - b. During damp weather and/or damp work environments, when the temperature of the surface to be coated is within 10°F of the dew point, heating or forced dehumidification equipment may be used to maintain a minimum temperature of 40°F and 10°F above the dew point for the surfaces to be coated, the coated surface, and the atmosphere in contact with the surface.
 - 1) Maintain conditions for a period of at least 8 hours or as recommended by the CSM.
 - 2) CONTRACTOR is responsible to provide dehumidification equipment, fans, and/or heaters inside enclosed and partially enclosed areas where conditions causing condensation are severe to maintain the required atmospheric and surface temperature requirements for proper coating application and cure.
 3. Verify application restrictions and constraints for coatings applied over concrete surfaces with rising temperatures or in direct sunlight.
 - a. Common coating deficiencies observed in these conditions include bubbling, pinhole formations and blistering.
 - b. Coordinate preventative measures with OWNER, such as schedule adjustment, as required.
 - c. Repair deficiencies as recommended by the CSM and OWNER at no additional cost to OWNER.
 4. Do not apply coatings over substrates and surfaces outside of the CSM's recommended minimum and maximum substrate temperatures for application during any point of time during application.
 5. Spray painting shall not be permitted when wind velocities at Work location are greater than 20 MPH.
 6. Work accomplished under unfavorable substrate and/or weather conditions will be considered unacceptable and complete re-cleaning and recoating of these areas will be required at the CONTRACTOR's expense.

D. Mixing:

1. Mix standard coating materials in strict accordance with CSM instructions with specified mixers and tools to achieve uniform, smooth consistency. Do not thin or dilute unless permitted by CSM; use recommended thinners within recommended limits.
 - a. Stir as required during application.
 - b. If surface film forms, do not stir film into material. Remove film and strain coating material before using.
 - c. Dispose of mixed materials that have exceeded the CSM's recommended pot-life.
 - d. Maintain containers used for mixing and applying coating in clean condition, free of foreign materials and residue.
2. Mix cementitious coating systems in strict accordance with CSM instructions. Strictly adhere to recommended mixing equipment, mixing durations, atmospheric and other requirements. Consider material volumes required for efficient/continuous application based on the size, configuration and/or restrictions associated with the Work and CSM's requirements.

E. Coating Film Thickness, Continuity and Quality:

1. Coating system thickness is the total thickness of all materials to be applied as part of the system including the primer, stripe, intermediate and finish coats.
 - a. Verify DFT for each coat over concrete surfaces once for every 100 square feet of surface area using a Positector 6000 DFT Gauge, or equivalent.
 - b. Verify DFT for each coat over non-ferrous surfaces once for every 50 square feet of surface area using a Positector 200 DFT Gauge, or equivalent.
 - c. Verify DFT for each coat over metallic surfaces once for every 50 square feet of surface area in accordance with SSPC-PA-2 using magnetic gages for ferrous metal.
 - d. Following quality control inspections, OWNER and/or Quality Assurance Inspector shall verify thickness of each coat.
2. The surface area covered per gallon of coating for various types of surfaces shall not exceed those recommended by the CSM.

F. Application:

1. Apply coating by roller, spray, brush and/or trowel as recommended by the CSM. Use applicator and technique best suited for the substrate, coating material and conditions.
 - a. Apply materials as soon as practicable after completion of surface preparation or recommended curing of previous material application as recommended by CSM to satisfy recoat windows.
 - b. Do not exceed recommended pot life of material.
 - c. Apply stripe coats by brush application only, unless otherwise permitted by CSM and Quality Assurance Inspector.
 - 1) Stripe coat all edges, corners, crevices, welds, nuts, bolts, irregular surfaces, etc. to ensure minimum dry film thickness is achieved in accordance with SSPC-PA Guide 11. Stripe coat shall not be spray applied.
 - 2) Stripe coat shall extend 1-inch (minimum) from each edge of surfaces to be stripe coated.
 - d. Do not coat over conditions detrimental to formation of durable coating film, such as dirt, rust, scale, grease, or moist or scuffed surfaces.
 - e. Apply primer and/or finish coats in one, or two coats, to provide specified thickness or recommended CSM thickness, whichever is greater. Do not apply subsequent coats until previous coat has fully cured and/or as recommended by CSM. Select application method to avoid excessive coating thickness.
 - 1) If undercoats or other conditions show through final coat, apply additional coats until coating film is of uniform finish, color, and appearance, if approved by CSM and OWNER.
 - 2) Ensure that edges, corners, and crevices receive minimum dry film thickness.

- 3) Brush Application: Work material into surface in even film. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw lines at edges and color breaks.
 - 4) Roller Application: Keep cover wet; do not dry roll. Apply material in sections. Lay on required amount of material, working material into grooves and rough areas. Then level material, working it into surface.
 - 5) Spray Application: Use spray application only when permitted by CSM's written instructions and authorities having jurisdiction. Apply material to provide equivalent hiding of brush-applied coat. Do not double back, building up film thickness of two coats in one application.
 - 6) All dry spray shall be removed, by sanding if necessary. In areas of deficient primer thickness, the area shall be thoroughly cleaned with power washing equipment, as necessary to remove all dirt; the area shall then be wire brushed, vacuumed and recoated.
 - 7) Cure cementitious materials as recommended by CSM and/or as required to mitigate drying shrinkage cracking and/or other deficiencies.
 - a) Do no patch, repair, overlay, disturb and/or otherwise alter finish coats of cementitious materials prior to review by the Quality Assurance Inspector.
 - 8) All areas coated with impure, unsatisfactory or unauthorized coating material, or coated in an unworkmanlike or objectionable manner, shall be thoroughly cleaned and recoated or otherwise corrected as directed by CSM, OWNER and/or Quality Assurance Inspector.
- f. Special Conditions:
- 1) Asphalt and Concrete Pavement Markings and Striping:
 - a) Install markings, striping and/or other pavement coating systems in accordance with CSM requirements and requirements herein.
 - b) Ensure substrates and surfaces are dry, clean and free of loose materials, debris, contaminants, etc. prior to application unless otherwise permitted by CSM.
 - c) Apply within CSM's specified ambient and/or substrate surface temperature ranges for coating system to be applied.
 - d) Pre-heat and/or pre-treat substrate surfaces in accordance with CSM's specifications and requirements.
 - e) Utilize stencils, string lines, pins, shapes and/or other appropriate layout and measuring tools, methods and techniques to ensure markings, lines, striping and/or other shapes are installed to the appropriate line and position.
 - f) Utilize manufacturer recommended equipment and application techniques for the selected coating system and/or materials to be applied.
 - 2) Non-Skid Surfaces:
 - a) Aggregate may be incorporated into topcoat applications when a walking nonskid surface is preferred. Non-Skid tape may also be applied.
 - 3) Use of Sealant:
 - a) When intermittent welding is used to attach unistrut, angles, brackets, structural members, etc. in an outdoor location or corrosive environment, the crevices at the joint, if 3/16-inch or less, may be filled with a sealant compatible with the coating system prior to coating to effectively seal the concealed area from air and moisture penetration.

3.8 FINAL INSPECTION

- A. Perform a final inspection to determine whether coating system Work meets the requirements of the Contract Documents. OWNER, OWNER's designated representative and/or Quality Assurance Inspector will subsequently conduct a final inspection with the CONTRACTOR.

Any rework required shall be marked. Such areas shall be recleaned and repaired as specified herein or as recommended by the CSM and/or OWNER at no additional cost to OWNER.

TABLE 1: QUALITY ASSURANCE TESTING

TEST / INSPECTION	STANDARD / METHOD	SUBSTRATE	SCHEDULE	FREQUENCY	ACCEPTANCE CRITERIA
Substrate Adhesion	ASTM D7234	Concrete ; CMU	Prior to coating application	1 test / 100 SF	≥ 300 psi
Ultrasonic Thickness	ASTM E213	Ferrous Metal	After surface preparation	As required	Varies
Sharp Edges, Weld Platter, Slivers, Etc.	Visual	Ferrous Metal	Prior to coating application	All	All defects shall be addressed
pH	pH Indicating Paper or Equal	Concrete ; CMU	After surface preparation ; Prior to coating application	5 tests / 1000 SF	9.0 – 12.0
pH	pH Indicating Paper or Equal	Ferrous Metal	After surface preparation ; Prior to coating application	5 tests / 1000 SF	6.0 – 9.0
Soluble Salt / Conductivity	SSPC Guide 15	Ferrous Metal (Immersion & Intermittent Immersion)	After Surface Preparation ; Prior to Coating Application	5 test / 1000 SF (or) 3 tests / element (Whichever is greater)	30 µS/cm
Soluble Salt / Conductivity	SSPC Guide 15	Ferrous Metal (Atmospheric)	After Surface Preparation ; Prior to Coating Application	5 test / 1000 SF (or) 3 tests / element (Whichever is greater)	70 µS/cm
Chlorides	CHLOR*TEST™	All (Immersion & Intermittent Immersion)	After Surface Preparation ; Prior to Coating Application	5 tests / 1000 SF	3.0 ppm
Chlorides	CHLOR*TEST™	All (Atmospheric)	After Surface Preparation ; Prior to Coating Application	5 tests / 1000 SF	5.0 ppm
Surface Cleanliness	SSPC-VIS1 ; ISO 8502-3	Steel	Prior to coating application	All	No Defects
Surface Cleanliness	Visual	Ductile Iron ; Cast Iron	Prior to coating application	All	No Defects
Surface Cleanliness	Visual	Concrete ; CMU ; All Other	Prior to coating application	All	No Defects
Surface Profile	ASTM D4417 ; SSPC SP Guidelines	Ferrous Metal	Prior to coating application	1 test / 25 SF	Per CSM and/or Project Requirements
Surface Profile	ICRI 03732 - CSP Chips	Concrete ; CMU	Prior to coating application	1 test / 50 SF	Per CSM and/or Project Requirements
Moisture (Plastic Sheet)	ASTM D4263	Concrete ; CMU	Prior to coating application	1 test / 500 SF	No moisture
Wet Film Thickness	ASTM D4414	All	All	1 test / 50 SF	Per CSM and/or Project Requirements
Dry Film Thickness	ASTM D7091 ; SSPC-PA-2	Ferrous and Non-Ferrous Metal	After each coat applied ; After final coat	1 test / 50 SF	Per CSM and/or Project Requirements
Dry Film Thickness	ASTM D6132	Concrete ; CMU ; Wood ; Plastic ; FRP ; Etc.	After each coat applied ; After final coat	1 test / 100 SF (concrete) ; 1 test / 50 SF (other)	Per CSM and/or Project Requirements
Coating Adhesion	ASTM D4541	Ferrous Metal	After each coat applied ; After final coat	3 test / element (or) 1 test / 500 SF (Whichever is greater)	≥ 300 psi
Coating Adhesion	ASTM D7234	Concrete	After each coat applied ; After final coat	3 test / element (or) 1 test / 500 SF (Whichever is greater)	≥ 300 psi
Coating (Visual) [Curing / Contamination / Solvent Retention / Pinholes / Sagging / Defects	Visual	All	After each coat applied ; Prior to application of next coat	All	No observed defects
Holiday Detection	ASTM D5162	Ferrous Metal	Following System Application	All	No observed defects
Holiday Detection	ASTM D4787	Concrete	Following System Application	All	No observed defects

TABLE 2: COLOR SHADE CODE

COLOR SHADE	U.S. GOVERNMENT FEDERAL REGISTER 595 PAINT COLOR NUMBER
Aluminum	17178
Black	17038
Blue	15050
Brown	10091
Gray, Dark	26132
Gray, Light	16473
Green, Dark	14062
Green, Light	14533
Orange	12246
Red	11105
White	17875
Yellow	13655

TABLE 3: EQUIPMENT AND PIPING COLOR IDENTIFICATION CODE

EQUIPMENT AND PIPING COLOR IDENTIFICATION CODE

UNIT PROCESS	FLOW	COLOR	ABBREVIATION
	Non Potable Water	Lt. Green	NPW
	Non Potable Well Water	Lt. Green	NPWW
	Potable Water	Dk. Green	PW
	Drain	Lt. Gray	DRAIN
	Interceptor Pump Station	Dk. Gray	
	Drainage Pump Station Discharge	Lt. Gray	DPSD
	Electrical Conduit	Red	
	Fire Protection	Red	FIRE
	Floor Drain	Lt. Gray	FD
	Fuel Oil	Black	FO
	Fuel Oil Supply	Black	FOS
	Fuel Oil Return	Black	FOR
	Hot Water Supply	Lt. Green	HWS
	Hot Water Return	Lt. Green	HWR
	Hot Water Reverse Return	Lt. Green	HW REV RET
	HVAC	Lt. Gray	HVAC
	Hydraulic Oil	Black	HDO
	Hot Potable Water	Dk. Green	HPW
	Lube Oil	Black	LO
	Natural Gas	Yellow	NAT GAS
	Polymer Dry Air	Blue	DA
	Process Drain	Lt. Gray	DRAIN
	Propane	Yellow	LP
	Roof Drain	Lt. Gray	RD
	Seal Water	Lt. Green	SW
	Service Air (Low Pressure)	Blue	LPSA
	Service Air (High Pressure)	Blue	HPSA
	Sanitary Drain	Lt. Gray	DRAIN
	Sanitary Sewer Force Main	Lt. Gray	SSFM
	Spray Water	Lt. Green	SPRAY
	Steam	Aluminum	STEAM
	Storm Drain	Lt. Gray	STORM
	Sump Pump Discharge	Lt. Gray	SPD
	Tank Drain	Lt. Gray	DRAIN
	Vacuum	Blue	VAC
	Vent	Lt. Gray	V
Odor Control	Odorous Air	Lt. Gray	OA
	Scrubber Blowdown	Orange	SBD
	Scrubber Chemical Feed	Orange	SCF
	Scrubber Recirculation Cleaning	Orange	SRC
	Scrubber Recirculation Discharge	Orange	SRD
	Scrubber Recirculation Suction	Orange	SRS
	Scrubber Drain	Lt. Gray	DRAIN
	Scrubber Exhaust	Lt. Gray	SCRUB EXH
	Scrubber Intake	Lt. Gray	SCRUB INTK
	Scrubber (vessel)	Lt. Gray	---
Preliminary Treatment	Cyclone Influent	Lt. Gray	CYCL INF
	Cyclone Recycle	Lt. Gray	CYCL RCY
	Grit	Lt. Gray	GRIT

	Raw Wastewater Influent	Lt. Gray	RWI
	Screened Effluent	Lt. Gray	SE
	Septic Tank Unloading	Lt. Gray	SEPTIC UNLDG
Primary Treatment	Primary Clarifier Influent	Lt. Gray	PCI
	Primary Clarifier Effluent	Lt. Gray	PCE
	Primary Clarifier Solids	Brown	PCS
	Primary Scum	Lt. Gray	SCUM
Intermediate Treatment	Oxidation Tower Influent	Lt. Gray	OTI
	Oxidation Tower Effluent	Lt. Gray	OTE
	Intermediate Clarifier Influent	Lt. Gray	ICI
	Intermediate Clarifier Effluent	Lt. Gray	ICE
	Intermediate Biosolids	Brown	INS
	Intermediate Scum	Lt. Gray	SCUM
Biological Treatment	Aerated Supernatant Return		ASR
	Anaerobic Influent	Lt. Gray	ANI
	Anaerobic Effluent	Lt. Gray	ANE
	Anoxic Influent	Lt. Gray	AXI
	Anoxic Effluent	Lt. Gray	AXE
	Anoxic Recycle	Lt. Gray	ARCY
	Aeration Influent	Lt. Gray	ARI
	Aeration Effluent	Lt. Gray	ARE
	Mixed Liquor	Brown	MLSS
	Nitrified Recycle	Lt. Gray	NRCY
	Secondary Clarifier Influent	Lt. Gray	SCI
	Secondary Clarifier Effluent	Lt. Gray	SCE
	Secondary Scum	Lt. Gray	SCUM
	Return Activated Solids	Brown	RAS
	Waste Activated Solids	Brown	WAS
Disinfection	Contact Tank Effluent	Lt. Gray	CTE
	Contact Tank Scum	Lt. Gray	SCUM
Effluent Pumping	Final Effluent	Lt. Gray	FNE
	Holding Pond Drain	Lt. Gray	DRAIN
Scum Disposal	Feed Scum	Lt. Gray	FD SCUM
	Concentrated Scum	Lt. Gray	CN SCUM
	Scum Concentrator Subnatant	Lt. Gray	SCB
	Scum	Lt. Gray	SCUM
Solids Thickening	Decant Supernatant Return	Lt. Gray	DSR
	Decant Tank Drain	Lt. Gray	DRAIN
	Flotation Thickener Feed Solids	Brown	FTFS
	Flotation Thickener Recycle	Lt. Gray	FTRCY
	Flotation Thickened Solids	Brown	FTS
	Flotation Thickener Subnatant	Lt. Gray	FSB
	Gravity Belt Thickener Feed Solids	Brown	GBFS
	Gravity Belt Thickener Filtrate	Lt. Gray	GBFL
	Gravity Belt Thickened Solids	Brown	GBTS
	Gravity Thickener Feed Solids	Brown	GTFS
	Gravity Thickened Solids	Brown	GTS
Gravity Thickener Overflow/Supernatant	Lt. Gray	GSP	
Digestion	Primary Digester Feed Solids	Brown	PDFS
	Primary Digested Solids	Brown	PDS
	Digester Recirculation Solids	Brown	DRS
	Primary Digester Supernatant	Lt. Gray	PDSP
	Primary Digester Transfer Solids	Brown	PDXS

	Secondary Digested Solids	Brown	SDS
	Secondary Digester Supernatant	Lt. Gray	SDSP
	Digester Gas	Yellow	DGAS
Solids Holding Tank	Holding Tank Feed Solids	Brown	HTFS
Solids Conditioning	Conditioning Tank Feed Solids	Brown	CNFS
Solids Dewatering	Centrifuge Feed Solids	Brown	CFS
	Centrifuge Biosolids Cake	Brown	CCK
	Centrifuge Centrate	Lt. Gray	CCT
	Centrifuge Thickened Biosolids	Brown	CTS
	Centrifuge Thickening Centrate	Lt. Gray	CTCT
	Foreign Biosolids Loading	Brown	FLS
	Foreign Biosolids Unloading	Brown	FUS
Solids Incineration	Incinerator Feed Cake	Brown	IFC
	Incinerator Ash	Brown	ASH
	Incinerator Scrubber Water Effluent	Lt. Gray	ISE
	Scrubber Intake	Lt. Gray	SI
	Scrubber Exhaust	Lt. Gray	SE
Nitrification Enhancement Facility	Nitrification Enhancement Facility Influent	Lt. Gray	NEFINF
	Nitrification Enhancement Facility Aeration Effluent	Brown	NEFARE
	Nitrification Enhancement Facility Secondary Effluent	Brown	NEFSCE
	Nitrification Enhancement Facility Solids	Brown	NEFS
Chemicals	Acid Wash Supply	Orange	AWS
	Acid Wash Return	Orange	AWR
	Alum	Orange	ALUM
	Ammonia	Orange	AMMONIA
	Caustic	Orange	CAUSTIC
	Caustic Solution	Orange	CAUSTIC SOL
	Dry Polymer	Orange	DPOLY
	Ferric/Ferrous	Orange	FERRIC/FERROUS
	Hydrogen Peroxide	Orange	PEROXIDE
	Liquid Polymer	Orange	LPOLY
	Muriatic	Orange	MURIATIC
	Polymer Solution	Orange	POLY SOL
	Sodium Bisulfite	Purple	BISULFITE
	Sodium Bisulfite Solution	Orange	BISULFITE SOL
	Sodium Hypochlorite	Orange	HYPO
Sodium Hypochlorite Solution	Orange	HYPO SOL	
Chemical Storage Tanks	Chemical Tanks	Lt. Gray OR White	(Name of Chemical)
Bollards		Yellow	---
Water Reclamation	Reclaimed Water Main	Purple	RWM
Misc.	Abandoned		ABAND
	Sample	Unit Process Color	(Unit Process Name)/SAMP

CHECKLIST 1: CONCRETE COATING

Project
Inspector
Task
Location

Quality Assurance Hold points are indicated in Bold

Sheet 1 of 2

<u>Date</u>	<u>Initials</u>	<u>Task</u>
_____	_____	1. Required submittals have been provided to OWNER for review and have been accepted.
_____	_____	2. Existing conditions, surfaces and related items relevant to work tasks have been examined and accepted. Deficiencies, obstructions, abnormalities and/or constraints have been communicated to OWNER and appropriately resolved.
_____	_____	3. CSM has reviewed substrates, environmental and operating conditions. CSM has verified selected coating system is suitable for application.
_____	_____	4. OWNER property including, but not limited to, equipment, components, structures, etc. have been adequately protected.
_____	_____	5. Required mockups have been applied, reviewed, and approved by Quality Assurance Inspector.
_____	_____	6. Newly placed concrete and/or cementitious surfaces have been cured a minimum of 28 days unless specified otherwise permitted by CSM. Validation of suitable substrate conditions have been tested per appropriate industry standards, recognized by the CSM and documentation has been provided to OWNER for review.
_____	_____	7. Quality Assurance Inspector has conducted requisite number of substrate adhesion tests. Adhesion satisfies requirements as specified in the Contract Documents.
_____	_____	8. Quality Assurance Inspector has verified concrete surface preparation meets ICRI CSP and CSM requirements as specified in the Contract Documents.
_____	_____	9. Quality Assurance Inspector has conducted requisite number of soluble salt/conductivity and chloride testing. Testing satisfies requirements as specified in the Contract Documents.
_____	_____	10. Quality Assurance Inspector has verified pH satisfies requirements as specified in the Contract Documents.
_____	_____	11. Quality Assurance Inspector has verified degree of surface cleanliness satisfies requirements as specified in the Contract Documents.
_____	_____	12. Static cracks have been prepared, treated, routed, and filled as specified in the Contract Documents and per the CSM's requirements.
_____	_____	13. Moving cracks have been identified and an RFI has been submitted to OWNER for review and recommendations as required.
_____	_____	14. Control joints, expansion joints, movement joints/cracks and related items have been prepared and appropriate joint filler(s) have been installed as specified in the Contract Documents and CSM Requirements.

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|-------|-------|--|
| _____ | _____ | 15. Bug holes and surface imperfections have been filled with the appropriate surfacer, crack filler and/or other material and cove joints have been installed as specified in the Contract Documents and per the CSM's requirements. |
| _____ | _____ | 16. Additional pre-coating tasks have been performed. |
| _____ | _____ | 17. Substrates are visibly dry and passed manufacturer recommended moisture test, with no visible condensation (unless specifically permitted by CSM). |
| _____ | _____ | 18. Final substrate conditions and preparations have been reviewed by the CSM and/or Quality Assurance Inspector. |
| _____ | _____ | 19. Batch information, shelf life, storage conditions and related items for materials to be applied have been reviewed by the Quality Assurance Inspector. |
| _____ | _____ | 20. Ambient and surface temperature, relative humidity, weather conditions, substrate and materials are within specified limits. Conditions related to wind have been reviewed to prevent overspray damage to nearby equipment, vehicles, etc. |
| _____ | _____ | 21. Mixing and application equipment and tools have been tested and verified to be in good working order. |
| _____ | _____ | 22. Mix and prepare coating materials according to CSM's written instructions. |
| _____ | _____ | 23. Quality Assurance Inspector has verified surfacer, primer, base or finish coat application. |
| _____ | _____ | 24. Quality Assurance Inspector has performed requisite number of wet film, adhesion and/or dry film thickness (DFT) tests. Coating has been reapplied to test locations and touch-up repairs are complete. |
| _____ | _____ | 25. Surfacer, primer or base coat has been prepared per Contract Documents and CSM Requirements and ready to receive primer, base, intermediate or finish coat within specified recoat period. |
| _____ | _____ | 26. Batch information, shelf life, storage conditions and related items for materials to be applied have been reviewed by Quality Assurance Inspector. |
| _____ | _____ | 27. Quality Assurance Inspector has verified surface preparation and degree of cleanliness. |
| _____ | _____ | 28. Ambient and surface temperature, relative humidity, weather conditions, substrate and materials are within specified limits. Conditions related to wind have been reviewed to prevent overspray damage to nearby equipment, vehicles, etc. |
| _____ | _____ | 29. Mixing and application equipment and tools have been tested and verified to be in good working order. |
| _____ | _____ | 30. Primer, base, intermediate and/or finish coat is mixed and applied per Contract Documents and CSM Requirements. |
| _____ | _____ | 31. Quality Assurance Inspector has performed requisite number of wet film, adhesion and/or dry film thickness (DFT) tests. Coating has been reapplied to test locations and touch-up repairs are complete. |
| _____ | _____ | 32. Quality Assurance Inspector has performed holiday testing. |
| _____ | _____ | 33. Coated surfaces have been installed per Contract Documents and CSM requirements and accepted by Quality Assurance Inspector. |
| _____ | _____ | 34. Refer to steps 25 through 31 for subsequent applications. |

CHECKLIST 2: FERROUS METAL COATING

Project
Inspector
Task
Location

Quality Assurance Hold points are indicated in Bold

Sheet 1 of 2

<u>Date</u>	<u>Initials</u>	<u>Task</u>
_____	_____	1. Required submittals have been provided to OWNER for review and have been accepted.
_____	_____	2. Existing conditions, surfaces and related items relevant to work tasks have been examined and accepted. Deficiencies, obstructions, abnormalities and/or constraints have been communicated to OWNER and appropriately resolved.
_____	_____	3. CSM has reviewed substrates, environmental and operating conditions. CSM has verified selected coating system is suitable for application.
_____	_____	4. OWNER property including, but not limited to, equipment, components, structures, etc. have been adequately protected.
_____	_____	5. Required mockups have been applied, reviewed, and approved by Quality Assurance Inspector.
_____	_____	6. Quality Assurance Inspector has performed ultrasonic thickness (UT) testing (as required).
_____	_____	7. Required steel repairs have been performed and prepared for coating (as required). Repairs have been verified by Quality Assurance Inspector.
_____	_____	8. Quality Assurance Inspector has conducted requisite number of soluble salt/conductivity and chloride testing. Testing satisfies requirements as specified in the Contract Documents.
_____	_____	9. Quality Assurance Inspector has verified pH satisfies requirements as specified in the Contract Documents.
_____	_____	10. Quality Assurance Inspector has verified surface preparation meets SSPC and CSM requirements as specified in the Contract Documents.
_____	_____	11. Quality Assurance Inspector has verified degree of surface cleanliness meets SSPC and CSM requirements as specified in the Contract Documents.
_____	_____	12. Joints, bridges and transition requiring sealant or other work has been addressed (as required).
_____	_____	13. Additional pre-coating tasks have been performed.
_____	_____	14. Substrates are visibly dry and free of laitance.
_____	_____	15. Final substrate conditions and preparations have been reviewed and approved by the CSM and/or Quality Assurance Inspector.
_____	_____	16. Batch information, shelf life, storage conditions and related items for materials to be applied have been reviewed by Quality Assurance Inspector.
_____	_____	17. Ambient and surface temperature, relative humidity, weather conditions, substrate and materials are within specified limits. Conditions related to wind have been reviewed to prevent overspray damage to nearby equipment, vehicles, etc.

- _____ 18. Mix and prepare coating materials according to CSM's written instructions.
- _____ 19. **Quality Assurance Inspector has verified primer, stripe, base or finish coat application.**
- _____ 20. **Quality Assurance Inspector has performed requisite number of wet film, adhesion and/or dry film thickness (DFT) tests. Coating has been reapplied to test locations and touch-up repairs are complete.**
- _____ 21. Primer, base or intermediate coat has been prepared per Contract Documents and CSM Requirements and ready to receive stripe, base, intermediate or finish coat within specified recoat period.
- _____ 22. **Batch information, shelf life, storage conditions and related items for materials to be applied have been reviewed by Quality Assurance Inspector.**
- _____ 23. **Quality Assurance Inspector has verified surface preparation and degree of cleanliness.**
- _____ 24. Ambient and surface temperature, relative humidity, weather conditions, substrate and materials are within specified limits. Conditions related to wind have been reviewed to prevent overspray damage to nearby equipment, vehicles, etc.
- _____ 25. Stripe, base, intermediate and/or finish coat is mixed and applied per Contract Documents and CSM Requirements.
- _____ 26. **Quality Assurance Inspector has performed requisite number of wet film, adhesion and/or dry film thickness (DFT) tests. Coating has been reapplied to test locations and touch-up repairs are complete.**
- _____ 27. **Quality Assurance Inspector has performed holiday testing.**
- _____ 28. **Coated surfaces have been installed per Contract Documents and CSM requirements and accepted by Quality Assurance Inspector.**
- _____ 29. **Refer to steps 21 through 26 for subsequent applications.**

END OF SECTION

END OF SECTION