# SECTION 099000 PAINTING AND COATING

## PART 1 - GENERAL

A. Description

This section includes materials and application of painting and coating systems for the following surfaces:

1. Submerged metal.
2. Exposed metal.
3. Buried metal.
4. Metal in contact with concrete.

It does not include coating steel water tanks and reservoirs.

B. Related Work Specified Elsewhere

1. General Concrete Construction: 030500.
2. Cold-Applied Wax Tape Coating: 099752.
3. Polyethylene Sheet Encasement: 099754.
4. Fusion-Bonded Epoxy Linings and Coatings: 099761.

C. Submittals

1. Submit shop drawings in accordance with the General Conditions and Section 013300.
2. Submit manufacturer's data sheets showing the following information:
   a. Percent solids by volume.
   b. Minimum and maximum recommended dry-film thickness per coat for prime, intermediate, and finish coats.
   c. Recommended surface preparation.
   d. Recommended thinners.

e. Statement verifying that the specified prime coat is recommended by the manufacturer for use with the specified intermediate and finish coats.

f. Application instructions including recommended equipment and temperature limitations.

g. Curing requirements and instructions.

3. Submit color swatches.

4. Submit certificate identifying the type and gradation of abrasives used for surface preparation.

5. Submit material safety data sheets for each coating.

PART 2 - MATERIALS

A. Painting and Coating Systems

The following index lists the various painting and coating systems by service and generic type:

PAINT COATINGS SYSTEM INDEX

| **No.** | **Title** | **Generic Coating** |
|---|---|---|
| Submerged Metal Coating System | | |
| 7. | Submerged Metal, Potable or Nonpotable Water | Epoxy |
| Exposed Metal Coating System | | |
| 10. | Exposed Metal, Corrosive Environment | High-build epoxy (two-coat system) with polyurethane topcoat |
| Buried Metal Coating System | | |
| 21. | Buried Metal | Epoxy |
| 24. | Buried Metal | Corrosion-resisting grease |
| Nonferrous Metal Coating System | | |
| 54. | Aluminum Insulation from Concrete and Carbon Steel | Epoxy |

These systems are specified in detail in the following paragraphs. For each coating, the required surface preparation, prime coat, intermediate coat (if

required), topcoat, and coating thicknesses are described. Mil thicknesses shown are minimum dry-film thicknesses.

B. Submerged Metal Coating System

1. System No. 7--Submerged Metal, Potable or Nonpotable Water:

Type: Epoxy.

Service Conditions: For use with structures, valves, piping, or equipment immersed in potable or nonpotable water.

Surface Preparation: SSPC SP-10.

Coating System: Apply the manufacturer's recommended number of coats to attain the specified minimum coating thickness. Products: Devoe Bar-Rust 233H, Tnemec N140 or 100, Sherwin-Williams Tank Clad HS B62-80, PPG AQUAPON® LT NSF Low Temperature Epoxy Coatings 95-172, Carboline Carboguard 891, Ameron 395, International Interline 785HS, Carboline Plasite 7133 or 9133, Keysite 740, Scotchkote 306, or equal; 30 mils total. Color of topcoat: white. Each coat shall be different color than the one preceding it.

C. Exposed Metal Coating System

1. System No. 10--Exposed Metal, Corrosive Environment:

Type: High-build epoxy intermediate coat having a minimum volume solids of 60%, with an inorganic zinc prime coat and a pigmented polyurethane finish coat having a minimum volume solids of 52%.

Service Conditions: For use with metal structures or pipes subjected to water condensation; chemical fumes, such as hydrogen sulfide; salt spray; and chemical contact.

Surface Preparation: SSPC SP-10.

Prime Coat: Self-curing, two-component inorganic zinc-rich coating recommended by the manufacturer for overcoating with a high-build epoxy finish coat. Minimum zinc content shall be 12 pounds per gallon. Apply to a thickness of 3 mils. Products: Tnemec 90E-92, Devoe Catha-Coat 304 or 304V, International Interzinc 22HS, Ameron 9HS, Carboline Carbozinc 11HS, Sherwin-Williams Zinc-Clad II Plus, PPG METALHIDE® 28 Inorganic Zinc-Rich Primer 97-672, or equal.

Intermediate Coat: Tnemec 104, ICI Devoe Devran 224HS or 231, International Interseal 670HS, Ameron 385, Carboline Carboguard 890,

Sherwin-Williams Macropoxy 646 B58-600, PPG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 series, or equal; 5 mils.

Finish Coat: Two-component pigmented acrylic or aliphatic polyurethane recommended by the manufacturer for overcoating a high-build epoxy coating. Apply to a thickness of at least 2 mils. Products: Tnemec Series 1075, ICI Devoe Devthane 379, International Interline 990HS, Ameron 450HS, Carboline 134HG, Sherwin-Williams Hi-Solids Polyurethane B65-300, PPG PITTHANE® Ultra Gloss Urethane Enamel 95-812 series, or equal.

D. Buried Metal Coating System

1. System No. 21--Buried Metal:

Type: High solids epoxy or phenolic epoxy having a minimum volume solids of 80% (ASTM D2697).

Service Conditions: Buried metal, such as valves, flanges, bolts, nuts, structural steel, and fittings.

Surface Preparation: SSPC SP-10.

Coating System: Apply three or more coats of Ameron 400, Tnemec 104HS or 80, ICI Devoe Bar-Rust 233H, Carboline 890LT, Sherwin-Williams Tank Clad HS B62-80 series, or equal; 30 mils total. Maximum thickness of an individual coating shall not exceed the manufacturer's recommendation.

2. System No. 24--Buried Metal:

Type: Corrosion-resisting grease.

Service Conditions: Buried metal, such as bolts, bolt threads, tie rods, and nuts.

Surface Preparation: SSPC SP-3 or SP-6.

Coating: NO-OX-ID GG-2 as manufactured by Sanchem, Inc. Apply to a minimum thickness of 1/4 inch.

E. Coating Systems for Nonferrous Metals

1. System No. 54--Aluminum Insulation from Concrete and Carbon Steel:

Type: High solids epoxy or phenolic epoxy having a minimum volume solids of 80% (ASTM D2697).

Service Conditions: Coat areas of aluminum grating, stairs, structural members or aluminum fabrications, in contact with concrete or carbon steel with this system.

Surface Preparation: Solvent or steam cleaning per SSPC SP-1; do not use alkali cleaning. Then dust blast.

Coating System: Apply three or more coats of Ameron 400, Tnemec Series 135, ICI Devoe Bar-Rust 233H, Sherwin-Williams Macropoxy B58-600, PPG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 series, or equal; 30 mils total. Maximum thickness of an individual coating shall not exceed the manufacturer's recommendation.

F. Abrasives for Surface Preparation

1. Abrasives used for preparation of ferrous (excluding stainless steel) surfaces shall be one of the following:

   a. 16 to 30 or 16 to 40 mesh silica sand or mineral grit.

   b. 20 to 40 mesh garnet.

   c. Crushed iron slag, 100% retained on No. 80 mesh.

   d. SAE Grade G-40 or G-50 iron or steel grit.

2. In the above gradations, 100% of the material shall pass through the first stated sieve size and 100% shall be retained on the second stated sieve size.

3. Abrasives used for preparation of copper and aluminum surfaces shall be one of the following:

   a. Crushed slag, 80 to 100 mesh.

   b. Very fine silica sand, 80 to 100 mesh.

PART 3 - EXECUTION

A. Weather Conditions

1. Do not paint in the rain, wind, snow, mist, and fog or when steel or metal surface temperatures are less than 5°F above the dew point.

2. Do not apply paint when the relative humidity is above 85%.

3. Do not paint when temperature of metal to be painted is above 120°F.

4. Do not apply epoxy and polyurethane paints on an exterior or interior surface if air or surface temperature is below 60°F or expected to drop below 60°F in 24 hours.

B. Surface Preparation Procedures

1. Remove oil and grease from metal surfaces in accordance with SSPC SP-1. Use clean cloths and cleaning solvents and wipe dry with clean cloths. Do not leave a film or greasy residue on the cleaned surfaces before abrasive blasting.

2. Remove weld spatter and weld slag from metal surfaces and grind smoothly rough welds, beads, peaked corners, and sharp edges including erection lugs in accordance with SSPC SP-2 and SSPC SP-3. Grind 0.020 inch (minimum) off the weld caps on pipe weld seams. Grind outside sharp corners, such as the outside edges of flanges, to a minimum radius of 1/4 inch.

3. Do not abrasive blast or prepare more surface area in one day than can be coated in one day; prepare surfaces and apply coatings the same day. Remove sharp edges, burrs, and weld spatter.

4. For carbon steel, do not touch the surface between the time of abrasive blasting and the time the coating is applied. Apply coatings within two hours of blasting or before any rust bloom forms.

5. Surface preparation shall conform with the SSPC specifications as follows:

| | |
|---|---|
| Solvent Cleaning | SP-1 |
| Hand Tool Cleaning | SP-2 |
| Power Tool Cleaning | SP-3 |
| White Metal Blast Cleaning | SP-5 |
| Commercial Blast Cleaning | SP-6 |
| Brush-Off Blast Cleaning | SP-7 |
| Pickling | SP-8 |
| Near-White Blast Cleaning | SP-10 |
| Power Tool Cleaning to Bare Metal | SP-11 |
| Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating | SP-12 |
| Surface Preparation of Concrete | SP-13 |

6. Dust blasting is defined as cleaning the surface through the use of very fine abrasives, such as siliceous or mineral abrasives, 80 to 100 mesh. Apply a

fine etch to the metal surface to clean the surface of any contamination or oxide and to provide a surface profile for the coating.

7. Wherever the words “solvent cleaning,” “hand tool cleaning,” “wire brushing,” or “blast cleaning” or similar words are used in these specifications or in paint manufacturer’s specifications, they shall be understood to refer to the applicable SSPC (Society for Protective Coatings), surface preparation specifications listed above.

8. For carbon steel surfaces, after abrasive blast cleaning, the height of the surface profile shall be 2 to 3 mils. Verify the surface profile by measuring with an impresser tape acceptable to the Owner’s Representative. Perform a minimum of one test per 100 square feet of surface area. Testing shall be witnessed by the Owner’s Representative. The impresser tape used in the test shall be permanently marked with the date, time, and locations where the test was made. Test results shall be promptly presented to the Owner’s Representative.

9. Do not apply any part of a coating system before the Owner’s Representative has reviewed the surface preparation. If coating has been applied without this review, if directed by the Owner’s Representative, remove the applied coating by abrasive blasting and reapply the coat in accordance with this specification.

C. Abrasive Blast Cleaning

1. Use dry abrasive blast cleaning for metal surfaces. Do not use abrasives in automatic equipment that have become contaminated. When shop or field blast cleaning with handheld nozzles, do not recycle or reuse blast particles.

2. After abrasive blast cleaning and prior to application of coating, dry clean surfaces to be coated by dusting, sweeping, and vacuuming to remove residue from blasting. Apply the specified primer or touch-up coating within the period of an eight-hour working day. Do not apply coating over damp or moist surfaces. Reclean prior to application of primer or touch-up coating any blast cleaned surface not coated within said eight-hour period.

3. Keep the area of the work in a clean condition and do not permit blasting particles to accumulate and constitute a nuisance or hazard.

4. During abrasive blast cleaning, prevent damage to adjacent coatings. Schedule blast cleaning and coating such that dust, dirt, blast particles, old coatings, rust, mill scale, etc., will not damage or fall upon wet or newly coated surfaces.

D. Procedures for Items Having Shop-Applied Prime Coats

1. After application of primer to surfaces, allow coating to cure for a minimum of two hours before handling to minimize damage.

2. When loading for shipment to the project site, use spacers and other protective devices to separate items to prevent damaging the shop-primed surfaces during transit and unloading. If wood spacers are used, remove wood splinters and particles from the shop-primed surfaces after separation. Use padded chains or ribbon binders to secure the loaded items and minimize damage to the shop-primed surfaces.

3. Cover shop-primed items 100% with protective coverings or tarpaulins to prevent deposition of road salts, fuel residue, and other contaminants in transit.

4. Handle shop-primed items with care during unloading, installation, and erection operations to minimize damage. Do not place or store shop-primed items on the ground or on top of other work unless ground or work is covered with a protective covering or tarpaulin. Place shop-primed items above the ground upon platforms, skids, or other supports.

E. Field Touch-Up of Shop-Applied Prime Coats

1. Remove oil and grease surface contaminants on metal surfaces in accordance with SSPC SP-1. Use clean rags wetted with a degreasing solution, rinse with clean water, and wipe dry.

2. Remove dust, dirt, salts, moisture, chalking primers, or other surface contaminants that will affect the adhesion or durability of the coating system. Use a high-pressure water blaster or scrub surfaces with a broom or brush wetted with a solution of trisodium phosphate, detergent, and water. Rinse scrubbed surfaces with clean water.

3. Remove loose or peeling primer and other surface contaminants not easily removed by the previous cleaning methods in accordance with SSPC SP-7. Take care that remaining primers are not damaged by the blast cleaning operation. Remaining primers shall be firmly bonded to the steel surfaces with blast cleaned edges feathered.

4. Remove rust, scaling, or primer damaged by welding or during shipment, storage, and erection in accordance with SSPC SP-10. Take care that remaining primers are not damaged by the blast cleaning operation. Areas smaller than 1 square inch may be prepared per SSPC SP-11. Remaining primers shall be firmly bonded to the steel surfaces with cleaned edges feathered.

5. Use repair procedures on damaged primer that protects adjacent primer. Blast cleaning may require the use of lower air pressure, smaller nozzles, and abrasive particle sizes, short blast nozzle distance from surface, shielding, and/or masking.

6. After abrasive blast cleaning of damaged and defective areas, remove dust, blast particles, and other debris by dusting, sweeping, and vacuuming; then apply the specified touch-up coating.

7. Surfaces that are shop primed shall receive a field touch-up of the same primer used in the original prime coat.

F. Painting Systems

1. All materials of a specified painting system, including primer, intermediate, and finish coats, shall be produced by the same manufacturer. Thinners, cleaners, driers, and other additives shall be as recommended by the paint manufacturer for the particular coating system.

2. Deliver paints to the jobsite in the original, unopened containers.

G. Paint Storage and Mixing

1. Store and mix materials only in areas designated for that purpose by the Owner's Representative. The area shall be well-ventilated, with precautionary measures taken to prevent fire hazards. Post "No Smoking" signs. Storage and mixing areas shall be clean and free of rags, waste, and scrapings. Tightly close containers after each use. Store paint at an ambient temperature from 50°F to 100°F.

2. Prepare multiple-component coatings using all of the contents of the container for each component as packaged by the paint manufacturer. Do not use partial batches. Do not use multiple-component coatings that have been mixed beyond their pot life. Provide small quantity kits for touch-up painting and for painting other small areas. Mix only the components specified and furnished by the paint manufacturer. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

H. Procedures for the Application of Coatings

1. Conform to the requirements of SSPC PA-1. Follow the recommendations of the coating manufacturer including the selection of spray equipment, brushes, rollers, cleaners, thinners, mixing, drying time, temperature and humidity of application, and safety precautions.

2. Stir, strain, and keep coating materials at a uniform consistency during application. Power mix components. For multiple component materials,

premix each component before combining. Apply each coating evenly, free of brush marks, sags, runs, and other evidence of poor workmanship. Use a different shade or tint on succeeding coating applications to indicate coverage where possible. Finished surfaces shall be free from defects or blemishes.

3. Do not use thinners unless recommended by the coating manufacturer. If thinning is allowed, do not exceed the maximum allowable amount of thinner per gallon of coating material. Stir coating materials at all times when adding thinner. Do not flood the coating material surface with thinner prior to mixing. Do not reduce coating materials more than is absolutely necessary to obtain the proper application characteristics and to obtain the specified dry-film thicknesses.

4. Remove dust, blast particles, and other debris from blast cleaned surfaces by dusting, sweeping, and vacuuming. Allow ventilator fans to clean airborne dust to provide good visibility of working area prior to coating applications. Remove dust from coated surfaces by dusting, sweeping, and vacuuming prior to applying succeeding coats.

5. Apply coating systems to the specified minimum dry-film thicknesses as determined per SSPC PA-2.

6. Apply primer immediately after blast cleaning and before any surface rusting occurs, or any dust, dirt, or any foreign matter has accumulated. Reclean surfaces by blast cleaning that have surface colored or become moist prior to coating application.

7. Apply a brush coat of primer on welds, sharp edges, nuts, bolts, and irregular surfaces prior to the application of the primer and finish coat. Apply the brush coat prior to and in conjunction with the spray coat application. Apply the spray coat over the brush coat.

8. Before applying subsequent coats, allow the primer and intermediate coats to dry for the minimum curing time recommended by the manufacturer. In no case shall the time between coats exceed the manufacturer's recommendation.

9. Each coat shall cover the surface of the preceding coat completely, and there shall be a visually perceptible difference in applied shade or tint of colors.

10. Applied coating systems shall be cured at 75°F or higher for 48 hours. If temperature is lower than 75°F, curing time shall be in accordance with printed recommendations of the manufacturer, unless otherwise allowed by the Owner's Representative.

11. Assembled parts shall be disassembled sufficiently before painting or coating to ensure complete coverage by the required coating.

I. Surfaces Not To Be Coated

Do not paint the following surfaces unless otherwise noted in the drawings or in other specification sections. Protect during the painting of adjacent areas:

1. Concrete walkways.

2. Mortar-coated pipe and fittings.

3. Stainless steel.

4. Fencing.

5. Electrical fixtures except for factory coatings.

6. Nameplates.

7. Grease fittings.

8. Buried pipe, unless specifically required in the piping specifications.

9. Aluminum handrail, stairs, and grating.

J. Protection of Surfaces Not To Be Painted

Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process. Mask openings in motors to prevent paint and other materials from entering the motors.

K. Surfaces To Be Coated

The exact coating to be applied in any location is not designated by the descriptive phrases in the coating system titles such as “corrosive environment,” “buried metal,” or “submerged metal.” Coat surfaces with the specific coating systems as described below:

1. Coat aboveground and exposed piping or piping in vaults as described in the various piping specifications. Color of finish coat shall be blue.

2. Coat submerged ductile iron piping per System No. 7.

3. Coat valves as described in the various valve specifications. Aboveground valves, or valves in vaults and structures, shall match the color of the connecting piping.

4. Coat aluminum surfaces in contact with concrete per System No. 54.

5. Coat buried flanges, nuts and bolts, valves, flexible pipe couplings, exposed rebar in thrust blocks, and valve boxes per System No. 21. Coat buried bolt threads, tie bolt threads, and nuts per System No. 24.

L. Dry-Film Thickness Testing

1. Measure coating thickness specified for carbon steel surfaces with a magnetic-type dry-film thickness gauge in accordance with SSPC PA-2. Provide certification that the gauge has been calibrated by a certified laboratory within the past six months. Provide dry-film thickness gauge as manufactured by Mikrotest or Elcometer.

2. Test the finish coat of metal surfaces (except zinc primer and galvanizing) for holidays and discontinuities with an electrical holiday detector, low-voltage, wet-sponge type. Provide measuring equipment. Provide certification that the gauge has been calibrated by a certified laboratory within the past six months. Provide detector as manufactured by Tinker and Rasor or K-D Bird Dog.

3. Check each coat for the correct dry-film thickness. Do not measure within eight hours after application of the coating.

4. For metal surfaces, make five separate spot measurements (average of three readings) spaced evenly over each 100 square feet of area (or fraction thereof) to be measured. Make three readings for each spot measurement of either the substrate or the paint. Move the probe or detector a distance of 1 to 3 inches for each new gauge reading. Discard any unusually high or low reading that cannot be repeated consistently. Take the average (mean) of the three readings as the spot measurement. The average of five spot measurements for each such 100-square-foot area shall not be less than the specified thickness. No single spot measurement in any 100-square-foot area shall be less than 80%, nor more than 120%, of the specified thickness. One of three readings which are averaged to produce each spot measurement may underrun by a greater amount as defined by SSPC PA-2.

5. Perform tests in the presence of the Owner's Representative.

M. Repair of Improperly Coated Surfaces

If the item has an improper finish color or insufficient film thickness, clean and topcoat the surface with the specified paint material to obtain the specified color and coverage. Sandblast or power-sand visible areas of chipped, peeled, or

abraded paint, feathering the edges. Then prime and finish coat in accordance with the specifications. Work shall be free of runs, bridges, shiners, laps, or other imperfections.

N. Cleaning

1. During the progress of the work, remove discarded materials, rubbish, cans, and rags at the end of each day's work.

2. Thoroughly clean brushes and other application equipment at the end of each period of use and when changing to another paint or color.

3. Upon completion of painting work, remove masking tape, tarps, and other protective materials, using care not to damage finished surfaces.

END OF SECTION