SECTION 09800 - PROTECTIVE COATING

City of San Diego, CWP Guidelines

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A The WORK of this Section includes the protective coating of all indicated surfaces including surface preparation, pretreatment, coating application, touch-up, protection of surfaces not to be coated, cleanup, and all appurtenant work.

B. Definitions

1. The term “paint”, “coatings”, or “finishes” as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, and all other protective coatings, except galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.

2. The term “DFT” shall mean minimum dry film thickness, without any negative tolerance.

C. The following surfaces shall not be protective coated hereunder unless indicated.

1. Concrete except in chemical(s) containment areas

2. Stainless steel

3. Machined surfaces

4. Grease fittings

5. Glass

6. Equipment nameplates

7. Platform gratings, stair treads, door thresholds, and other walk surfaces

D. the coating system schedules summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied. Coating notes on the drawings are used to show exceptions to the schedules, to show or extend the limits of coating systems, or to clarify or show details for application of the coating systems.

[E. **ArchitecturalCoatings:** Wood, drywall and plaster surfaces shall be coated as indicated in Section 09900 - Architectural Paint Finishes. All other surfaces of buildings shall be coated as indicated in this Section.]

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 09900 - Architectural Paint Finishes

1.3 CODES

A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

1. Uniform Building Code

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

1. References herein to "SSPC Specifications" or "SSPC" shall mean the published standards of the Steel Structures Painting Council, 40 24th Street, 6th Floor, Pittsburgh, PA 15222.

2. References herein to "NACE" shall mean the published standards of the National Association of Corrosion Engineers, P.O. Box 281340, Houston, TX 77218-8340.

3. Commercial Standards:

ANSI A13.1	Scheme for Identification of Piping Systems
ANSI/AWWA C105	Polyethylene Encasement for Ductile Iron Piping
ANSI/AWWA C203	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape-Hot-Applied
ANSI/AWWA C209	Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
ANSI/AWWA D102	Painting Steel Water-Storage Tanks

4. Federal Specifications:

TT-P-28	Paint, Aluminum, Heat Resisting (1200^{O}F)
DOD-P-23236	Military Specification, Paint Coating Systems, Steel Ship Tank, Fuel and Salt Water Ballast

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300 unless indicated otherwise.

B. Submittals shall include the following information and be submitted at least 30 days prior to protective coating work.

1. Coating Materials List: The CONTRACTOR shall provide a coating materials list which indicates the manufacturer and the coating number, keyed to the coating systems herein, prior to or at the time of submittal of samples.

2. Paint Manufacturer's Catalogue: For each paint system to be used the CONTRACTOR shall submit manufacturer's catalogue containing the following data

   a. Paint Manufacturer’s data sheet for each product used, including statements on the suitability of the material for the intended use.

   b. Technical and performance information that demonstrates compliance with the system performance and material requirements.

   c. Manufacturer’s Instructions and recommendations on surface preparation, thinning, mixing, handling, applying and proper storage.

   d. Colors available for each product (where applicable).

   e. Compatibility of shop and field applied coatings (where applicable).

   f. Material safety data sheet for each product used.

C. Samples

1. Samples of all paint, finishes, and other coating materials shall be submitted on 8½-inch by 11-inch sheet metal. Each sample shall be completely coated over its entire surface with one protective coating material, type, and color.

[2. Two sets of color samples to match each color selected by the CONSTRUCTION MANAGER from the Manufacturer’s standard color sheets. If custom mixed colors are indicated, the color samples shall be made using color formulations prepared to match the color samples furnished by the CONSTRUCTION MANAGER. The color formula shall be shown on the back of each color sample.]

3. Qualifications of Painting Subcontractor

   a. Copy of a valid State of California license as required for the application of coatings.

   b. Five references which show that the painting subcontractor has demonstrated successful experience with the indicated coating systems in the recent past. Provide the name, address and telephone number of the owner of each installation. The CONTRACTOR shall obtain the references from the subcontractor and submit them to the CONSTRUCTION MANAGER.

1.6 SERVICES OF MANUFACTURER

A. For submerged and severe service coating systems, the CONTRACTOR shall require the paint manufacturer to furnish the following services:

1. The manufacturer's representative shall furnish at least 6 hours of on-site instruction in the proper surface preparation, use, mixing, application and curing of the coating systems.

2. The manufacturer's representative shall personally observe the start of surface preparation, mixing, and application of the coating materials.

3. The manufacturer's representative shall provide technical support to resolve field problems associated with manufacturer's products furnished under this Contract or the application thereof.

4. The manufacturer shall certify that these services have been furnished, and the CONTRACTOR shall submit the certification within 7 days of completion of each paint system.

1.7 INSPECTION AND TESTING

A. **General:** The CONTRACTOR shall give the CONSTRUCTION MANAGER a minimum of 3 days' advance notice of the start of any field surface preparation work or coating application work, and a minimum of 7 days' advance notice of the start of any shop surface preparation work.

B. All such work shall be performed only in the presence of the CONSTRUCTION MANAGER, unless the CONSTRUCTION MANAGER has granted prior approval to perform such work in its absence.

C. Inspection by the CONSTRUCTION MANAGER, or the waiver of inspection of any particular portion of the work, shall not relieve the CONTRACTOR of its responsibility to perform the work in accordance with these Specifications.

D. Scaffolding shall be erected and moved to locations where requested by the CONSTRUCTION MANAGER to facilitate inspection. Additional illumination shall be furnished to cover all areas to be inspected.

E. **Inspection Devices:** The CONTRACTOR shall furnish, until final acceptance of such coatings, inspection devices in good working condition for the detection of holidays and measurement of dry-film thicknesses of protective coatings. Dry-film thickness gauges shall be made available for the CONSTRUCTION MANAGER'S use at all times while coating is being done, until final acceptance of such coatings. The CONTRACTOR shall furnish the services of a trained operator of the holiday detection devices until the final acceptance of such coatings. Holiday detection devices shall be operated only in the presence of the CONSTRUCTION MANAGER.

F. **Holiday Testing:** The CONTRACTOR shall holiday test all coated ferrous surfaces inside a steel reservoir, or other surfaces which will be submerged in water or other liquids, or surfaces which are enclosed in a vapor space in such structures and surfaces coated with any of the submerged and severe service coating systems. Areas which contain holidays shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then retested. In addition to the above the CONSTRUCTION MANAGER may test any surfaces for any number of times at no additional cost to CONTRACTOR. All defects so found shall be corrected by the CONTRACTOR at no additional cost to the OWNER.

1. Coatings With Thickness Exceeding 20 Mils: For surfaces having a total dry film coating thickness exceeding 20 mils: pulse-type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, or equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the indicated coating thickness.

2. Coatings With Thickness of 20 Mils or Less: For surfaces having a total dry film coating thickness of 20 mils or less: Tinker & Rasor Model M1 non-destructive type holiday detector, K-D Bird Dog, or equal shall be used. The unit shall operate at less than 75-volts. For

thicknesses between 10 and 20 mils, a non-sudsing type wetting agent, such as Kodak Photo-Flo, or equal, shall be added to the water prior to wetting the detector sponge.

G. **Film Thickness Testing:** On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC "Paint Application Specification No. 2" using a magnetic-type dry film thickness gauge such as Mikrotest model FM, Elcometer model 111/1EZ, or equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating. On non-ferrous metals and other substrates, the coating thicknesses shall be measured at the time of application using a wet film gauge.

H. **Surface Preparation:** Evaluation of blast cleaned surface preparation work will be based upon comparison of the blasted surfaces with the standard samples available from the NACE, using NACE standard TM-01-70 and TM-01-75.

1.8 WARRANTY INSPECTION

A. A warranty inspection may be conducted during the eleventh month following completion of all coating and painting work. The CONTRACTOR and a representative of the coating material manufacturer shall attend this inspection. All defective work shall be repaired in accordance with these specifications and to the satisfaction of the OWNER. The OWNER may, by written notice to the CONTRACTOR, reschedule the warranty inspection to another date within the one-year correction period, or may cancel the warranty inspection altogether. If a warranty inspection is not held, the CONTRACTOR shall not be relieved of its responsibilities under the Contract Documents.

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NTS: Include the following paragraph if the project contains steel chemical tanks lined with System 107.

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[B. **Extended Maintenance of Chemical Tank Lining Systems:** The CONTRACTOR shall promptly repair any defects in the chemical resistant sheet lining system for a period of two years after the lining has been placed into service. Such maintenance shall include repair of the chemical tank and any equipment or facilities damaged by the corrosive action of the chemicals.]

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NTS: Use the following paragraph if the project contains any steel reservoir or tank lined with System 100 or 105.

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[C. **Steel Reservoir Coating System Inspection:** The CONTRACTOR shall conduct an inspection during the eleventh month after the date when the reservoir was filled with water and placed into service. The CONTRACTOR shall require a representative of the coating material Manufacturer to attend the inspection. All coating defects shall be repaired in accordance with these specifications and to the satisfaction of the CONSTRUCTION MANAGER/OWNER. If a warranty inspection is not held during or before the eleventh month, the CONTRACTOR is not relieved of its warranty responsibilities under the Contract Documents. If the CONTRACTOR fails to conduct an 11-month inspection for reasons not attributed to the CONSTRUCTION MANAGER/OWNER, the CONTRACTOR is not relieved of the warranty responsibilities under the contract Documents, and the warranty period shall be extended until the 11-month inspection is conducted and defective work is repaired.]

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use.

B. Paint materials shall be carefully stored in a manner that will prevent damage and in an area that is protected from deleterious elements.

PART 2 -- PRODUCTS

2.1 GENERAL

A. **Suitability:** The CONTRACTOR shall use suitable coating materials as recommended by Manufacturer for the intended service.

B. **Compatibility:** In any coating system only compatible materials from a single manufacturer shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.

C. **Colors:** All colors and shades of colors of all coats of paint shall be as indicated or selected by the CONSTRUCTION MANAGER. Each coat shall be of a slightly different shade, to facilitate inspection of surface coverage of each coat. [Finish colors shall be as selected from the manufacturer's standard color samples by the CONSTRUCTION MANAGER.] [Finish colors shall be custom mixed to match color samples furnished by the CONSTRUCTION MANAGER.]

D. Substitute or “Or Equal” Products

1 **To establish equality under Section 01600 – Products, Materials, Equipment, and Substitutions**, the CONTRACTOR shall provide satisfactory documentation from the firm manufacturing the proposed substitute or "or-equal" material that said material meets the requirements and is equivalent or better than the listed materials in the following properties:

a. Quality

b. Durability

c. Resistance to abrasion and physical damage

d. Life expectancy

e. Ability to recoat in future

f. Solids content by volume

g. Dry film thickness per coat

h. Compatibility with other coatings

I. Suitability for the intended service

j. Resistance to chemical attack

k. Temperature limitations in service and during application

l. Type and quality of recommended undercoats and topcoats

m. Ease of application

n. Ease of repairing damaged areas

o. Stability of colors

E. Protective coating materials shall be standard products produced by recognized manufacturers who are regularly engaged in production of such materials for essentially identical service conditions. Where requested, the CONTRACTOR shall provide the name of least one successfully performing application of the proposed manufacturer's products in a project of comparable size and complexity constructed in the recent past.

F. The cost of all testing and analyzing proposed substitute materials that may be required by the CONSTRUCTION MANAGER shall be paid by the CONTRACTOR at no additional cost to the OWNER. If the proposed substitution requires changes in the contract work, the CONTRACTOR shall bear all such costs involved and the costs of allied trades affected by the substitution at no additional cost to the OWNER.

2.2 INDUSTRIAL COATING SYSTEMS

A. **Material Sources**: Each of the following manufacturers is capable of supplying many of the industrial coating materials indicated herein. Where manufacturers and paint numbers are listed, it is to show the type and quality of coatings that are required. Proposed substitute materials shall be considered as indicated above. All industrial coating materials shall be materials that have a record of satisfactory performance in industrial plants, manufacturing facilities, water, and wastewater treatment plants.

1. Ameron

2. Carboline Coatings Company

3. Inorganic Coatings, Inc.

4. International (Courtaulds)

5. Tnemec Company

B. **System 1 - Alkyd Enamel:** High quality, gloss or semi-gloss, medium long oil alkyd finish shall have a minimum solids content of 49 percent by volume. Primer shall be as recommended by manufacturer.

1. Prime coat (DFT = 3 mils) Amercoat 5105, Tnemec 4-55, or equal.

2. Finish coats (two or more, DFT = 3 mils), Amercoat 5401 HSA, or 5405, Tnemec 2H, or equal.

3. Total system DFT = 6 mils.

C. **System 2 - Not Used**

D. **System 3 - Aluminum Silicone Resin:** Aluminum silicone resin material shall be suitable for a service temperature of up to 1,000 degrees F, and shall comply with Federal Specification TT-P-28.

1. Prime coat and finish coat (2 or more, DFT = 3 mils), Tnemec Series 39-1061, Amercoat 878, or equal.

2. Total system DFT = 3 mils.

E. **System 4 - Aliphatic Polyurethane:** Two component aliphatic acrylic polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, resistance to chemical fumes and severe weathering and with a minimum solids content of 58 percent by volume. Primer shall be a rust inhibitive two component epoxy coating with a minimum solids content of 68 percent by volume.

1. Prime coat (DFT = 4 mils), Amercoat 385, Carboline 893, Tnemec 69, or equal.

2. Finish coat (one or more, DFT = 3 mils), Amershield, Carboline 134 HS, Tnemec 74, or equal.

3. Total system DFT = 7 mils.

4. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture.

F. **System 5 - Inorganic Zinc/Polyurethane:** The inorganic zinc primer shall be a water or solvent based, self-curing, zinc silicate 2-component inorganic coating which contains at least 85 percent of metallic zinc by weight in the dried film, and is recommended by the coating manufacturer as a primer for this system. The intermediate coat shall be a high-build two component epoxy with a solids content of at least 70 percent by volume. Finish coats shall be a 2-component aliphatic acrylic or polyester polyurethane coating material that provides superior color and gloss retention, resistance to chemical fumes and severe weathering, and a minimum solids content of 58 percent by volume.

1. Prime coat (DFT = 2 mil), Ameron Dimetcote 21-5 or 21-9, Inorganic Coatings 531, or equal.

2. Intermediate coat (DFT = 4 mils), Ameron 385, Inorganic Coatings P24, or equal.

3. Finish coats (one or more, DFT = 3 mils), Ameron Amershield, Inorganic Coatings 64, or equal.

4. Total system DFT = 10 mils.

5. Intermediate coat shall be applied in excess of 4 mils DFT or in more than one coat as necessary to completely cover the inorganic zinc primer and prevent application bubbling of the polyurethane finish coat.

6. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture.

7. If the inorganic zinc primer is used as a pre-construction or shop applied primer, all damaged and uncoated areas shall be spot abrasive blasted and coated after construction using the indicate material.

G. **System 6 - Inorganic Zinc, Water Based:** Water based, self curing, ethyl silicate shall be a two component inorganic coating material that contains at least 85 percent of metallic zinc by weight in the dried film.

1. Prime coat and finish coat (One, DFT = 3 mils), Ameron Dimetcote 21-5, Inorganic Coatings 531, or equal.

2. Total system DFT = 3 mils.

H. **System 7 - Acrylic Latex:** Single component, water based acrylic latex with a fungicide additive shall have a minimum solids content of 35 percent by volume. Prime coat shall be as recommended by manufacturer. The coating material shall be available in the ANSI safety colors.

1. Prime coat (DFT = 2 mils), as recommended by manufacturer.
2. Finish coats (2 or more, DFT = 6 mils), Ameron Amercoat 220, Carboline 3359, Tnemec 6, or equal.

3. Total system DFT = 8 mils.

I. **System 8 - Epoxy Equipment:** Two component, rust inhibitive polyamide cured epoxy coating material shall provide a recoatable finish that is available in a wide selection of colors. The coating material shall have a minimum solids content of 66 percent by volume and be resistant to service conditions of condensing moisture, splash and spillage of lubricating oils, and frequent washdown and cleaning

1. Prime coat DFT = 3 mils, Ameron 385, Tnemec 69, or equal.

2. Prime coat, where shop applied. (DFT = 3 mils), universal primer, Ameron 185 HS, Tnemec 50-330 or 161, or equal.

3. Finish coat (2 or more, DFT =6 mils), Ameron 385, Tnemec 69, or equal.

4. Total system DFT = 6 mils.

J. **System 9 - Inorganic Zinc/Epoxy, Equipment:** The inorganic zinc primer shall be a water or solvent based, self curing, zinc silicate, two-component inorganic coating that contains at least 85 percent of metallic zinc by weight in the dried film, and is recommended by the coating manufacture as a primer for this system. The finish coats shall be a polyamide cured epoxy material with a minimum solids content of at least 80 percent by volume, and available in a large selection of colors.

1. Prime coat DFT =3 mils Ameron Dimetcote 21-5 or 21-9, Carboline carbozinc 7 WB, or equal.

2. Finish coats (2 or more, DFT = 9 mils) Ameron 400, Carboline 890, or equal.

3 Total system DFT = 12 mils.

K. **System 10 - Acrylic, Concrete**: The acrylic coating material shall be a single component, industrial grade, high molecular weight acrylic coating material shall have a minimum solids content of 35 percent by volume. The filler-sealer shall be a two component epoxy masonry sealer for wet and exterior exposure, with a solids content of at least 64 percent by volume. A 100 percent solids epoxy surface shall be used to fill holes and patch the concrete surface after abrasive blasting.

1. Prime coat (Filler-sealer), applied in two coats to the entire surface and worked into the surface with a squeegee to achieve a smooth, void-free surface, Tnemec 54-660, Ameron Nu-Klad 105A followed by Nu-Klad 114A (2 coats), or equal.

2. Finish coats (2 or more, DFT = 6 mils), Tnemec 6, Ameron Amercoat 220, or equal.

L. **System 11 - Aliphatic Polyurethane, Concrete:** Two component aliphatic polyester polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, and resistance to chemical fumes and severe weathering, and with a minimum solids content of 65 percent by volume. Filler-sealer compound shall be a two component epoxy material used to provide a smooth surface for the epoxy intermediate coat. The filler-sealer shall be applied to the entire concrete surface and worked into the concrete surface with a wide blade putty knife or squeegee. The intermediate coat shall be a high-build epoxy coating with a minimum solids content of 70 percent by volume.

1. Prime coat (Filler-sealer), Ameron Nu-Klad 105A followed by, Nu-Klad 114 Tnemec 54-660, or equal.

2. Intermediate coat (DFT = 4 mils), Ameron Amerlock 400, Tnemec 104 HS, or equal.

3. Finish coats (2 or more, DFT = 3 mils), Ameron Amershield, Tnemec 74, or equal.

M. **System 12 - Aliphatic Polyurethane, Fiber Glass:** Two-component aliphatic polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, and resistance to chemical fumes and severe weathering. A primer, tie coat, or mist coat shall be used as recommended by the manufacturer.

1. Prime coat (Tie coat), Ameron Amercoat 385, Tnemec 66, or equal.

2. Finish coats (2 or more, DFT = 3 mils), Ameron Amershield, Tnemec 74, or equal.

2.2 SUBMERGED AND SEVERE SERVICE COATING SYSTEMS

A. **Materials Sources**: The manufacturers' products listed in this paragraph are materials which satisfy the material descriptions of this paragraph and have a documented successful record for long term submerged or severe service conditions. Proposed substitute products shall be considered as indicated above.

B. **System 100 - Amine Cured Epoxy:** High build, amine cured, straight epoxy resin shall have a solids content of at least 80 percent by volume, and shall be suitable for long-term immersion service in potable water and wastewater. For potable water service, the coating material shall be listed by the NSF International as in compliance with NSF Standard 61– Drinking Water System Components – Health Effects.

1. Prime coat and finish coats (3 or more, DFT = 16 mils), Amercoat 395, Tnemec 139, or equal.

2. For coating of valves and non-submerged equipment, DFT = 12 mils.

C. **System 101 - Cold-Applied Tape:** Tape coating materials and procedures shall be in accordance with ANSI/AWWA C209. Prefabricated tape shall be Type II. The system shall consist of a primer layer, inner layer tape (35 mils), and an outer layer tape (35 mils). Total system DFT = 70 mils.

D. **System 102 - Polyamide Cured Epoxy:** High build, polyamide epoxy resin shall have a solids content of at least 56 percent by volume, and shall be suitable for long-term immersion in potable water and municipal wastewater. For potable water service, the coating material shall be listed by the NSF International as in compliance with NSF Standard 61.

1. Prime coat and finish coats (3 or more, DFT = 12 mils), Tnemec 20, or equal.

E. **System 103 - Coal Tar Epoxy:** High build, 2-component amine or polyamide cured coal tar epoxy shall have a solids content of at least 68 percent by volume, suitable for long term immersion in wastewater and for coating of buried surfaces, and conforming to DOD-P-23236, Class 2, or to SSPC Paint 16. Prime coats are for use as a shop primer only. Prime coat shall be omitted when both surface preparation and coating are to be performed in the field.

1. Finish coats (2 or more, DFT = 16 mils), Amercoat 78 HB, Tnemec 46 H-413, or equal.
2. Total system DFT = 16 mils.

F. **System 104 - Not Used**

G. **System 105 - Epoxy, Reservoirs:**

1. Primer: Solids content of 100 percent, NSF listed, compatible with finish coating, 3 mils.

2 Polyamide Cured Epoxy: High build polyamide cured epoxy coating shall have a solids content of at least 70 percent by volume and a finish coat color of white.

3. Amine Cured Epoxy: High build amine cured epoxy coating shall have a solids content of at least 78 percent by volume and with a finish coat color of white or ivory.

4. The epoxy coating material shall be either a polyamide-cured epoxy or an amine-cured epoxy suitable for long-term immersion service in reclaimed and potable water. The material shall and listed by NSF International as in compliance with NSF Standard 61 and shall conform with State and local health regulations and policies for service in potable water reservoirs. The CONTRACTOR shall submit a written certification that the proposed materials meet the above regulatory agency standards and policies. The material shall be applied with a primer if recommended by the coating manufacturer.

5. Part A: Products shall be as listed, or equal:

a.	Pre-coating, prior to erection. See Note (1) under Paragraph f.	(DFT = 3 mils)	Ameron Dimetcote 21-5, International Interline 982
b.	Finish coating, prior to erection. Top of roof rafters, girders, and other areas not accessible after erection.	(DFT = 9 mils)	Ameron Amercoat 395, International Interline 925
c.	Touch up, following erection. See Note (2) under Paragraph f.	(DFT = 3 mils)	

d.	Difficult-to-coat areas, following erection. See Note (3) under Paragraph f.	(DFT = 9 mils)	Ameron Amercoat 395, International Interline 925
e.	Finish Coats (2 or more)	(DFT = 9 mils)	Ameron 395, International Interline 925

f. Notes:

(1) All lap roof plate edges, both sides, are to be pre-coated. If necessary, zinc primer exposed on exterior of roof may be removed prior to welding. Pre-coating shall extend at least 6 inches from plate edges.

(2) Touch-up coating shall be done for areas damaged during erection, or areas not pre-coated. The CONTRACTOR shall spot sandblast to SSPC-SP-5 - white metal blast cleaning, before application of coating. Material used for touch-up shall be the specified material, or a compatible primer recommended by the manufacturer.

(3) All edges, nuts, bolts, lap joints, weld seams and the roof rim angle shall receive one brush-applied coat prior to the application of the first complete spray coat.

6. Part B: Products shall be as listed, or equal:

a.	Difficult-to-coat areas. See Note (1) under Paragraph d.		Ameron Amercoat 395, International Interline 925
b.	Finish coats (2 or more). Finish coats to be applied at 4-6 mils DFT per coat. See Note (1) under Paragraph d.	(DFT = 12 mils)	Ameron Amercoat 395, International Interline 925

c. Total system DFT = 12 mils

d. Notes:

(1) All edges, nuts, bolts, lap joints, and weld seams shall receive one brush-applied coat prior to the application of the first complete spray coat.

7. Curing Period: Prior to immersion, the completed system shall be subjected to at least 240 hours of curing time with the metal temperature at a minimum of 70 degrees F, or 480 hours at a minimum of 60 degrees F, both conditions at a maximum relative humidity of 50 percent and under the forced ventilation conditions required by the paragraph entitled "Curing of Coatings, herein. More curing time or a higher temperature shall be provided if recommended by the epoxy coating manufacturer. If the environmental conditions do not provide the necessary minimum temperature, use heated air to provide the necessary heat for curing. Other combinations of curing time and temperature may be used if the coating manufacturer presents satisfactory documentation and test results to substantiate that the degree of curing is equal or greater than curing for 240 hours at 70 degrees F.

8. Volatile Organic Compound Testing: The completed interior reservoir coating system shall be tested for volatile organic compounds as specified herein.

H. **System 106 - Fusion Bonded Epoxy:** The coating material shall be a 100 percent powder epoxy, certified as compliant with NSF Standard 61, applied in accordance with the ANSI/AWWA C213 "AWWA Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines," except that the surface preparation shall be as specified in the coating system schedule of this Section. The coating shall be applied using the fluidized bed or electrostatic spray process.

1. Coating DFT = 16 mils, Scotchkote 134 (electrostatic) or 206N (fludized bed), or equal, applied in one coat.

2. For coating of valves, DFT = 12 mils.

3. For field repairs, the use of a liquid epoxy will be permitted , applied in one coat to provide a DFT of 15 mils. The liquid epoxy shall be Scotchkote 312 or as recommended by the powder epoxy manufacturer.

I. **System 107 - Chemical Resistant Sheet Lining:**

1. Materials: The CONTRACTOR shall use natural rubber, chlorobutyl rubber, ethylene propylene diene monomer (EPDM) rubber, chloroprene polymer (neoprene) rubber, or chlorosulfonated polyethylene (Hypalon) rubber sheet lining materials as indicated herein. The shop drawing submittal shall contain technical information that confirms the suitability of the lining material system for long-term contact with each chemical to be stored. The service temperatures are expected to be up to 150 degrees F.

2. Neoprene sheet lining material shall be synthetic rubber formulated for steam curing at atmospheric pressure. The minimum lining thickness shall be 3/16 inch. The lining material shall be Polymeric Protective Linings BFG 2011 (59688), or equal.

3. Chlorobutyl sheet lining material shall be synthetic rubber formulated for steam curing at atmospheric pressure. The minimum lining thickness shall be 3/16-inch. The lining material shall be Polymeric BFG 1051 (60924), or equal.

4. Natural rubber (soft) sheet lining material shall be soft natural rubber formulated for steam curing at atmospheric pressure. The minimum lining thickness shall be 3/16 inch. The lining material shall be Polymeric BFG 2004 (83160), or equal.

5. Material rubber (hard) sheet lining material shall be a hard, natural rubber resistant to oxidizing agents and formulated for autoclave curing. The minimum lining thickness shall be 3/16 inch. The lining material shall be Polymeric BFG 1006 (8631), or equal.

6. EPDM sheet lining material shall be synthetic rubber suitable for use as a lining for 50 percent sulfuric acid solution and formulated for autoclave or steam curing under pressure. The lining material shall be Polymeric BFG 1039 (EP 156), or equal.

7. Hypalon sheet lining material shall be synthetic rubber suitable for use as a lining for 50 percent sulfuric acid solution. The lining material shall be Polymeric BFG 2045 (8706), or equal.

8. Primers, adhesives, activators, accelerators and other necessary materials shall be as specified by the sheet material manufacturer.

9. Metal Surface Preparation: Prior to abrasive blast cleaning the base metal shall be prepared as specified by the sheet lining material manufacturer's installation instructions. If the instructions differ from these specifications the higher degree of cleaning and surface preparation shall be provided. Abrasive blast cleaning shall be done in accordance with this Section.

10. Installation of lining materials shall be in accordance with the material manufacturer's written installation instructions. All interior surfaces shall be lined, including all piping, vents, fittings, flange faces, manhole covers and blind flanges.

11. The lining system shall be holiday tested in accordance with this Section before and after curing.

12. The lining system shall be cured by steam using the time and temperature as specified by the material manufacturer.

J. **System 108 - Epoxy, Concrete:** The coating material shall be an amino cured epoxy material suitable for long-term immersion in water and wastewater and for service where subjected to occasional splash and spillage of water and wastewater treatment chemicals. The finish coating material shall have a minimum solids content of 69 percent by volume. If used for potable water service the finish coating material shall be listed by the NSF International as in compliance with NSF Standard 61, and shall conform with state and local health regulations and policies for service in potable water. The filler-sealer shall be a 1000 percent solids amine-cured epoxy material with silica and inert fillers.

1. Filler-sealer: Plastic 9029 (applied by squeegee); Tnemec 69-1211 (6-8 mils) followed by Tnemec 63-1500; Ameron Nu-Klad 105A followed by Nu-Klad 114A (two coats) or equal.

2. Finish coats (two or more, DFT = 12 mils); Plasite 9133; Tnemec 69; Ameron Amercoat 395, or equal. On walking surfaces use a non-skid additive such as Ameron 886 in the final coat.

K. **System 109 - Not Used**

L. **System 110 - Not Used**

M. **System 111 - Vinyl Ester:** Vinyl ester resin coating material with an inert flake pigment suitable for immersion service in 30 percent hydrochloric acid and 30 percent sulfuric acid solutions.

1. Two or more coats (DFT = 40 mils), Plasite 4100, or equal. Use a prime coat as recommended by the material manufacturer.

N. **System 112 - Vinyl Ester, Concrete:** Vinyl ester resin coating material with an inert flake pigment suitable for immersion service in hydrochloric acid and sulfuric acid solutions. The filler-sealer shall be a 100 percent solids amine-cured epoxy or vinyl ester material with silica and inert fillers. The filler-sealer is applied to the entire concrete surface. A 100 percent solids epoxy or vinyl ester surfacer shall be used to fill holes and patch the concrete surface after abrasive blasting.

1. Prime coat (filler-sealer), applied in two coats using a squeegee to achieve a smooth void-free surface, Plasite 9028 MI, or equal.
2. Finish coats (two or more, DFT = 40 mils), Plasite 4100, or equal.

2.3 SPECIAL COATING SYSTEMS

A. **System 200 - PVC Tape:** Prior to wrapping the pipe with PVC tape, the pipe and fittings first shall be primed using a primer recommended by the PVC tape manufacturer. After being primed, the pipe shall be wrapped with a 20-mil adhesive PVC tape, half-lapped, to a total thickness of 40 mils.

B. **System 201 - Rich Portland Cement Mortar:** Rich portland cement mortar coating shall have a minimum thickness of 1/8-inch, followed by enclosure in an 8-mil thick polyethylene sheet with all joints and edges lapped and sealed with tape.

C. **System 203 - Epoxy Surfacing:** Two-component epoxy floor surfacing shall be formulated to resist many acids, alkalies, and solvents. Material shall be resistant to liquid alum, sodium hydroxide, and 50 percent sulfuric acid. Products shall be as follows, or equal:

1. Prime coat Nu-Klad 105; finish coat Nu-Klad 110 (1/4-inch thick), or equal.

D. **System 204 - Water-Retardant:** Two coats (or single coat if manufacturer recommends in writing) of a clear, non-staining, silane-modified-siloxane masonry water-retardant material. The water-retardant system after application shall be provided with not less than a five-year warranty on the performance of the product.

1. TAMMS Barricade Series; Rainguard "Blok-Lok"; or equal.

Surfaces shall be cleaned with a chemical cleaner approved by the manufacturer and power wash. Surfaces shall be clean and dry before application of the material. Method and rate of application shall be in accordance with manufacturer's published instructions. A manufacturer's representative shall be present during applications if necessary for warranty.

E. **System 205 - Polyethylene Encasement:** Application of polyethylene encasement shall be in accordance with ANSI/AWWA C105 using Method C.

F. **System 206 - Cement Mortar Coating:** A 1-1/2-inch minimum thickness mortar coating reinforced with 3/4-inch galvanized welded wire fabric shall be provided. The cement mortar shall contain no less than one part Type V cement to 3 parts sand. The cement mortar shall be cured by a curing compound meeting the requirements of "Liquid Membrane-Forming Compounds for Curing Concrete" ASTM C 309-81, Type II, white pigmented, or by enclosure in an 8-mil thick polyethylene sheet with all joints and edges lapped by at least 6 inches.

G. **System 207 - Not Used**

H. **System 208 - Aluminum Metal Isolation:** Two coats of a high build polyamide epoxy painting, such as Tnemec 66, or equal (8 mils). Total thickness of system DFT = 8.0 mils.

I. **System 209 - Alkyd-Wood:** Industrial quality, gloss or semi-gloss, medium long oil alkyd coating material with a minimum solids content of 49 percent by volume. Primer shall be an alkyd primer as recommended by the manufacturer.

1. Prime coat DFT = 3 mils

2. Finish coats (two or more, DFT = 3 mils), Amercoat 5401, Tnemec 2H, or equal.

3. Total system DFT = 6 mils.

J. **System 210 - Acrylic-Wood:** Single component, water-based acrylic latex coating material with a fungicide additive and a minimum solids content of 35 percent by volume. Primer shall be an alkyd primer as recommended by the manufacturer.

1. Prime coat DFT = 2 mils.

2. Finish coats (two or more, DFT = 6 mils), Amerguard 220, Carboline 3300, Tnemec 6, or equal.

3. Total system DFT = 8 mils.

K. **System 211 - Acrylic Drywall:** Single component, water-based acrylic latex coating material with a fungicide additive and a minimum solids content of 35 percent by volume. Primer shall be a PVA sealer as recommended by the manufacturer.

1. Prime coat DFT = 1.5 mils.

2. Finish coats (two or more, DFT = 6 mils), Amerguard 220, Carboline 3300, Tnemec 6, or equal.

3. Total system DFT = 7.5 mils.

PART 3 -- EXECUTION

3.1 WORKMANSHIP

A. Skilled craftsmen and experienced supervision shall be used on all WORK.

B. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to insure thorough cleaning and an adequate thickness of coating material. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat would not increase the hiding. Special attention shall be given to insure that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other precautionary measures.

C. All damage to surface resulting from the WORK shall be cleaned, repaired, and refinished to original condition.

3.2 STORAGE, MIXING, AND THINNING OF MATERIALS

A. **Manufacturer's Recommendations:** Unless otherwise indicated, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for all other procedures relative to coating shall be strictly observed.

B. All protective coating materials shall be used within the manufacturer's recommended shelf life.

C. **Storage and Mixing:** Coating materials shall be stored under the conditions recommended by the Material Safety Data Sheets, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings of different manufacturers shall not be mixed together.

3.3 PREPARATION FOR COATING

A. **General:** All surfaces to receive protective coatings shall be cleaned as indicated prior to application of coatings. The CONTRACTOR shall examine all surfaces to be coated, and shall correct all surface defects before application of any coating material. All marred or abraded spots on shop-primed and on factory-finished surfaces shall receive touch-up restoration prior to any coating application. Surfaces to be coated shall be dry and free of visible dust.

B. **Protection of Surfaces Not to be Coated:** Surfaces which are not to receive protective coatings shall be protected during surface preparation, cleaning, and coating operations.

C. All hardware, lighting fixtures, switchplates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked or otherwise protected. Drop cloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of all mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations. Openings in motors shall be masked to prevent entry of coating or other materials.

D. Care shall be exercised not to damage adjacent work during blast cleaning operations. Spray painting shall be conducted under carefully controlled conditions. The CONTRACTOR shall be fully responsible for and shall promptly repair any and all damage to adjacent work or adjoining property occurring from blast cleaning or coating operations.

E. **Protection of Painted Surfaces:** Cleaning and coating shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly-coated surfaces.

3.4 SURFACE PREPARATION STANDARDS

A. The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification:

1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.

2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by hand chipping, scraping, sanding, and wire brushing.

3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by power tool chipping, descaling, sanding, wire brushing, and grinding.

4. White Metal Blast Cleaning (SSPC-SP5): Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.

5. Commercial Blast Cleaning (SSPC-SP6): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 33 percent of each square inch of surface area.

6. Brush-Off Blast Cleaning (SSPC-SP7): Removal of all visible oil, grease, soil, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust and paint which cannot be removed by a dull putty knife may remain.

7. Near-White Blast Cleaning (SSPC-SP10): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 5 percent of each square inch of surface area.

3.5 METAL SURFACE PREPARATION (UNGALVANIZED)

A. The minimum abrasive blasting surface preparation shall be as specified in the coating system schedules included at the end of this Section. Where there is a conflict between these specifications and the coating manufacturer's printed recommendations for the intended service, the more stringent degree of cleaning shall apply.

B. Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard TM-01-70 - Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive and TM-01-75 - Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grits..

C. Oil, grease, welding fluxes and other surface contaminants shall be removed by solvent cleaning per SSPC-SP1 prior to blast cleaning.

D. All sharp edges shall be rounded or chamfered and all burrs, and surface defects and weld splatter shall be ground smooth prior to blast cleaning.

E. The type and size of abrasive shall be selected to produce a surface profile that meets the manufacturer's recommendation for the specific coating and service conditions. Abrasive shall not be used unless approved by the CONSTRUCTION MANAGER.

1. Submerged and Severe Service

a. Automated blasting systems shall not be used for surfaces that will be in submerged service but are acceptable for severe service.

b. Abrasives for submerged and severe service coatings shall be clean, hard, sharp cutting crushed: no metallic abrasives shall be used.

2. Other Services

a. Either automated or manual methods of blasting may be used.

b. Abrasives shall be clean, oil-free metallic abrasives, composed of at least 50 percent grit.

F. The CONTRACTOR shall comply with the applicable federal, state, and local air pollution control regulations for blast cleaning.

F. Compressed air for air blast cleaning shall be supplied at adequate pressure from well maintained compressors equipped with oil/moisture separators which remove at least 95 percent of the contaminants.

G. Surfaces shall be cleaned of all dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming or another approved method prior to painting.

H. Enclosed areas and other areas where dust settling is a problem shall be vacuum cleaned and wiped with a tack cloth.

I. Damaged or defective coating shall be removed by the specified blast cleaning to meet the clean surface requirements before recoating.

J. If the specified abrasive blast cleaning will damage adjacent work, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC-SP2, or SSPC-SP3 may be used.

K. Shop applied coatings of unknown composition shall be completely removed before the specified coatings are applied. Valves, castings, ductile or cast iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary coatings. Temporary coatings shall be completely removed by solvent cleaning per SSPC-SP1 before the abrasive blast cleaning work has been started.

L. Shop primed equipment shall be solvent cleaned in the field before finish coats are applied.

3.6 SURFACE PREPARATION FOR GALVANIZED FERROUS METAL

A. Galvanized ferrous metal shall be alkaline cleaned per SSPC-SP1 to remove oil, grease, and other contaminants detrimental to adhesion of the protective coating system to be used, followed by brush-off blast cleaning per SSPC-SP7.

B. Pretreatment coatings of surfaces shall be in accordance with the printed recommendations of the coating manufacturer.

3.7 SURFACE PREPARATION OF FERROUS SURFACES WITH EXISTING COATINGS, EXCLUDING STEEL RESERVOIR INTERIORS

A. **General:** All grease, oil, heavy chalk, dirt, or other contaminants shall be removed by solvent or detergent cleaning prior to abrasive blast cleaning. The generic type of the existing coatings shall be determined by laboratory testing.

B. **Abrasive Blast Cleaning:** The CONTRACTOR shall provide the degree of cleaning specified in the coating system schedule for the entire surface to be coated. If the degree of cleaning is not specified in the schedule, deteriorated coatings shall be removed by abrasive blast cleaning to SSPC-SP6, Commercial Blast Cleaning. Areas of tightly adhering coatings shall be cleaned to SSPC-SP7, Brush-off Blast Cleaning, with the remaining thickness of existing coating not to exceed 3 mils.

C. **Incompatible Coatings:** If coatings to be applied are not compatible with existing coatings the CONTRACTOR shall apply intermediate coatings per the paint manufacturer's recommendation for the specified coating system or shall completely remove the existing coating prior to abrasive blast cleaning. A small trial application shall be conducted for compatibility prior to painting large areas.

D. **Unknown Coatings:** Coatings of unknown composition shall be completely removed prior to application of new coatings.

E. **Water Abrasive or Wet Abrasive Blast Cleaning:** Where indicated or where job site conditions do not permit dry abrasive blasting for industrial coating systems due to dust or air pollution considerations, water abrasive blasting or wet abrasive blasting may be used. In both methods, paint-compatible corrosion inhibitors shall be used, and coating application shall begin as soon as the surfaces are dry. Water abrasive blasting shall be done using high pressure water with sand injection. In both methods, the equipment used shall be commercially produced equipment with a successful service record. Wet blasting methods shall not be used for submerged and severe service coating systems unless indicated.

3.8 CONCRETE AND CONCRETE BLOCK MASONRY SURFACE PREPARATION

A. Surface preparation shall not begin until at least 30 days after the concrete or masonry has been placed.

B. All oil, grease, and form release and curing compounds shall be removed by detergent cleaning per SSPC-SP1 before abrasive blast cleaning.

C. Concrete, concrete block masonry surfaces and deteriorated concrete surfaces to be coated shall be abrasive blast cleaned to remove existing coatings, laitance, deteriorated concrete, and to roughen the surface equivalent to the surface of the No. 80 grit flint sandpaper.

D. If acid etching is required by the coating application instructions, the treatment shall be made after abrasive blasting. After etching, rinse surfaces with water and test the pH. The pH shall be between neutral and 8.

E. Surfaces shall be clean and as recommended by the coating manufacturer before coating is started.

F. Unless required for proper adhesion, surfaces shall be dry prior to coating. The presence of moisture shall be determined with a moisture detection device such as Delmhorst Model DB, or equal.

3.9 PLASTIC, FIBER GLASS, AND NONFERROUS METALS SURFACE PREPARATION

A. Plastic and fiber glass surfaces shall be sanded or brush off blast cleaned prior to solvent cleaning with a chemical compatible with the coating system primer.

B. Non-ferrous metal surfaces shall be solvent-cleaned SSPC-SP1 followed by sanding or brush-off blast cleaning SSPC-SP7.

C. All surfaces shall be clean and dry prior to coating application.

3.10 ARCHITECTURAL CONCRETE BLOCK MASONRY SURFACE PREPARATION

A. The mortar surfaces shall be cured at least 14 days before surface preparation work is started.

B. Dust, dirt, grease, and other foreign matter shall be removed prior to abrasive blasting.

C. The masonry surfaces shall be prepared in accordance with the material manufacturer's printed instructions.

3.11 SHOP COATING REQUIREMENTS

A. Unless indicated otherwise, items of equipment, or parts of equipment which are not submerged in service, shall be shop primed and then finish coated in the field after installation with the indicated or approved color. The methods, materials, application equipment and all other details of shop painting shall comply with this section. If the shop primer requires topcoating within a specified period of time, the equipment shall be finish coated in the shop and then touch-up painted after installation.

B. All items of equipment, or parts and surfaces of equipment which are submerged or inside an enclosed hydraulic structure when in service, with the exception of pumps and valves, shall have all surface preparation and coating work performed in the field.

C. For certain pieces of equipment it may be undesirable or impractical to apply finish coatings in the field. Such equipment may include engine generator sets, equipment such as electrical control panels, switchgear or main control boards, submerged parts of pumps, ferrous metal passages in valves, or other items where it is not possible to obtain the specified quality in the field. Such equipment shall be primed and finish coated in the shop and touched up in the field with the identical material after installation. The CONTRACTOR shall require the manufacturer of each such piece of equipment to certify as part of its shop drawings that the surface preparation is in accordance with these specifications. The coating material data sheet shall be submitted with the shop drawings for the equipment.

D. For certain small pieces of equipment the manufacturer may have a standard coating system which is suitable for the intended service conditions. In such cases, the final determination of suitability will be made during review of the shop drawing submittals. Equipment of this type generally includes only indoor equipment such as instruments, small compressors, and chemical metering pumps.

E. Shop painted surfaces shall be protected during shipment and handling by suitable provisions including padding, blocking, and the use of canvas or nylon slings. Primed surfaces shall not be exposed to the weather for more than 2 months before topcoated, or less time if recommended by the coating manufacturer.

F. Damage to shop-applied coatings shall be repaired in accordance with this Section and the coating manufacturer's printed instructions.

G. The CONTRACTOR shall make certain that the shop primers and field topcoats are compatible and meet the requirements of this Section. Copies of applicable coating manufacturer's data sheets shall be submitted with equipment shop drawings.

3.12 APPLICATION OF COATINGS

A. The application of protective coatings to steel substrates shall be in accordance with "Paint Application Specification No. 1, (SSPC-PA1)," Steel Structures Painting Council.

B. Cleaned surfaces and all coats shall be inspected prior to each succeeding coat. The CONTRACTOR shall schedule such inspection with the CONSTRUCTION MANAGER in advance.

C. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same working day.

D. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations, and this Section, whichever has the most stringent requirements.

E. Special attention shall be given to edges, angles, weld seams, flanges, nuts and bolts, and other places where insufficient film thicknesses are likely to be present. Use stripe painting for these areas.

F. Special attention shall be given to materials which will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.

G. Finish coats, including touch-up and damage repair coats shall be applied in a manner which will present a uniform texture and color matched appearance.

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NTS: Direct sunshine on freshly coated concrete can cause blowholes through the coating. The Specifier can prohibit applications in direct sunshine (may not be practical) or require rigorous, 100 percent coverage holiday testing of affected surfaces and repair of each pinhole.

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H. Coatings shall not be applied under the following conditions:

A. Temperature exceeding the manufacturer's recommended maximum and minimum allowable.

A. Dust or smoke laden atmosphere.

A. Damp or humid weather.

A. When the substrate or air temperature is less than 5 degrees F above the dewpoint.

A. When air temperature is expected to drop below 40 degrees F or less than 5 degrees F above the dewpoint within 8 hours after application of coating.

6. When wind conditions are not calm.

I. Dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Dept. of Commerce, Weather Bureau psychometric tables.

J. Steel piping shall be abrasive blast cleaned and primed before installation.

K. The finish coat on all work shall be applied after all concrete, masonry, and equipment installation is complete and the work areas are clean and dust free.

3.13 CURING OF COATINGS

A. The CONTRACTOR shall maintain curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section, whichever is the stringent, prior to placing the completed coating system into service.

B. In the case of enclosed areas, forced air ventilation, using heated air if necessary, may be required until the coatings have fully cured.

C. **Forced Air Ventilation of Steel Reservoirs and Enclosed Hydraulic Structures:** Forced air ventilation is required for the application and curing of coatings on the interior surfaces of enclosed hydraulic structures. During application and curing periods continuously exhaust air from the lowest level of the structure using portable ducting. After all interior coating operations have been completed provide a final curing period for a minimum of 10 days, during which the forced ventilation system shall operate continuously. For additional requirements, refer to the specific coating system being used in the.

3.14 TESTING FOR VOLATILE ORGANIC COMPOUNDS IN POTABLE WATER RESERVOIRS

A. **General**: The CONTRACTOR shall provide the following services to ensure that the interior reservoir coatings or linings do not convey volatile organic compounds to the potable water.

B. **Selection of Coating or Lining Material**: The CONTRACTOR shall provide a coating or lining system that has a successful record in meeting the national, regional, and local regulations and policies pertaining to leaching of volatile organic compounds into potable water.

C. Before the coating or lining materials are used, the CONTRACTOR shall by letter notify the regulatory agency having jurisdiction. The letter shall describe the proposed materials, including brand names, catalog numbers, catalog technical data, application and curing instructions, and material safety data sheets.

D. The CONTRACTOR shall provide curing time, temperature and ventilations as required by the manufacturer or this Section, whichever is the more stringent requirement. In some cases, the CONTRACTOR may find it necessary to extend the curing time or ventilation time beyond the requirements in order to comply with the regulatory agency requirements or to reduce the leached organic compounds to the required levels. All costs in connection with any extended curing times required for curing shall be at no additional cost to the OWNER.

E. Following the curing or ventilation period, the CONTRACTOR shall clean, disinfect and fill the reservoir as specified.

F. A 7-day soaking period shall follow initial filling to determine the presence of any leached organics. Before the tank is placed into service, samples of the water in the tank will be taken by the CONSTRUCTION MANAGER and analyzed by a laboratory approved by the State of California or the EPA. Analyses will be for volatile organic compounds by EPA Method 524.1 - Volatile Organic Compounds in Water by Purge and Trap Gas Chromatography/Mass Spectrometry or 524-2 or equivalent (this test includes TCE, PCE, xylenes, toluene, ketones, carbon tetrachloride, and similar compounds).

G. If the test results are above either (1) 0.005 mg/l for TCE, 0.004 mg/l for PCE, 0.62 mg/l for xylenes, 0.10 mg/l for toluene, 0.75 mg/l for methyl-ethyl ketone (to be used as representative for all ketone compounds), 0.005 mg/l for carbon tetrachloride, or (2) the regulatory agency's recommended Action Level Limits, whichever is less, the CONTRACTOR shall drain the water from the tank and flush, refill, and retest at no additional cost to the OWNER. The CONTRACTOR shall provide as many curing, soaking, and flushing cycles as necessary to reduce the leached volatile organic compounds to levels below the requirements.]

3.15 IDENTIFICATION OF PIPING

A. Identification of piping shall be in accordance with Section 15030, "Piping Identification Systems."

B. Every valve or connection, where it may be possible for a worker to be exposed to a hazardous substance, shall be labeled per General Industry Safety Orders, Article 112 and 5194.

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NTS: Select either or none of the following paragraph C's. The first version provides for color code painting of all pipes. The second version provides color code painting for only chemical pipes.

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[C. All unburied pipe in structures and in chemical pipe trenches shall be color-code painted. Colors shall be as selected by the CONSTRUCTION MANAGER, or as indicated.]

[C. All unburied chemical pipes, including chemical pipes in structures and chemical pipe trenches shall be color-code painted. Colors shall be as selected by the CONSTRUCTION MANAGER, or as indicated.]

3.16 COATING SYSTEM SCHEDULES - FERROUS METALS

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NTS: In the following schedule for ferrous metal - not galvanized, select one version of entry FM-1 to serve as the basic default coating system for all surfaces. The subsequent entries, FM-2 through FM-17, become the exceptions to FM-1. Retain each entry (FM-2, FM-3, etc.) that is applicable to the project. Delete entries that are not used. For instance, if the project does not have engine exhaust pipes, delete entry FM-5.

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A. **Coating System Schedule, Ferrous Metal - Not Galvanized:**

	Item	**Surface Prep.**	**System No.**
[FM-1	All surfaces indoors and outdoors, exposed or covered, except those included below.	Commercial blast cleaning SSPC-SP6	(1) alkyd enamel]
[FM-1	All surfaces indoors and outdoors, exposed or covered, except those included below.	Commercial blast cleaning SSPC-SP6	(4) aliphatic polyurethane]
[FM-1	All surfaces indoors and outdoors, exposed or covered, except those included below.	Near white metal blast cleaning SSPC-SP10	(5) inorganic zinc/polyurethane]
FM-2	Surfaces in chlorination	Commercial blast cleaning SSPC-SP6	(100) amine-cured epoxy

	room, chlorine storage room.		
FM-3	Surfaces of equipment and ferrous surfaces submerged or intermittently submerged in potable water or utility water, including all surfaces lower than 2 feet above high water level and all surfaces inside enclosed hydraulic structures and vents (excluding shop-coated valves, couplings, pumps).	White metal blast cleaning SSPC-SP5	(100) amine-cured epoxy
FM-4	Surfaces exposed to high temperature (between 150 and 600 degrees F).	Near white metal blast cleaning SSPC-SP10	(6) inorganic zinc, water-based
FM-5	Surfaces exposed to high temperature (between 600 and 1000 degrees F).	Near white metal blast cleaning SSPC-SP10	(3) aluminum silicone resin
FM-6	Buried small steel pipe.	Removal of dirt, grease, oil	(200) PVC tape
FM-7	Where indicated, ferrous surfaces in water passages of all valves 4-inch size and larger, exterior surfaces of submerged valves.	White metal blast cleaning SSPC-SP5	(100) amine-cured epoxy
FM-8	Where indicated, ferrous surfaces in water passages and submerged surfaces of all pumps which have discharge size of 4 inches or larger.	White metal blast cleaning	(100) amine-cured epoxy
FM-9	Ferrous surfaces of sleeve-couplings.	Solvent cleaning SSPC-SP1, followed by near-white metal blast cleaning SSPC-SP5	(106) fusion-bonded epoxy
FM-10	All ferrous surfaces of sluice gates, flap gates,	White metal blast cleaning SSPC-SP5	(100) amine-cured epoxy

	and shear gate, including wall thimbles.		
FM-11	Buried surfaces that are not indicated to be coated elsewhere.	White metal blast cleaning SSPC-SP5	(100) amine-cured epoxy
FM-12	Interior surfaces of all chemical tanks, including tank nozzles, manholes, nozzle necks, flange faces.	White metal blast cleaning SSPC-SP5	(107) chemical-resistant sheet lining
[FM-13	External surfaces of buried steel tanks.	White metal blast cleaning SSPC-SP5	(100) amine-cured epoxy]

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NTS: Entries FM-14 and 15 require careful coordination between the process, architectural, and structural project team members. Be certain to check that the prefabricated building, structural steel, and miscellaneous metal specifications refer to Section 09800 for the protective coating requirements. Do not retain coating requirements in sections other than 09800. Coating requirements in trade building specifications are almost always inadequate for use on sanitary or industrial projects.

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FM-14	Structural steel, miscellaneous metalwork, and supports for prefabricated metal buildings	[Specifier enter]	[Specifier enter]
FM-15	Structural steel, miscellaneous metalwork, and supports for roof and facia support systems for buildings	[Specifier enter]	[Specifier enter]
FM-16	Surfaces of indoor equipment, not submerged.	Commercial blast cleaning SSPC-SP6	(8) epoxy, equipment
[FM-17]	[Specifier list of existing ferrous equipment or surfaces which are required to be re-coated as part of this work.]	[Specifier enter]	[Specifier enter]

FM-18	Buried pipe couplings, valves, fittings, and flanged joints (where piping is plastic).	Removal of dirt, grease, oil	(201) rich portland cement mortar
FM-19	Buried pipe couplings, valves, and flanged joints (where piping is ductile or cast iron, not tape-coated), including epoxy-coated surfaces.	As specified by reference specification	(205) polyethylene encasement
FM-20	Buried pipe couplings, valves, and flanged joints (where pipe is mortar-coated steel or reinforced concrete), including epoxy-coated surfaces.	Removal of dirt, grease, oil	(206 cement-mortar coating

$# _____

NTS: In the following paragraph for ferrous metal-galvanized, select one version of entry FMG-1 to serve as the basic default coating system for all galvanized surfaces.

_____ #$

B. **Coating System Schedule, Ferrous Metal - Galvanized:** Pretreatment coatings, barrier coatings, or washes shall be applied as recommended by the coating manufacturer. [All galvanized surfaces shall be coated] [All galvanized surfaces except for the following items shall be coated unless coating is required by other Sections: (1) Floor gratings and frames, (2) Handrails, (3) Stair treads, (4) Chain link fencing and appurtenances].

	Item	**Surface Prep.**	**System No.**
[FMG-1]	[All exposed surfaces indoors and outdoors, except those included below.]	Solvent cleaning SSPC-SP1	[(1) alkyd enamel]
[FMG-1]	[All exposed surfaces indoors and outdoors, except those included below.]	Solvent cleaning SSPC-SP1	[(4) aliphatic polyurethane]
FMG-2	Surfaces in chlorinator room, chlorine storage room.	Solvent cleaning SSPC-SP1	(100) amine-cured epoxy
FMG-3	Buried small steel pipe.	Removal of dirt, grease, oil	(200)

			PVC tape
FMG-4	Buried miscellaneous surfaces, couplings, valves, and flanged joints.	Removal of dirt, grease, oil	(201) rich portland cement mortar
FMG-5	Indoor sheet metal flashings, exposed ducts.	Solvent cleaning SSPC-SP1	(1) alkyd enamel
FMG-6	Surfaces buried or submerged in water or wastewater, including all surfaces lower than two feet above high water level and all surfaces inside enclosed hydraulic structures and vents.	Solvent cleaning SSPC-SP1 followed by brush-off grade blast cleaning SSPC-SP7	(100) amine-cured epoxy
[FMG-7]	[Specifier list of existing galvanized equipment or surfaces which are required to be recoated as part of this work.]	[Specifier enter]	[Specifier enter]

C. **Coating System Schedule, Steel Water Reservoir Interior**: For steel water reservoir exterior coating system, see "Coating System Schedule, Ferrous Metal-Not Galvanized." The interior surfaces of steel water reservoirs shall have all surface preparation and coating work performed in the field.

	Item	**Surface Prep.**	**System No.**
SR-1	All interior surfaces beginning one foot above high water level, including all plates, lap roof plate edges (both sides), roof structural members, fittings, and vents.	White metal blast cleaning SSPC-SP5. If Part A surfaces are shop primed, provide detergent cleaning per SSPC-SP1, prior to topcoating in field.	(105) Type A, epoxy, reservoirs
SR-2	Underside of column bases, floor under column bases before columns set in place, submerged contact surfaces that are not accessible after erection.	White metal blast cleaning SSPC-SP5	(105) Type B, epoxy, reservoirs
SR-3	Interior surfaces exclusive of surfaces in SR-1 and	White metal blast cleaning SSPC-SP5	(105) Type B, epoxy, reservoirs

SR-2 above, including the interior and exterior surface of the overflow, drain and other piping out to the first valve or coupling.

D. **Coating System Schedule, Steel Digester Floating Covers and Digester Gasholders:**

	Item	**Surface Prep.**	**System No.**
SD-1	All ferrous surfaces submerged in water or sludge, including rim plate.	White metal blast cleaning SSPC-SP5	(103) coal tar epoxy
SD-2	All ferrous surfaces exposed to digester gas.	White metal blast cleaning SSPC-SP5	(103) coal tar epoxy
SD-3	All interior ferrous surfaces of gasholder shell, including top angle.	White metal blast cleaning SSPC-SP5	(103) coal tar epoxy
SD-4	All ungalvanized interior surfaces inside digester roof, between and including the ceiling plate and the roof deck.	Near white metal blast cleaning SSPC-SP10	(6) inorganic zinc, water-based
SD-5	Exposed, outdoors.	Commercial blast cleaning SSPC-SP6	(4) aliphatic polyurethane

E. **Coating System Schedule, Interior Surfaces of Welded Steel Tanks:** for steel tank exterior coating systems, see "Coating System Schedule, Ferrous Metal-Not Galvanized:"

Product Stored	**Surface Prep.**	**System No.**
Caustic soda [50%]	Commercial blast cleaning SSPC-SP6	No coating
Sodium hypochlorite [12.5%]	White metal blast cleaning SSPC-SP5	(107) Chlorobutyl sheet lining
Water, potable water, utility water	White metal blast cleaning SSPC-SP5	(100) Amine-cured epoxy

$# _____

NTS: In the following schedule, select one version of entry NFM-1 to serve as the default coating system.

_____ #$

3.17 COATING SYSTEM SCHEDULE, NON-FERROUS METAL, PLASTIC, FIBER GLASS

A. Where isolated non-ferrous parts are associated with equipment or piping, the CONTRACTOR shall use the coating system for the adjacent connected surfaces. Do not coat handrails, gratings, frames or hatches. Only primers recommended by the coating manufacturer shall be used.

	Item	**Surface Prep.**	**System No.**
[NFM-1]	[All exposed surfaces, indoors and outdoors, except those included below.]	[Solvent cleaned SSPC-SP1]	[(1) alkyd enamel]
[NFM-1]	[All exposed surfaces, indoors and outdoors, except those included below.]	[Solvent cleaned SSPC-SP1]	[(4) aliphatic polyurethane]
NFM-2	Chlorination room, chlorine storage room.	Solvent cleaned SSPC-SP1	(100) amine-cured epoxy
NFM-3	Aluminum surfaces in contact with concrete, or with any other metal except galvanized ferrous metal.	Solvent cleaned SSPC-SP1	(208) aluminum metal isolation
NFM-4	Polyvinyl chloride plastic piping, indoors and outdoors, or in structures, not submerged.	Solvent cleaned SSPC-SP1	(7) acrylic latex
NFM-5	Fiber glass surfaces.	Per Paragraph [3.8]	(12) aliphatic polyurethane-fiber glass
NFM-6	Buried non-ferrous metal pipe.	Removal of dirt, grease, oil	(200) PVC tape
[NFM-7]	[Specifier list of existing equipment or surfaces which are required to be recoated as part of this work.]	[Specifier enter]	[Specifier enter]

3.18 COATING SYSTEM SCHEDULE-CONCRETE

	Item	Surface Prep.	System No.
C-1	Exposed indoors and outdoors, as shown.	Per Paragraph [3.8]	(10) acrylic, concrete
[C-1	All surfaces indoors and outdoors, as indicated.	Per paragraph [3.8]	(11) aliphatic polyurethane, concrete]
[C-2]	[Submerged in water or wastewater including surfaces up to 2 feet above high water line and down to 2 feet below low water line and all surfaces in an enclosed structure, as shown.]	Per Paragraph [3.8]	(108) epoxy, concrete]
[C-2]	[Submerged in wastewater including surfaces up to 2 feet above high water line and down to 2 feet below low water line and all surfaces in an enclosed structure, as shown.]	Per Paragraph [3.8]	(112) vinyl ester, concrete
C-3	Floor slab, exposure to chemicals, as shown.	Per Paragraph [3.8]	(203) epoxy surfacing
[C-4	Wall, floors, exposure to chemical splash, washdown, as indicated.	Per paragraph [3.8]	(11) aliphatic polyurethane concrete
C-5	Interior surfaces of sewer manholes, including bottom, and metal appurtenances, for manholes indicated.	Per Paragraph [3.8]	(12) vinyl ester, concrete
[C-6]	[Specifier list of existing concrete surfaces which are required to be recoated as part of this work and as shown.]	[Specifier enter]	[Specifier enter]

3.19 COATING SYSTEM SCHEDULE-CONCRETE BLOCK MASONRY

	Item	Surface Prep.	System No.
[CBM-1	Exposed, indoors and outdoors, as shown.	Per Paragraph [3.10]	(10) acrylic, concrete]
[CBM-1]	All surfaces, indoors and outdoors, as indicated.	Per paragraph [3.10]	(11) aliphatic polyurethane, concrete
CBM-2	Submerged in wastewater, including all vertical surfaces above waterline as indicated.	Per paragraph [3.10]	(108) epoxy, concrete
CBM-3	Exterior surfaces, above grade.	Per Paragraph [3.9]	(204) water-retardant
[CBM-4]	[Specifier list of existing masonry surfaces which are required to be recoated as part of this work, and as shown.]	[Specifier enter]	[Specifier enter]

** END OF SECTION **