

SECTION 09900
PAINTING & FINISH SCHEDULE

PART 1: GENERAL

1.01 DESCRIPTION

The work of this section consists of furnishing and applying paint for architectural, structural, mechanical and miscellaneous work as designated in the finish schedule.

The work comprises the painting of all exposed surfaces of concrete, sheet metal, iron and steel, process equipment, electrical equipment, process piping ducts and other miscellaneous items.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300: Submittals
- B. Section 03100: Concrete
- C. Section 05500: Metal Fabrication
- D. Section 15010: General Process and Onsite Utility Piping Provisions

1.03 SUBMITTALS

A materials list and samples shall be submitted as required by Section 01300 and as follows:

- A. Materials list naming each product to be used identified by manufacturer and type number.
- B. Volatile organic compound (VOC) level (gm/l) and manufacturer's certification of compliance with applicable air quality limits for each coating.
- C. Manufacturer's application recommendations for each product submitted.
- D. The Contractor shall submit a current chart of the Manufacturer's available colors for selection by the Engineer, forty five (45) days prior to the start of coating and painting. The Contractor shall furnish to the Engineer for review one 12-inch by 12-inch sheet of galvanized steel with paint system as specified for exterior service, in colors selected by the Engineer. Samples, when reviewed and accepted by the Engineer, shall establish the quality of the painted surface where these applications are indicated.

1.04 DEFINITIONS

- A. The term "paint" as used herein includes enamels, paints, sealers, emulsions and other coatings used as prime intermediate or finish coats for protection or decoration.
- B. The abbreviation "VS" represents "Volume of solids"

1.05 COMPLIANCE WITH VOLATILE ORGANIC COMPOUND (VOC) LIMITS

All paint and coating products shall comply with the applicable limits on volatile organic compounds (VOC) as established by the United States Environmental Protection Agency and by State and local air quality regulating agencies. It shall be the Contractor's responsibility to verify compliance of all paints and coatings. In the event that any paint or coating listed herein is found to be non-compliant, the Contractor shall notify the Engineer and the Engineer will select a substitute coating or paint.

1.06 QUALITY ASSURANCE

A. General:

Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and accepted professional standards and are approved by the Engineer.

B. Workmen:

Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

C. Paint Coordination:

1. Review other Sections of these Specifications as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.
2. Upon request, furnish information on the characteristics of the specific finish materials to assure that compatible prime coats are used.
3. Provide barrier coats over non-compatible primers, or remove the primer and re-prime as required.
4. Notify the Engineer in writing of anticipated problems in using the specified coating systems over prime-coatings supplied under other Sections.

1.07 DELIVERY AND STORAGE

- A. All materials shall be brought to the job site in original sealed containers. Each container shall bear the manufacturer's name, coating type, batch number, date of manufacture, storage life, and special directions. They shall not be used until the Engineer has inspected contents and obtained data from information on containers or label. Materials exceeding storage life recommended by the manufacturer shall be rejected.
- B. All coatings and paints shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings or paints must be stored to conform with City, County, State and Federal safety codes for flammable coatings or paint materials. At all times coatings or paints shall be protected from freezing.

1.08 REFERENCED SPECIFICATIONS AND STANDARDS

- A. Without limiting the general aspects of other requirements of these specifications, all surface preparation, coating and painting of surfaces shall conform to the applicable requirements of the National Association of Corrosion Engineers, the Steel Structures Painting Council, the American Concrete Institute, the Forest Products Research Society and the Manufacturer's printed instructions.
- B. The Engineer's decision shall be final as to interpretation and/or conflict between any on the reference specifications and standards contained herein.

1.09 SPARE SUPPLIES

The Contractor shall provide one unbroken gallon container or kit of each color and type of paint and each type of solvent and thinner required by the specifications. These spare paint supplies shall be stored as required in paragraph 09900-1.07 until delivery is requested by the Engineer.

PART 2: MATERIALS

2.01 PAINT AND FINISH PRODUCTS

- A. Paint and coating products shall be fresh and well ground; shall not settle readily, cake, or thicken in the container; shall be broken up readily with paddle to a smooth consistency; and shall have easy application properties. Other painting materials such as linseed oil, turpentine, mineral spirits, miscellaneous thinners, varnish, and shellac shall be of the highest quality.
- B. All paints and coatings shall be specifically manufactured for use on projects of this type, and shall be used on surfaces intended by the paint manufacturer. Paints and coatings shall be Tnemec, Ameron/PPG or equal. All paint and coatings shall be delivered in original containers, with seals unbroken.

- C. To establish a standard of quality, several specific paint and coating products are listed in the coating System Index under 2.05, this section.

2.02 COMPATIBILITY OF SHOP AND FIELD PAINTS

To ensure a satisfactory painting job it is essential that the paints applied in the shop and in the field be mutually compatible. Where prime coats are shop applied, the Contractor shall instruct suppliers to provide compatible primers with the finish coats selected by the Contractor. In no case will primers be allowed that are not manufactured by the suppliers of the finish coats unless approved by the Engineer.

2.03 COLORS

Color for the various surfaces to be painted shall be selected by the Engineer. Use of different colors for the various structures or for surfaces of a single structure may be directed by the Engineer.

2.04 SYSTEMS INDEX

A. System A: High Solids Epoxy Lining

1. TYPE OF COATING: Modified Amine Cured Epoxy Lining, minimum 70% VS, two component, suitable for wastewater, raw water, medium flow, medium to low H₂S
2. SURFACE: Ferrous metals and concrete submerged or immersed.
3. SURFACING: Prepared concrete shall be surfaced with epoxy mortar to fill bugholes, surface irregularities, and provide an acceptable continuous plane for epoxy finish. Epoxy mortar shall be a minimum 1/ 16" thickness.
 - a. Repair degraded concrete substrate utilizing microsilica mortar for thicknesses above 250 mils.
4. COATINGS AND DRY FILM THICKNESS (DFT):

<u>Concrete</u>				
<u>Coat No.</u>	<u>DFT per Coat</u>	<u>Sherwin Williams</u>	<u>Tnemec</u>	<u>PPG</u>
<u>1</u>	<u>65 – 250 mils</u>	<u>Duraplate 2300</u>	<u>Mortar Clad 218</u>	<u>Raven 760</u>
<u>2</u>	<u>8 – 20 mils</u>	<u>Sherglass FF</u>	<u>104 HS</u>	<u>Sigmashield 880</u>
<u>3</u>	<u>8 – 20 mils</u>	<u>Sherglass FF</u>	<u>104HS</u>	<u>Sigmashield 880</u>

<u>Ferrous Metal</u>				
<u>Coat No.</u>	<u>DFT per Coat</u>	<u>Sherwin Williams</u>	<u>Tnemec</u>	<u>PPG</u>
<u>1</u>	<u>8 – 20 mils</u>	<u>Sherglass FF</u>	<u>104 HS</u>	<u>Sigmashie Id 880</u>
<u>2</u>	<u>8 – 20 mils</u>	<u>Sherglass FF</u>	<u>104HS</u>	<u>Sigmashie Id 880</u>

A.B. System B: Protective Coal Tar

1. TYPE OF COATING: Protective Coal Tar or Coal Tar Epoxy, minimum 70% VS, two component, suitable for below grade service, meets MIL C200 performance for buried conditions.
2. SURFACE: Buried ferrous metals and concrete
3. COATINGS AND DRY FILM THICKNESS (DFT):

Coat No.	DFT per Coat	Sherwin Williams	Tnemec	PPG
1	10 - 20 mils	Targuard CTE	446	Sigmashield 880
2	10 - 20 mils	Targuard CTE	446	Sigmashield 880

B.C. System C: 100% Solids Epoxy Lining

1. TYPE OF COATING: 100% Solids Epoxy, non- polluting, solvent free, two-component, 100% solids, high physical characteristics, epoxy system designed as a chemical coating barrier against potable water, salt water and raw wastewater, raw sewer, sulfuric acid, high h2S, and high flow conditions.
2. SURFACE: Ferrous metal and concrete immersed, submerged.
3. SURFACING: Prepared concrete shall be surfaced with epoxy mortar to fill bugholes, surface irregularities, and provide an acceptable continuous plane for epoxy finish. Epoxy mortar shall be a minimum 1/ 16” thickness.
 - a. Repair degraded concrete substrate utilizing microsilica mortar for thicknesses above 250 mils.

4. Exterior: Buried exterior concrete shall be coated with an emulsified asphalt coating in accordance with Section 07175.

Concrete					
Coat	DFT per	Sherwin	Tnemec	Hydro Pox	PPG
1	65 – 250	Duraplate 2300	Mortar Clad	Hydro	Raven 760
2	80 – 125	Duraplate 6100	435	04-204HB	Raven 405

Ferrous Metal				
Coat	DFT per	Sherwin	Tnemec	PPG
1	25 - 45 mils	Duraplate 6100	Series 435	Novagaurd 840/890

D. System D: Epoxy, Polyurethane Finish

1. TYPE OF COATING: Polyamide or modified amine epoxy primer, minimum 70% VS, to meet performance of SSPC-Paint 42. Polyurethane finish with spot resistance to chemicals and UV resistance to meet performance of SSPC-Paint 36 Gloss Level 3. Suitable for medium to severe chemical or corrosive environments. Color required.
2. SURFACE: Exterior, non-submerged metals, Hollow Metal, Sheet Metal Cabinets, HVAC, PVC, CPVC, Fiberglass
3. NOTE: Where factory primed or coated ferrous metal item is to be field finish coated. Provide two coat epoxy, polyurethane system omitting the intermediate coat of the three coat system for ferrous metals.
4. COATINGS AND DRY FILM THICKNESS (DFT)

<u>CPVC, PVC, Plastic, Fiberglass, Non Metallic Substrate</u>				
<u>Coat No.</u>	<u>DFT per Coat</u>	<u>Sherwin Williams</u>	<u>Tnemec</u>	<u>Ameron</u>
<u>1</u>	<u>3 – 5 mils</u>	<u>Macropoxy 646</u>	<u>135</u>	<u>400</u>
<u>2</u>	<u>3 – 5 mils</u>	<u>HS Polyurethane 250</u>	<u>1074/1075</u>	<u>450</u>

<u>Shop Primed Hollow Metal, Sheet Metal Substrate</u>				
<u>Coat No.</u>	<u>DFT per Coat</u>	<u>Sherwin Williams</u>	<u>Tnemec</u>	<u>Ameron</u>

<u>1</u>	<u>3 – 5 mils</u>	<u>Macropoxy 646</u>	<u>N69</u>	<u>400</u>
<u>2</u>	<u>3 – 5 mils</u>	<u>HS Polyurethane</u> <u>250</u>	<u>1074/1075</u>	<u>450</u>

Non Ferrous Metal Substrate

<u>Coat No.</u>	<u>DFT per Coat</u>	<u>Sherwin Williams</u>	<u>Tnemec</u>	<u>Ameron</u>
<u>1</u>	<u>3 – 5 mils</u>	<u>Macropoxy 646</u>	<u>135</u>	<u>400</u>
<u>2</u>	<u>3 – 5 mils</u>	<u>HS Polyurethane</u> <u>250</u>	<u>1074/1075</u>	<u>450</u>

Ferrous, Metal Substrate

<u>Coat</u>	<u>DFT per</u>	<u>Sherwin</u>	<u>Tnemec</u>	<u>Ameron</u>
<u>1</u>	<u>5 – 10 mils</u>	<u>Macropoxy 646</u>	<u>N69</u>	<u>400</u>
<u>2</u>	<u>5 – 10 mils</u>	<u>Macropoxy 646</u>	<u>N69</u>	<u>400</u>
<u>3</u>	<u>3 – 5 mils</u>	<u>HS Polyurethane</u>	<u>1074/1075</u>	<u>450</u>

E. System E: Epoxy, Epoxy Finish

1. TYPE OF COATING: Polyamide or modified amine epoxy primer, minimum 70% VS, to meet performance of SSPC-Paint 42. Suitable for medium to severe chemical or corrosive environments. Color required.
2. SURFACE: Interior non-submerged metals, plastic piping,
3. COATINGS AND DRY FILM THICKNESS (DFT):

CPVC, PVC, Plastic, Fiberglass, Non Metallic Substrate

<u>Coat No.</u>	<u>DFT per Coat</u>	<u>Sherwin Williams</u>	<u>Tnemec</u>	<u>Ameron</u>
<u>1</u>	<u>3 – 5 mils</u>	<u>Tank Clad HS, B62-80</u>	<u>135</u>	<u>400</u>
<u>2</u>	<u>3 – 5 mils</u>	<u>Tank Clad HS, B62-80</u>	<u>135</u>	<u>400</u>

Non Ferrous Metal Substrate

<u>Coat No.</u>	<u>DFT per Coat</u>	<u>Sherwin Williams</u>	<u>Tnemec</u>	<u>Ameron</u>
<u>1</u>	<u>5 - 10 mils</u>	<u>Tank Clad HS, B62-80</u>	<u>N69</u>	<u>400</u>
<u>2</u>	<u>5 – 10 mils</u>	<u>Tank Clad HS, B62-</u>	<u>N69</u>	<u>400</u>

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Ferrous Metal Substrate

<u>Coat No.</u>	<u>DFT per Coat</u>	<u>Sherwin Williams</u>	<u>Tnemec</u>	<u>Ameron</u>
<u>1</u>	<u>5 – 10 mils</u>	<u>Tank Clad HS, B62-80</u>	<u>N69</u>	<u>400</u>
<u>2</u>	<u>5 – 10 mils</u>	<u>Tank Clad HS, B62-80</u>	<u>N69</u>	<u>400</u>
<u>3</u>	<u>5 – 10 mils</u>	<u>Tank Clad HS, B62-80</u>	<u>N69</u>	<u>400</u>

F. System N: Epoxy, Abrasion Resistant

1. TYPE OF COATING: Modified Amine, 96% VS, two component, abrasion resistant epoxy. Suitable for immersion in waste water, raw water, and abrasive conditions

2. SURFACE: Ferrous, Non Ferrous Metals, submerged, immersed

3. COATINGS AND DRY FILM THICKNESS (DFT):

Ferrous Metals Abrasive Condition

<u>Coat</u>	<u>DFT per</u>	<u>Sherwin</u>	<u>Tnemec</u>	<u>PPG</u>
<u>1</u>	<u>4 – 8 mils</u>	<u>Duraplate UHS</u>	<u>22</u>	<u>SigmaShie Id 880</u>
<u>2</u>	<u>8 – 12 mils</u>	<u>Duraplate UHS</u>	<u>22</u>	<u>SigmaShie Id 880</u>

PART 3: EXECUTION

3.01 GENERAL

- A. All surface preparation, coating and painting shall conform to applicable standards of the National Association of Corrosion Engineers, the Steel Structures Painting Council, the American Concrete Institute, the Forest Products Research Society and the Manufacturer's printed instructions. Material applied prior to approval of surface by the Engineer shall be removed and re-applied to the satisfaction of the Engineer at the expense of the Contractor.
- B. All work shall be performed by skilled craftsmen qualified to perform the required

work in a manner comparable with the best standards of practice.

- C. The Contractor shall provide a supervisor at the work site during cleaning and application operations. The supervisor shall have the authority to sign any change orders, coordinate work and make decisions pertaining to the fulfillment of the contract.
- D. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags.
- E. Coatings and painting systems include surface preparation, prime coating and finish coatings. Unless otherwise specified, prime coatings shall be field applied. Where prime coatings are shop applied, the Contractor shall instruct suppliers to provide the prime coat compatible with the finish coat specified. Any off-site work which does not conform to the specification is subject to rejection by the Engineer.

Shop applied prime coatings which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched up in the field as directed by the Engineer. The Contractor shall use repair procedures which insure the complete protection of all adjacent primer. The specified repair method and equipment may include wire-brushing, hand or power tool cleaning or dry air blast cleaning. In order to prevent injury to surrounding painted areas blast cleaning may require use of lower air pressure, smaller nozzle and abrasive particle sizes, short blast nozzle distance from surface, shielding and masking. If damage is too extensive, the item shall be re-cleaned and coated or painted as directed by the Engineer.

- F. The Contractor's coating and painting equipment shall be designed for application of materials and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Contractor's equipment shall be subject to approval by the Engineer.
- G. Application of the first coat shall follow immediately after surface preparation and cleaning and within an eight hour working day. Any cleaned areas not receiving first coat within eight-hour period shall be re-cleaned prior to application of first coat. This may include re-blasting.
- H. Prior to assembly, all surfaces made inaccessible after assembly shall be prepared as specified herein and shall receive the coating or paint system specified.

3.02 SURFACE PREPARATION, METALLIC SURFACES

- A. Surface preparation will be based on comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces", SSPC-Vis 1, ASTM Designation D220: "Standard Methods of Evaluating Degree of Rusting on Painted

Steel Surfaces", SSPC-Vis 2, ASTM Designation D610; Visual Standard for Surfaces of New Steel Air-blast Cleaned with Sand Abrasive", NACE Standard TM-01-70; and as described below. Anchor profile for prepared surfaces shall be measured by use of a non-destructive instrument such as a Keane-Tator Surface Profile Comparator or Testex Press-O-Film System.

To facilitate inspection the Contractor shall, on the first day of abrasive blast cleaning operations, blast clean metal panels to the standard specified. These panels shall be equivalent to the supplied plate stock which is to be coated or painted and shall have minimum measurements of 8-½-inches by 11-inches. After agreeing a specific panel meets the requirements of the specification, it shall be initialed by the Contractor and Engineer and coated with a clear non-changing finish. Panels shall be utilized for inspection purposes throughout the duration of blast cleaning operations.

- B. Heavy deposits of grease or oil shall be removed with solvent oil cleaner and any chemical contamination shall be neutralized and/or flushed off prior to any other surface preparation in accordance with SSPC-SP1.
- C. Surfaces scheduled for Near White or Commercial Blast Cleaning shall have all welds, edges, and sharp corners ground to a 1/16-inch radius and all weld splatter removed, and sandblasted in accordance with Steel Structures Painting Council Specifications, removing mill scale, rust, dirt, paint, or other foreign matter, and shall be slightly roughened to form a suitable anchor pattern for the coating application. Do not leave blasted surfaces overnight before coating. Remove all sand from the surface by brush or industrial vacuum.
- D. All other steel not scheduled for blast cleaning shall have all weld splatter removed, and rough edges and rough welds ground, and shall be cleaned by means of hand or power tools, in accordance with Steel Structures Painting Council Specification No. 2 or No. 3, removing all loose mill scale rust, dirt, paint, or other contaminants. Blast cleaning may be used if practical. The remaining mill scale, rust, and paint must be sufficiently abraded to provide for good bonding of the coating.
- E. Field blast cleaning for all surfaces shall be dry method unless otherwise directed.
- F. Particle size of abrasives used in blast cleaning shall be that which will produce a 2 mil (50.0 microns) surface profile or in accordance with recommendations of the manufacturer of the specified coating or paint system to be applied.
- G. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless specifically approved by the Engineer.
- H. During blast cleaning operations, caution shall be exercised to insure that existing coatings or paints are not exposed to abrasion from blast cleaning.

- I. The Contractor shall keep the area of his work in a clean condition and shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to performance of work or operation of existing facilities.
- J. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paints by a combination of blowing with clean dry air, brushing/brooming and/or vacuuming as directed by the Engineer.
- K. All welds shall be cleaned with a suitable chemical compatible with the specified coating materials.
- L. Application SSPC specifications are as follows:
 - 1. SOLVENT CLEANING (SSPC-SP1): Removal of oil, grease, soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.
 - 2. HAND TOOL CLEANING (SSPC-SP2): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by hand chipping, scraping, sanding, and wire-brushing.
 - 3. POWER TOOL CLEANING (SSPC-SP3): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by power wire-brushing, power impact tools or power sanders.
 - 4. WHITE METAL BLAST CLEANING (SSPC-SP5): Blast cleaning to a gray-white uniform metallic color until each element of surface is free of all visible residues.
 - 5. COMMERCIAL BLAST CLEANING (SSPC-SP6): Blast cleaning until at least two-thirds of each element of surface area is free of all visible residues.
 - 6. BRUSH-OFF BLAST CLEANING (SSPC-SP7): Blast cleaning to remove loose rust, loose mill scale and other detrimental foreign matter to degree specified.
 - 7. NEAR WHITE BLAST CLEANING (SSPC-SP10): Blast cleaning to nearly white metal cleanliness, until at least 95 percent of each element of surface area is free of all visible residues.
 - 8. BRUSH OFF ABRASIVE BLAST CLEANING OF NON FERROUS METALS (SSPC-SP16)
- M. Specific Surface Preparation: Surface preparation for the specific substrates shall be as designated as follows

1. New Ferrous Metal: Immersed, Submerged, Buried, SSPC-SP10, 3 – 5 mil profile for coating systems above 20 mils dft. Shop primed items for immersion shall be prepared in accordance with manufacturer's procedure for acceptable finish coat condition.
2. New Galvanized Metal: Immersed, Submerged, Buried, SSPC-SP16, 0.75 – 1.5 mil profile
3. New Ferrous Metal, Structural, Piping, Valves, Atmospheric: SSPC-SP6, 1.5 – 2 mil profile
4. New Ferrous Metal, Equipment, Shop Primed, Atmospheric: Shop performed SSPC-SP6, 1.5 – 2 mil profile
5. New Non Ferrous Metal, Structural, Piping: Atmospheric: SSPC-SP16, 0.75 – 1.5 mil profile. For atmospheric item in low corrosive environment, clean surfaces using phosphoric acid based detergent and rinse. Completely and thoroughly abrade surfaces utilizing 100 grit sandpaper or similar to impart profile and remove passivation layers. Confirm removal of passivation layers using methods defined in SSPC-SP16.
6. New Hollow Metal, Shop Primed: Clean per SSPC-SP1. Completely and thoroughly abrade shop applied primer. Remove any corrosion rust per SSPC-SP11 and prime with epoxy primer.
7. New Items, Shop Primed, Atmospheric: Clean per SSPC-SP1. Completely and thoroughly abrade shop applied primer. Remove any corrosion rust per SSPC-SP11 and prime with epoxy primer.
8. **Ductile Iron, Exposed, Submerged: If supplied, or existing with asphaltic coating, abrasive blast clean in accordance with NAPF-003.**

3.03 SURFACE PREPARATION, CONCRETE AND MASONRY

- A. New concrete and masonry shall cure at least 28 days and have a moisture content prior to coating or painting below 8 percent as measured by an instrument such as a Delmhorst Model DP, unless recommended otherwise by the paint manufacturer.
- B. All surfaces shall be thoroughly cleaned by abrasive blasting, wire-brushing or other approved methods, removing all traces of foreign materials in accordance with SSPC-SP13. Remove all loose concrete and masonry by chipping or other approved methods to leave only a sound, firmly bonded substrate. Remove all existing coating, surfacing materials from existing substrates where immersed, submerged conditions are expected to provide exposed substrate for subsequent repair.
- C. Cracks and voids shall be repaired or filled as directed by the Engineer with

approved suitable materials, mixed and applied in strict accordance with the Manufacturer's printed instructions. In general, final surface shall be smooth and free of voids, cavities, dirt, dust, oils, grease, or other contaminants.

- D. Where oil or grease deposits are present, prior to above surface preparation, clean surfaces by scrubbing with a solution of one and one-half ounces (44.4 ml) tri-sodium phosphate (TSP) and one and one-half ounces (44.4 ml) of non-sudsing detergent mixed into one gallon (3.785 liters) of warm water. Surfaces shall then be flushed clean with fresh water.
- E. Specific Surface Preparation: Surface preparation for the specific system shall be as designated in the Systems Index, Part 2.05 of these specifications.
 - 1. Concrete, Masonry, Brick, Immersed, Submerged, Chemical Containment: Dry abrasive blast clean per SSPC-SP13. Impart appropriate surface profile in accordance with ICRI 310.2, CSP 4 – 6 for lining systems and minimum CSP 6 for repair of degraded substrate. Utilize manufacturer's suggested epoxy mortar surfacing for newly constructed surfaces and microsilica mortar surfacing for repair of degraded existing substrates.
 - 2. Concrete, Masonry, Brick, CMU, Buried, Below Grade: Dry abrasive blast or mechanically clean per SSPC-SP13. Impart surface profile in accordance with ICRI 310.2 , CSP 2 – 5.
 - 3. Concrete, Masonry, Brick, CMU, Atmospheric: Dry abrasive blast or mechanically clean per SSPC-SP13. Impart surface profile in accordance with ICRI 310.2, CSP 2 – 5. Wet abrasive, vapor abrasive, or water jetting alternates may be submitted for review.

3.04 SURFACE PREPARATION OF CPVC, PVC, PLASTICS, AND FIBERGLASS

- A. Plastics, PVC, CPVC, and Fiberglass substrates requiring protection from UV, atmospheric exposure shall be cleaned to remove oils, residual glues, and foreign contaminants per SSPC-SP1. Surfaces shall be rinsed cleaned. Do not use hydrocarbon based solvents for waterbased acrylic primers or finishes.
- B. Completely and thoroughly abrade all surfaces utilizing 100 grit paper or similar to provide a clean, dull, profiled surface acceptable for epoxy primer.

3.05 SURFACE PREPARATION, WOOD AND COMPOSITION MATERIALS

- A. Wood and composite materials shall have a moisture content prior to coating or painting below 15 percent as measured by an instrument such as a Delmhorst Model BD-7, unless recommended otherwise by the paint manufacturer.
- B. All surfaces shall be thoroughly cleaned by use of mineral spirits, scrapers, sandpaper, or wire brushes to remove all dirt, oil, grease or other foreign substances.

Finished surfaces exposed to view shall, if necessary, be made smooth by planing or sandpapering. Small, dry, seasoned knots shall be scraped, sandpapered, and thoroughly cleaned, and shall be given a thin coat of WP-578 Western Pine Association knot sealer before application of the priming coat. Large, open unseasoned knots, and all beads or streaks of pitch shall be scraped off, or if the pitch is still soft, it shall be removed with mineral spirits and the resinous area shall be thinly coated with knot sealer. After priming, all holes and imperfections shall be filled with putty or plastic wood (colored to match the finish wood), allowed to dry, and sandpapered smooth. Painting of interior wood and composite materials shall proceed insofar as practicable, only after masonry work has dried. Existing surfaces shall be cleaned of all loose or flaking paint and sandpapered as required.

3.06 SURFACE PREPARATION OF SHOP PRIMED, SHOP FINISHED ITEMS TO RECEIVE FIELD FINISH COAT

- A. Shop primed surfaces to be finished in the field shall be thoroughly cleaned per SSPC-SP1. Shop applied primers shall be completely and thoroughly abraded. Remove all loose, damaged coatings in accordance with SSPC-SP2 or SP3. Provide primers for exposed substrates in addition to specified finish coats.
- B. Cabinets, HVAC, or other factory applied baked finishes to be over coated to match existing color scheme shall be cleaned per SSPC-SP1 and completely and thoroughly abraded to provide a clean, dull, profiled substrate for subsequent painting.

3.07 SURFACE PREPARATION OF EXISTING COATED SURFACES TO RECEIVE NEW FINISH COAT

- A. Existing coatings to be overcoated shall be thoroughly cleaned per SSPC-SP1. Abrasive brush blast clean all coated surfaces per SSPC-SP7. Where loose coating has been removed, abrasive blast clean exposed substrates according to the requirements of the base substrate, SSPC-SP6 for ferrous metal, SP16 for non-ferrous metal, or SSPC-SP12 for concrete.
- B. In the event that abrasive blasting is not possible, provide alternate mechanical preparation proposals for engineering review.

3.08 COATING APPLICATION

- A. Coating and paint application shall conform to the requirements of the Steel Structures Painting Council Paint Application Specifications SSPC-PA1, latest revision, for "Shop, Field and Maintenance Painting", and recommended practices of the National Association of Corrosion Engineers, the American Concrete Institute, the Forest Products Research Society and the Manufacturer of the paint and coating materials.

- B. Before applying any paint or finish, all surfaces shall be thoroughly cleaned and prepared for painting as herein specified. All cleaned metal shall be primed or painted, as specified, immediately after cleaning to prevent new rusting or oxidation of cleaned surfaces.
- C. Protective coverings or drop cloths shall be use to protect floors, fixtures, and equipment. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.
- D. Application:

No coating or paint shall be applied:

- 1. When the surrounding air temperature or the temperature of the surface to be coated or painted is below 40 degrees F.
- 2. To wet or damp surfaces or in rain, snow, fog or mist.
- 3. When the temperature is less than 5 degrees F above the dewpoint.
- 4. When it is expected the air temperature will drop below 40 degrees F or less than 5 degrees F above the dewpoint within eight hours after application of coating or paint

Dewpoint shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with the US Department of Commerce Weather Bureau Psychometric Tables.

If above conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable, unless conditions are acceptable to the paint manufacturer for any given coating. The days coating or painting shall be completed in time to permit the film sufficient drying time to prevent damage by atmospheric conditions.

- E. All painting shall be well applied, leaving no sags, laps, brush, or other defects. Each coat must thoroughly dry before applying next coat, and all work must be carefully cut into a true line and left smooth and clean. Hardware trim and other items shall be removed as required for proper application of coatings.

All painting shall conform to the following general conditions:

- 1. Thickness of coating in mils shall mean the dry film thickness. The number of coats specified shall mean the minimum number of coats to be used. Additional coatings shall be required if necessary to obtain the specified film thickness.

2. No coating work shall be done under unfavorable weather conditions.
3. Prime coats shall be provided where called for as a part of the painting system. Shop prime coats shall conform to the specified painting system for the given item. It shall be the responsibility of the Contractor to coordinate work so that factory prime items are primed or painted with a coating compatible with the specified finish painting system.
4. Particular attention shall be given to all welds, edges, and corners so as to get full and adequate coverage. Damaged shop prime coats or field applied prime coats shall be carefully replaced before finish painting. Surface preparation for replacement of damaged coats shall be such as to give a clean surface for proper bonding of prime coat. Finish coatings shall not be applied until touch-up prime coat has completely dried.
5. Minimum between coat drying items, as stated in the printed instructions of the coating manufacturer will be carefully observed.
6. Thinning shall be done only if necessary for workability of the coating material in accordance with the manufacturer's printed instructions. Use only the appropriate thinner.
7. Each coat shall be applied in a different color from the preceding coat, the finish coat to be color selected by the Engineer. When a white finish color is desired, the last two coats shall be white.
8. Where installed coatings or linings are to be placed in submerged, partially submerged or immersed conditions, provide a pinhole free, monothlic film, fully cured prior to placing into service. Provide detailed reports of inspection and repair activity.

3.09 SPECIAL REQUIREMENTS FOR GALVANIZED AND NON-FERROUS METALS

- A. Where galvanized or non-ferrous metals are scheduled to be painted, the surface shall be brush blasted in accordance with SSPC-SP16 before finish are applied. Do not remove the galvanized coating. Damaged areas should be repaired with an appropriate zinc-rich primer or cold galvanizing compound with greater than 80% zinc content in the dried film, such as Tnemec Series 90-97, Sherwin Williams Zinc Clad III HS

3.10 INSPECTION

- A. Inspection - General:

Concrete, plastic and wood surfaces shall be visually inspected to insure specified coverage has been attained. Where destructive testing is deemed necessary, an instrument such as a Tooke Gage shall be used. Thickness of coatings and paints

on metal surfaces shall be checked with a non-destructive type thickness gauge. Coating integrity shall be tested with an approved inspection device. Holiday detection shall be performed prior to the application of aluminum or metallic finish coats. Holiday detectors shall not exceed the voltage recommended by the manufacturer of the coating system. For film thickness between 10 and 20 mils, a non-sudsing type wetting agent such as Kodak Photo-Flo shall be added to the water prior to wetting the detector sponge. All pinholes shall be marked, repaired in accordance with the manufacturer's recommendations and retested. No pinholes or other irregularities will be permitted in the final coating.

In cases of dispute concerning film thickness or holidays, the Engineer's calibrated instruments and measurements shall predominate. Wide film thickness discrepancies shall be measured and verified with a micrometer or other approved measuring instrument.

B. Inspection Devices:

The Contractor shall furnish, until final acceptance of coating and painting, inspection devices in good working condition for detection of holidays and measurement of dry-film thickness of coating and paint. The Contractor shall also furnish US Department of Commerce, National Bureau of Standards certified thickness calibration plates to test accuracy of dry-film thickness gauge and certified instrumentation to test accuracy of holiday detectors.

Dry-film thickness gauges and holiday detectors shall be made available for the Engineer's use at all times until final acceptance of application. Holiday detection devices shall be operated in the presence of the Engineer.

Acceptable devices for ferrous metal surfaces include, but are not limited to Tinker-Razor Model M-1 holiday detector for coatings to 20 mils dry film thickness, Tinker-Razor Models AP and AP-W holiday detectors for coatings in excess of 20 mils dry-film thickness, and Mikrotest or Positest unit for dry-film thickness gauging. Non-ferrous metal surfaces shall be checked with an instrument such as an Elcometer "Eddy Current" Tester or De Felsko Model 252. Inspection devices shall be operated in accordance with the manufacturer's instructions.

3.11 SAFETY AND HEALTH REQUIREMENTS

A. General:

In accordance with requirements set forth by regulatory agencies applicable to the construction industry and Manufacturer's printed instructions and appropriate technical bulletins and manuals, the Contractor shall provide and require use of personnel protective lifesaving equipment for persons working in or about the project site.

B. Head and Face Protection and Respiratory Devices:

Equipment shall include protective helmets which shall be worn by all persons in the vicinity of the work. In addition, workers engaged in or near the work during abrasive blasting shall wear eye and face protection devices and air purifying, half-mask or mouthpiece respirator with appropriate filter. Barrier creams shall be used on any exposed areas of skin.

C. Ventilation:

Where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof. Ventilation shall reduce the concentration of air contaminant to the degree a hazard does not exist. Air circulation and exhausting of solvent vapors shall be continued until coatings have fully cured.

D. Sound Levels:

Whenever the occupational noise exposure exceed maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protective devices.

E. Illumination:

Adequate illumination shall be provided while work is in progress, including explosion-proof lights and electrical equipment. Whenever required by the Engineer, the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The level of illumination for inspection purposes shall be determined by the Engineer.

F. Temporary Ladders and Scaffolding:

All temporary ladders and scaffolding shall conform to applicable safety requirements. They shall be erected where requested by the Engineer to facilitate inspection and be removed by the Contractor to locations requested by the Engineer.

3.12 PRESERVATION

During construction, painter shall assume the preservation of all his work against damage by accident or otherwise, and shall leave the work clean and whole. The work will not be accepted until all of the work has been completed and all retouching has been done. All work which is rejected, or for any reason has to be done over, will be done by the Contractor at his expense.

3.13 CLEANING

During the progress of the work, all other work shall be covered and fully protected from

injury or painter's finish, and care shall be exercised not to splatter paint, enamel, etc., on adjacent work. Upon completion of the work, all staging, scaffolding and containers shall be removed from the site or destroyed in a manner approved by the Engineer. Name and data plates on equipment shall not be painted and shall be left clean and legible upon completion of the project. All damage to surfaces resulting from the work of this section shall be cleaned, repaired, or refinished to the satisfaction of the Engineer at no expense to the Agency.

3.14 FINISH SCHEDULE

The following is a partial schedule and does not include all surfaces that require coatings. Coat unlisted surfaces with the same coating system as similar listed surfaces. Additional coating requirements are included with the architect's drawings and specifications for the buildings.

System "A" Polymidoamine Epoxy:

Exterior of all piping and valves except for stainless steel piping.

Submerged pipe supports and hangers except for stainless steel.

Exterior of submerged pumps, mixers, motors and other equipment.

Bell rings and underside of manholes covers and frames.

Field priming of ferrous metals surfaces with defective shop prime costing or where no other prime coating is specified.

Cast iron sluice gates and stem guides.

All other submerged iron and steel metal unless specified otherwise.

System "B" Protective Coal Tar: Underground pipe flanges, corrugated metal pipe couplings, flexible pipe couplings, and miscellaneous underground metals not specified to receive another protective coating system.

System "C" 100% Solids Epoxy:

Interiors of new manhole and new wet well, unless specifically identified on drawings.

Apply coating prior to drilling and installing pipe and anchors and supports.

System "D" Polyamidoamine Epoxy, Polyurethane:

Doors, door frames, ventilators, louvers, grilles, exposed sheet metal, and flashing.

Exterior piping, valves, pipe hangers and supports, electrical conduit, and other supports except for stainless steel.

Valve and gate operators and stands.

Structural steel including galvanized steel.

Process equipment (not submerged) including pumps, motors, equipment guards, equipment supports and other miscellaneous metals except for stainless steel and aluminum.

Cranes and hoist rails.

Exposed plastic and fiberglass piping, and ductwork.

Exposed PVC piping and valves.

Electrical antenna masts and supports.

Exterior electrical cabinets, boxes, and exposed conduits that are not factory painted.

All other miscellaneous exposed metals and plastics unless specified otherwise.

System "E" Polymidoamine Epoxy: ~~Not used unless indicated on drawings. Interior non-submerged piping, valves, pipe hangers and supports, exposed interior electrical conduits, and other supports except for stainless steel.~~

System "F" Acrylic Epoxy: Not used unless indicated on drawings.

System "G" Modified Aliphatic Amine Epoxy: Not used unless indicated on the drawings.

System "H" Aliphatic Polyurethane: Not used unless indicated on the drawings.

System "I" Latex Acrylic, Semi-Gloss: Not used unless indicated on the Drawings.

System "J" Resinous Flooring: Not used unless indicated on the drawings.

System "K" Polyurea Elastomer: Not used unless indicated on the Drawings.

System "L" High Build Acrylic: Not used unless indicated on the Drawings.

System "M" Wax: Not used unless indicated on the Drawings.

| System "N" Emulsified Asphalt Coating (See Section 0711075): Exterior buried walls for damp proofing the Manhole and Wet Well Exteriors.

System "O" Aromatic Elastomeric Polyurethane, or Epoxy: Not used unless indicated on the Drawings.

System "P" Polyamide Epoxy: Not used unless indicated on the Drawings.

System "Q" Vinyl Ester: Not used unless indicated on the Drawings.

System "R" Flexible Polyurethane: Not used unless indicated on the Drawings.

System "S" Fusion Epoxy: Not used unless indicated on the Drawings.

System "T" Self-Crosslinking Acrylic: Not used unless indicated on the Drawings.

System "U" Semi Gloss Silicone Trim Enamel: Not used unless indicated on the drawings.

END OF SECTION