SECTION 09 96 00
HIGH PERFORMANCE INDUSTRIAL COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section is for painting of process piping that is not factory painted because it is PVC piping or is steel piping that must be painted after field welding. It is also for existing steel headtank that must be painted anywhere its existing paint is removed to weld on additional parts and is for steel parts welded to the existing steel headtank.

B. Section Includes:
   1. High performance industrial coatings (HPIC).
   2. Any other coating, thinner, accelerator, inhibitor, etc., specified or required as part of a complete System specified in this Specification Section.
   3. Minimum surface preparation requirements.

C. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.
   3. Section 01 61 03 - Equipment - Basic Requirements.
   4. Division 40 - Process Interconnections.
   5. Section 40 05 00 - Pipe and Pipe Fittings - Basic Requirements.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. ASTM International (ASTM):
      a. B499, Standard Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals.
      b. D3359, Standard Test Methods for Rating Adhesion by Tape Test.
      c. D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
      d. D4414, Standard Practice for Measurement of Wet Film Thickness by Notch Gages.
      e. D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
      f. D6132, Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Using an Ultrasonic Gage.
      g. D6677, Standard Test Method for Evaluating Adhesion by Knife.
      h. D7091, Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals.
      i. E337, Standard Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures).
   2. Environmental Protection Agency (EPA).
   3. National Association of Pipe Fabricators (NAPF):
      a. 500-03, Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings:
         1) 500-03-04, Abrasive Blast Cleaning for Ductile Iron Pipe.
         2) 500-03-05, Abrasive Blast Cleaning for Cast Ductile Iron Fittings.
   4. The Society for Protective Coatings (SSPC):
      a. PA 2, Procedure for Determining Conformance to Dry Coating Thickness Requirements.
      b. SP 1, Solvent Cleaning.
      c. SP 2, Hand Tool Cleaning.

d. SP 3, Power Tool Cleaning.
e. SP 16, Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.

5. The Society for Protective Coatings/ NACE International (SSPC/ NACE):
   a. SP 5/ NACE No. 1, White Metal Blast Cleaning
   b. SP 6/ NACE No. 3, Commercial Blast Cleaning.
   c. SP 7/ NACE No. 4, Brush-off Blast Cleaning.
   d. SP 10/ NACE No. 2, Near-White Blast Cleaning.

B. Qualifications:
   1. Coating manufacturer's technical representative shall be a NACE Certified Coatings Inspector, Level 3 minimum.
   2. Applicators shall have minimum of 10 years of experience in application of similar products on similar project.
      a. Provide references for minimum of three different projects completed in last five years with similar scope of work.
      b. Include name and address of project, size of project in value (coating) and contact person.
   3. NACE inspector shall be NACE Certified Coatings Inspector Level 3 minimum and shall have minimum of five years of experience of conducting inspections and tests as indicated in this Specification Section.

C. Miscellaneous:
   1. Furnish coating through one manufacturer unless noted otherwise.

D. Deviation from specified MIL thickness or product type is not allowed without written authorization of Engineer.

E. Material shall not be thinned unless approved, in writing, by coating manufacturer's technical representative.

1.3 DEFINITIONS

A. Applicator:
   1. Applicator is the person actually installing or applying the product in the field, at the Project site, or at an approved shop facility.

B. Approved Factory Finish: Finish on a product in compliance with the finish specified in the Specification Section where the product is specified or in Specification Section 01 61 03.

C. Appurtenant Surface: Accessory or auxiliary surface attached to or adjacent to a surface indicated to be coated.

D. Corrosive Environment:
   1. Immersion in or subject to:
      a. Condensation, spillage or splash of a corrosive material such as water, wastewater or chemical solution.
      b. Exposure to corrosive caustic or acidic agent, chemicals, chemical fumes, chemical mixture, or solutions.
      c. For purposes of this Specification Section, corrosive environments include:
         1) Outdoor areas not otherwise identified as highly corrosive.
         2) Piping galleries.
         3) Surfaces within 2 FT of high water level.
         4) Chemicals storage and feed areas:
            a) Formalin Storage - Hatchery Building.

E. Outdoor Atmosphere or Surface: Outdoor atmosphere or surface exposed to weather and/or direct sunlight.

F. Holiday:

1. A void, crack, thin spot, foreign inclusion, or contamination in the coating that significantly lowers the dielectric strength of the coating.
2. May also be identified as a discontinuity or pinhole.

G. HPIC: High performance industrial coatings.
1. Epoxies, urethanes, vinyl ester, waterborne vinyl acrylic emulsions, acrylates, silicones, alkyds, acrylic emulsions and any other coating listed as a HPIC.

H. Interior Atmosphere or Surface: Indoor atmosphere or surface not exposed to weather and/or direct sunlight.

I. Immersion Service:
1. Any surface immersed in water or some other liquid.
2. Surface of any pipe, valve, or any other component of the piping system subject to frequent wetting.
3. Surfaces within two feet above high water level in water bearing structures.

J. Piping System: Pipe, valves, fittings and accessories.

K. Surface Hidden from View:
1. Within pipe chases.
2. Between top side of ceilings and underside of floor or roof structures above.

L. Vapor Space: Interior space within tankage, closed structures, or similar elements that is above the low liquid line and subject to the accumulation of fumes, vapor and/or condensation.

1.4 SUBMITTALS

A. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

B. Certifications:
1. Applicator experience qualifications.
a. No submittal information will be reviewed until Engineer has received and approved applicator qualifications.
2. NACE inspector certification.
3. NACE inspector experience qualifications.
4. Certification that High Performance Coating Systems proposed for use have been reviewed and approved by a NACE Certified Coatings Inspector employed by the coating manufacturer.
a. Submittals not including this certification will be returned without review.

C. Shop Drawings:
1. Product technical data including:
a. Acknowledgement that products submitted meet requirements of standards referenced.
b. Manufacturer's surface preparation instructions.
c. Manufacturer's application instructions.
1) Manufacturer's standard details, including but not limited to penetrations, transitions, and terminations for:
a) High-build coatings on concrete.
b) Secondary containment coatings.
c) UV channels.
d) Other special conditions as applicable.
d. If products being used are manufactured by Company other than listed in the MATERIALS Article of this Specification Section, provide complete individual data sheet comparison of proposed products with specified products including:
1) Application procedure.
2) Coverage rates.
3) Certification that product is designed for intended use and is equal or superior to specified product.

e. Contractor's written plan of action for containing airborne particles created by blasting operation and location of disposal of spent contaminated blasting media.
f. Coating manufacturer's recommendation on abrasive blasting.
g. Coating manufacturer's technical representative's written statement attesting that applicator has been instructed on proper preparation, mixing and application procedures for coatings specified.
h. Manufacturer's recommendation for universal barrier coat.
i. Manufacturer's recommendation for providing temporary or supplemental heat or dehumidification or other environmental control measures.

2. Manufacturer's statement regarding applicator instruction on product use.

D. Samples:
1. Manufacturer's full line of colors for Engineer's preliminary color selection.
2. After preliminary color selection by Engineer provide two, 3 x 5 IN samples of each final color selected.

E. Informational Submittals:
1. Approval of application equipment.
2. Applicator's daily records:
a. Submit daily records at end of each week in which coating work is performed unless requested otherwise by Engineer's on-site representative.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver in original containers, labeled as follows:
1. Name or type number of material.
2. Manufacturer's name and item stock number.
3. Contents, by volume, of major constituents.
4. Warning labels.
5. VOC content.

B. Store materials in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 DEGF.

1.6 PROJECT CONDITIONS

A. Pre-application Conference:
1. Prior to commencement of surface preparation or coating application, the Contractor shall convene a pre-application conference with all affected parties, including but not limited to: the applicator, coating manufacturer's technical representative, Owner's representative, and Engineer's representative(s).
2. The meeting shall discuss all aspects of the Project including but not limited to:
a. Schedule.
b. Material storage and handling.
c. Examination of surfaces to be coated.
d. Protection of surfaces not to be coated.
e. Surface preparation.
f. Coating application:
1) Environmental conditions for application of coatings.
2) Temporary environmental controls.
g. Field quality control requirements:
1) Manufacturer's technical representative responsibilities.
2) Contractor performed testing.
a) Instrumentation requirements.
b) Frequency of testing.
c) Record keeping.
3) NACE inspector performed testing.

B. Verify that atmosphere in area where coating is to take place is within coating manufacturer's acceptable temperature, humidity and sun exposure limits.
   1. Provide temporary heating, shade and/or dehumidification as required to bring area within acceptable limits.
      a. Provide temporary dehumidification equipment properly sized to maintain humidity levels required by coating manufacturer.
      b. Provide clean heat with heat exchanger type equipment sufficient in size to maintain temperature on a 24 HR basis.
         1) Vent exhaust gases to outdoor environment.
         2) No exhaust gases shall be allowed to vent into the space being coated or any adjacent space.
   2. Do not apply coatings in snow, rain, fog or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. High Performance Industrial Coatings:
      a. Carboline Protective Coatings.
      b. PPG.
      c. The Sherwin-Williams Company.
      d. Tnemec.
      e. AkzoNobel.

B. Submit request for substitution in accordance with Specification Section 01 25 00.

C. "Or-Equal" Submittals:
   1. Materials by other manufacturers are acceptable provided that they are established as being compatible with and of equal quality to the coatings of the manufacturers listed.
   2. Provide satisfactory documentation from the proposed "or-equal" manufacturer that proposed materials meets or exceeds the following:
      a. Is of the same generic resin.
      b. Requires comparable surface preparation.
      c. Has comparable application requirements.
      d. Meets the same VOC levels or better.
      e. Provides the same finish and color options.
      f. Is suitable for the intended service.
      g. Resistance to abrasion and physical damage.
      h. Resistance to chemical attack.
      i. Resistance to UV exposure.
      j. Ability to recoat in future.
      k. Dry film thickness per coat.
         1) Where manufacturer’s product data sheet indicates a minimum MIL thickness per coat that is greater than specified herein, MIL thickness for entire coating system shall be increased proportionately.
      l. Minimum and Maximum time between coats.
      m. Compatibility with other coatings.
      n. Temperature limitations in service and during application.
      o. Type and quality of recommended undercoats and topcoats.
      p. Ease of application.
      q. Ease of repairing damaged areas.
      r. Stability of colors.
   3. The cost of all testing and analyzing of the proposed substitute materials shall be borne by the CONTRACTOR.

2.2 MATERIALS

A. Coatings used for interior finishes shall meet the requirements of the building code.

B. Coatings shall comply with the VOC limits of EPA:
1.

C. For unspecified materials such as thinner, provide manufacturer's recommended products.

D. High Performance Industrial Coatings:

COATING CODE	GENERIC DESCRIPTION	MANUFACTURER	
		TNEMEC	SHERWIN WILLIAMS
AAE	Acrylic/Acrylate Emulsion	Series 180 WB Tneme-Crete	Cement Plex 875
AREC	Abrasion-Resistant Epoxy Coating	Series 435 Perma-Glaze	Duraplate 5900
CRM	Cementitious Repair Mortar	Series 217 MortarCrete	Cemtec Silatec MSM
CRU	Corrosion Resistant Urethane	Series 290 CRU	Polylon HP
DFA	Dry-fall Acrylic	Series 115 Uni-Bond DF	DFA Dry Fall Acrylic
EBF	Epoxy Block Filler	Series 1254 Epoxoblock WB	Kem Cati Coat HS
ESF	Epoxy Surfacer/Filler	Series 215 Surfacing Epoxy	Steel Seam FT 910
EMM	Epoxy Modified Cementitious Mortar	Series 218 MortarClad	Duraplate 2300
EF	Epoxy Flooring	Series 237 Power-Tread	GP3746
GFRE	Glass Flake Reinforced Epoxy	Series 142	Sher-Glass FF
HREM	H2S-Resistant Epoxy Mortar	Series 434 Perma-Shield H_2S	Duraplate 5900 Mortar
HU	Hybrid Urethane	Series 740 UVX	Acrolon Ultra
MIO	MIO Polyurethane	Series 1 Omnithane	Corothane 1 MIO
MPE	Multi-Purpose Epoxy	Series N69 Hi-Build Epoxoline II	Macropoxy 646
MTEP	Moisture-Tolerant Epoxy Primer	Series 201 Epoxoprime	Corobond 100
SCE	Secondary Containment Epoxy	Series 237SC Chembloc	Cor Cote HP
SCEP	Secondary Containment Epoxy Primer	Series 206SC Chembloc	GP3552
STEP	Surface-Tolerant Epoxy Primer	Series 135 Chembuild	Macropoxy 646
UHSE	Ultra-High Solids Epoxy (NSF 61)	Series 22 Epoxoline	Duraplate UHS

COATING CODE	GENERIC DESCRIPTION	MANUFACTURER	
		TNEMEC	SHERWIN WILLIAMS
VEP	Vinyl Ester Primer	Series 251SC Chembloc	Corobond Vinyl Ester Primer
VESC	Vinyl Ester Secondary Containment	Series 252SC Chembloc	Cor Cote VEN FF
ZRU	Zinc-Rich Urethane	Series 94-H_20 Hydro-Zinc	Corothane 1 Galvapak

E. High Temperature Coatings:

COATING CODE	GENERIC DESCRIPTION	MANUFACTURER		
		PPG	TNEMEC	SHERWIN WILLIAMS
HTZRP	High Temperature Zinc Rich Primer	Dimetcote 9 Series	Series 1505 Endura-Heat ZR	Zinc Clad II Plus

2.3 COATING SYSTEMS:

A. The following tables indicate coating systems by material and environment, unless a specific application is indicated.

Environment/ Application	Surface Preparation	Prime Coat	Intermediate Coats	Finish Coat
Ferrous Metals (Structural & Miscellaneous Metals)				
Interior atmospheric	SSPC-SP 6/ NACE No. 3	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE
Interior atmospheric (corrosive environment)	SSPC-SP 10/ NACE No. 2, min. 2 MIL anchor profile	2.5 to 3.5 MIL ZRU	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE
Immersion - Wastewater	SSPC-SP 10/ NACE No. 2	3.0 to 4.0 MIL MPE		12 to 16 MIL GFRE
Immersion - Wastewater (abrasion resistant)	SSPC-SP 10/ NACE No. 2 min. 3 MIL anchor profile	15 to 20 MIL AREC		15 to 20 MIL AREC
Immersion - non NSF	SSPC-SP 10/ NACE No. 2	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE
Outdoor atmospheric	SSPC-SP 6/ NACE No. 3	2.5 to 3.5 MIL ZRU	3.0 to 5.0 MIL MPE	2.5 to 3.5 MIL HU
Outdoor atmospheric	SSPC-SP 6/ NACE No. 3	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE	2.5 to 3.5 MIL HU

Environment/ Application	Surface Preparation	Prime Coat	Intermediate Coats	Finish Coat
Galvanized Steel				
Interior atmospheric	SSPC-SP 16	4.0 to 6.0 MIL STEP		2.0 to 3.0 MIL MPE
Immersion - non NSF	SSPC-SP 16	4.0 to 6.0 MIL STEP	2.0 to 3.0 MIL MPE	2.0 to 3.0 MIL MPE
Outdoor atmospheric	SSPC-SP 16	4.0 to 6.0 MIL STEP		2.5 to 3.5 MIL HU
Field cut pipe threads	SSPC-SP 3	4.0 to 6.0 MIL STEP	Coat per exposure above	Coat per exposure above
Non Ferrous Metals, including piping				
Dissimilar Materials Protection	SSPC-SP 2	4.5 to 5.5 MIL MPE		
Interior atmospheric	SSPC-SP 2	3.0 to 4.0 MIL MPE		3.0 to 4.0 MIL MPE
Vapor space at covered clarifiers, digesters and similar structures	SSPC-SP 10/ NACE No. 2 min. 3 MIL anchor profile	5 to 7 MIL MPE		30 to 40 MIL AREC
Immersion - Wastewater (abrasion resistant)	SSPC-SP 16			40 to 45 MIL AREC
Immersion - non NSF	SSPC-SP 16	3.0 to 4.0 MIL MPE		5.0 to 6.0 MIL MPE
Outdoor atmospheric	SSPC-SP 2	4.0 to 6.0 MIL MPE		2.5 to 3.5 MIL HU
Ferrous Piping				
Interior atmospheric	SSPC-SP 6/ NACE No. 3	2.5 to 3.5 MIL ZRU	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE
Vapor space at covered clarifiers, digesters and similar structures	SSPC-SP 10/ NACE No. 2 min. 3 MIL anchor profile	5 to 7 MIL MPE		30 to 40 MIL AREC
Immersion - Wastewater	SSPC-SP 10/ NACE No. 2	3.0 to 4.0 MIL MPE		12 to 16 MIL GFRE
Immersion - Wastewater (abrasion resistant)	SSPC-SP 10/ NACE No. 2, min 3 MIL anchor profile	15 to 20 MIL AREC		15 to 20 MIL AREC
Immersion - non NSF	SSPC-SP 5/ NACE No.1	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE
Outdoor atmospheric	SSPC-SP 10/ NACE No. 2	2.5 to 3.5 MIL ZRU	3.0 to 4.0 MIL MPE	2.5 to 3.5 MIL HU
Ductile Iron Piping				

Environment/ Application	Surface Preparation	Prime Coat	Intermediate Coats	Finish Coat
Interior atmospheric	Pipe: NAPF 500-03-04 Fittings: NAPF 500-03-05	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE
Vapor space at covered clarifiers, digesters and similar structures	SSPC-SP 10/ NACE No. 2 min. 3 MIL anchor profile	5 to 7 MIL MPE		30 to 40 MIL AREC
Immersion - Wastewater	Pipe: NAPF 500-03-04 Fittings: NAPF 500-03-05	3.0 to 4.0 MIL MPE		12 to 16 MIL GFRE
Immersion - Wastewater (abrasion resistant)	Pipe: NAPF 500-03-04 Fittings: NAPF 500-03-05	15 to 20 MIL AREC		15 to 20 MIL AREC
Immersion - non NSF	Pipe: NAPF 500-03-04 Fittings: NAPF 500-03-05	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE
Outdoor atmospheric	Pipe: NAPF 500-03-04 Fittings: NAPF 500-03-05	3.0 to 4.0 MIL MPE	3.0 to 4.0 MIL MPE	2.5 to 3.5 MIL HU
PVC Piping				
Interior atmospheric	Hand Sanding/ SSPC-SP 1	3.0 to 4.0 MIL MPE		3.0 to 4.0 MIL MPE
Outdoor atmospheric	Hand Sanding/ SSPC-SP 1	3.0 to 4.0 MIL MPE		2.5 to 3.5 MIL HU

Environment/ Application	Surface Preparation	Filler/Surfacer	Prime Coat	Intermediate Coat(s)	Finish Coat
Concrete*					
Walls, ceilings, and appurtenant surfaces Interior atmospheric	SSPC-SP 13/ NACE No. 6 ICRI CSP 5	ESF and/or EMM as necessary to fill holes and depressions	100 to 150 SQFT/GAL MPE		100 to 150 SQFT/GAL MPE
Interior floors	SSPC-SP 13/ NACE No. 6 ICRI CSP 5	ESF as necessary to fill holes and depressions	175 to 225 SQFT/GAL EF clear	200 to 250 SQFT/GAL EF pigmented	200 to 250 SQFT/GAL EF pigmented
Interior Safety Striping	SSPC-SP 13/ NACE No. 6 ICRI CSP 3	ESF and/or EMM as necessary to fill holes and depressions			6.0 to 8.0 MIL EF Pigmented

Environment/ Application	Surface Preparation	Filler/Surfacer	Prime Coat	Intermediate Coat(s)	Finish Coat
Interior - Secondary Containment	SSPC-SP 13/ NACE No. 6 ICRI CSP 5	ESF and/or EMM as necessary to fill holes and depressions	6.0 to 8.0 MIL MTEP	60 to 80 MIL SCEP Fiberglass mat Saturated with 8.0 to 12 MILS SCE	10 to 12 MIL SCE
Immersion - non NSF	SSPC-SP 13/ NACE No. 6 ICRI CSP 5	1/16 to 1/4 IN EMM			16 to 20 MIL UHSE
Immersion - Wastewater (Abrasion Resistant)	SSPC-SP 13/ NACE No. 6 ICRI CSP 5	1/16 to 1/4 IN EMM	1/8 IN HREM		15 to 25 MIL AREC
Immersion - Wastewater - Clarifier Launders	SSPC-SP 13 NACE No. 6 ICRI CSP 5	1/16 to 1/4 IN EMM	60 to 80 MIL REC		30 to 45 MIL AREC
Vapor space at covered clarifiers, digesters and similar structures	SSPC-SP 13/ NACE No. 6 ICRI CSP 5	1/16 to 1/4 IN EMM			30 to 45 MIL AREC
Outdoor atmospheric Corrosive Environment	SSPC-SP 13/ NACE No. 6 ICRI CSP 5	ESF and/or EMM as necessary to fill holes and depressions	150 to 175 SQFT/GAL AAE		150 to 175 SQFT/GAL AAE
Outdoor - Secondary Containment	SSPC-SP 13/ NACE No. 6 ICRI CSP 5	ESF and/or EMM as necessary to fill holes and depressions	6.0 to 8.0 MIL MTEP	60 to 80 MIL SCEP Fiberglass mat Saturated with 8.0 to 12 MILS SCE	10 to 12 MIL SCE 20. to 3.0 MIL CRU

* For repair of deteriorated existing concrete, provide additional surface preparation as specified in PREPARATION article in this Specification Section.

Environment/ Application	Surface Preparation	Filler/Surfacer	Prime Coat	Intermediate Coat(s)	Finish Coat
CMU*					
Interior atmospheric	Refer to PART 3	100 to 150 SQFT/Gal EBF	75 to 100 SQFT/Gal MPE		75 to 100 SQFT/Gal MPE
Outdoor atmospheric Corrosive Environment	Refer to PART 3	100 to 150 SQFT/Gal EBF	175 to 200 SQFT/Gal MPE		275 to 300 SQFT/Gal HU
Outdoor atmospheric Non-Corrosive Environment					

* Coverage rates indicated are based on smooth-face normal weight CMU. Provide increased coverage rates in accordance with manufacturer's recommendations for more porous surfaces.

PART 3 - EXECUTION

3.1 ITEMS TO BE COATED

A. Outdoor Surfaces, including but not limited to:
   1. Piping, valves, fittings, hydrants and supports:
      a. As scheduled in Specification Section 40 05 00.
      b. Process piping scheduled.
      c. Field welded connections of factory coated piping.
   2. Ferrous metal tankage.
   3. Appurtenant surfaces attached to or adjacent to a surface indicated to be coated:
      a. Conduit, boxes, covers and supports.

B. Interior Areas:
   1. Refer to Room Finish Schedule on Drawings.
      a. If space is scheduled to be coated, coat all appurtenant surfaces within the space unless specifically noted otherwise. Appurtenant surfaces include but are not limited to:
         1) Columns.
         2) Equipment pads.
         3) Equipment supports.
         4) Underside of roof or floor decks above:
            a) Including semi-exposed or concealed from view unless noted otherwise.
         5) Ductwork and supports.
         6) Conduit, boxes, covers and supports.
         7) Miscellaneous ferrous metal surfaces.
   2. Ferrous metal tankage.
   3. Interior and Exterior surfaces of steel storage tanks.
      a. The following tankage is to be coated:
         1) Surface Water Headtank.

3.2 ITEMS NOT TO BE COATED

A. General: Do not coat items listed in this Article, unless noted otherwise.

B. Items with Approved Factory Finish: These items may require repair of damaged coated areas or coating of welded connections.

C. Electrical Equipment.

D. Moving parts of mechanical and electrical units where coating would interfere with the operation of the unit.

E. Code labels, equipment identification or rating plates and similar labels, tagging and identification.

F. Contact surfaces of friction-type structural connections.

G. Stainless Steel Surfaces, except:
   1. Dissimilar metals in immersion service.
   2. Piping where specifically noted to be coated.
   3. Banding as required to identify piping.

H. Aluminum Surfaces, except:
   1. Where specifically shown in the Contract Documents.
   2. Where in contact with concrete.
   3. Where in contact with dissimilar metals.
   4. Appurtenant surfaces as described in the ITEMS TO BE COATED article.

I. Fiberglass Surfaces, except:
   1. Fiberglass piping where specifically noted to be coated.
   2. Piping supports where specifically noted to be coated.
   3. Appurtenant surfaces as described in the ITEMS TO BE COATED article.

J. Mechanical piping scheduled to be insulated.

K. Interior of Pipe, Ductwork, and Conduits.
   1. See Division 23 for ductwork.
   2. See Division 40 for pipe linings.

L. Galvanized Steel Items, unless specifically noted to be coated.

M. Architectural Finishes:
   1. Outdoor concrete indicated to receive another finish.
   2. Precast concrete surfaces, unless specifically indicated to be coated.
   3. Prefinished masonry surfaces:
      a. Pre-colored masonry (outdoor face).
         1) Interior face shall be coated where scheduled.
      b. Burnished (ground face) concrete masonry.
      c. Prefaced masonry.
      d. Face brick.
      e. Glass masonry.
   4. Plastic laminate.
   5. Solid surface material.
   6. Standing and running trim.
   7. Fiberglass fabrications.
   8. Anodized aluminum.
   9. PVDF coated metals.
   10. Factory finished doors and frames.
   11. Aluminum windows, curtainwall and storefront framing systems.
   12. Finish hardware.
   13. Glass and glazing.
   14. Ceramic, porcelain, quarry tile or natural stone.
   15. Acoustical materials.
   16. Building specialties.
   17. Louvers.
   18. Casework and countertops.
   19. Pipe insulation and jacketing.
   20. Standing seam metal roof, fascia, trim, soffit and accessories.

3.3 PREPARATION

A. General:
   1. Prepare surfaces to be coated in accordance with coating manufacturer's instructions and this Specification Section unless noted otherwise in this Specification Section.
      a. Where discrepancy between coating manufacturer's instructions and this Specification Section exists, the more stringent surface preparation shall be provided unless approved otherwise, in writing, by the Engineer.
   2. Remove all dust, grease, oil, compounds, dirt and other foreign matter which would prevent bonding of coating to surface.
   3. Adhere to manufacturer's recoat time surface preparation requirements.
      a. Surfaces that have exceeded coating manufacturer's published recoat time and/or have exhibited surface chalking shall be prepared prior to additional coating in accordance with manufacturer's published recommendations.
         1) Minimum SSPC-SP 7/ NACE No. 4 unless otherwise approved by Engineer.

B. Protection:
   1. Protect surrounding surfaces not to be coated.
   2. Remove and protect hardware, accessories, plates, fixtures, finished work, and similar items; or provide ample in-place protection.
   3. Protect code labels, equipment identification or rating plates and similar labels, tagging and identification.

C. Prepare and coat before assembly all surfaces which are inaccessible after assembly.

D. Ferrous Metal:
   1. Prepare ductile iron pipe in accordance with pipe manufacturer's recommendations and NAPF.
      a. All piping, pumps, valves, fittings and any other component used in the water piping system that requires preparation for coating shall be prepared in accordance with requirements for immersion service.
      b. Prepare all areas requiring patch coating in accordance with recommendations of manufacturer and NAPF.
      c. Remove bituminous coating per piping manufacturer, coating manufacturer and NAPF recommendations.
         1) The most stringent recommendations shall apply.
   2. Complete fabrication, welding or burning before beginning surface preparation.
      a. Chip or grind off flux, spatter, slag or other laminations left from welding.
      b. Remove mill scale.
      c. Grind smooth rough welds and other sharp projections.
   3. Solvent clean in accordance with SSPC-SP 1.
   4. Restore surface of field welds and adjacent areas to original surface preparation.

E. Preparation by Abrasive Blasting:
   1. Schedule the abrasive blasting operation so blasted surfaces will not be wet after blasting and before coating.
   2. Provide compressed air for blasting that is free of water and oil.
      a. Provide accessible separators and traps.
   3. Protect nameplates, valve stems, rotating equipment, motors and other items that may be damaged from blasting.
   4. All abrasive-blasted ferrous metal surfaces shall be inspected immediately prior to application of coatings.
      a. Inspection shall be performed to determine cleanliness and profile depth of blasted surfaces and to certify that surface has been prepared in accordance with these Specifications.
   5. Perform additional blasting and cleaning as required to achieve surface preparation required.
      a. Re-blast surfaces not meeting requirements of these Specifications.
      b. Prior to coating, re-blast surfaces allowed to set overnight and surfaces that show rust bloom.
      c. Surfaces allowed to set overnight or surfaces which show rust bloom prior to coating shall be re-inspected prior to coating application.
   6. Profile depth of blasted surface: Not less than 1 MIL or greater than 2 MILS unless required otherwise by coating manufacturer.
   7. Ensure abrasive blasting operation does not result in embedment of abrasive particles in coating.
   8. Confine blast abrasives to area being blasted.
      a. Provide shields of polyethylene sheeting or other such barriers to confine blast material.
      b. Plug pipes, holes, or openings before blasting and keep plugged until blast operation is complete and residue is removed.
   9. Abrasive blasting media may be recovered, cleaned and reused providing Contractor submits, for Engineer's review, a comprehensive recovery plan outlining all procedures and equipment proposed in reclamation process.
   10. Properly dispose of blasting material contaminated with debris from blasting operation.

F. All Plastic Surfaces:
   1. Sand using 80-100 grit sandpaper to scarify surfaces.

3.4 APPLICATION

A. General:

1. Thin, mix and apply coatings by brush, roller, or spray in accordance with manufacturer's installation instructions.
    a. Application equipment must be inspected and approved in writing by coating manufacturer.
2. Temperature and weather conditions:
    a. Do not coat surfaces when surface temperature is below 50 DEGF unless product has been formulated specifically for low temperature application and application is approved in writing by Engineer and coating manufacturer's technical representative.
    b. Avoid coating surfaces exposed to hot sun.
    c. Do not coat damp surfaces.
    d. Apply coating to concrete or masonry surfaces in descending temperatures, in accordance with coating manufacturer's application instructions.
3. Apply materials under adequate illumination.
4. Provide complete coverage to MIL thickness specified.
    a. Thickness specified is dry MIL thickness.
5. Evenly spread to provide full, smooth coverage.
    a. All coating systems are "to cover."
        1) In situations of discrepancy between manufacturer's square footage coverage rates and MIL thickness, MIL thickness requirements govern.
    b. When color or undercoats show through, apply additional coats until coating is of uniform finish and color.
    c. Finished coating system shall be uniform and without voids, bugholes, holidays, laps, brush marks, roller marks, runs, sags or other imperfections.
6. If so directed by Engineer, do not apply consecutive coats until Engineer has had an opportunity to observe and approve previous coats.
7. Work each application of material into corners, crevices, joints, and other difficult to work areas.
8. Provide coating manufacturer’s recommended details at all terminations, penetrations, embedments, cracks, joints and changes in substrate direction.
9. Avoid degradation and contamination of blasted surfaces and avoid inter-coat contamination.
    a. Clean contaminated surfaces before applying next coat.
    b. Intercoat surface cleanliness shall be inspected and approved by the Engineer prior to application of each coat.
10. Smooth out runs or sags immediately, or remove and recoat entire surface.
11. Allow preceding coats to dry before recoating.
    a. Recoat within time limits specified by coating manufacturer.
    b. If recoat time limits have expired re-prepare surface in accordance with coating manufacturer's printed recommendations.
12. Allow coated surfaces to cure prior to allowing traffic or other work to proceed.
13. Coat all aluminum in contact with dissimilar materials.
14. When coating rough surfaces which cannot be backrolled sufficiently, hand brush coating to work into all recesses provided that the maximum DFT is not exceeded.
15. Backroll surfaces if coatings are spray applied.

B. Employ services of coating manufacturer's technical representative to ensure that field-applied coatings are compatible with factory-applied or existing coatings.
    1. Certify through material data sheets.
    2. Perform test patch.
        a. Prepare existing coating surface to receive specified coating system.
        b. Apply coating to a minimum 1 SQFT area and allow to cure in accordance with manufacturer's recommendations.
        c. Evaluate adhesion to existing coating:
            1) Concrete or Masonry substrates: ASTM D4541.
            2) All other substrates: ASTM D6677 and ASTM D3359 (X-cut method).

3. If field-applied coating is found to be not compatible, require the coating manufacturer's technical representative to recommend, in writing, product to be used as barrier coat, thickness to be applied, surface preparation and method of application.
    a. Perform test patch as described above.
4. At Contractor's option, coatings may be removed, surface re-prepared, and new coating applied using appropriate coating system listed in the MATERIALS Article, Coating Systems paragraph of this Specification Section.
    a. All damage to surface as result of coating removal shall be repaired to original condition or better by Contractor at no additional cost to Owner.

C. Prime Coat Application:
1. Apply structural steel and miscellaneous steel prime coat in the factory.
    a. Finish coats shall be applied in the factory.
    b. Prime coat referred to here is prime coat as indicated in this Specification.
        1) Prime coating applied in factory (shop) as part of Fabricator's standard rust inhibiting and protection coating is not acceptable as replacement for specified prime coating.
    c. Application of all factory-applied coatings(s) on structural steel and miscellaneous steel and steel joist and steel truss shall be continually observed and certified by NACE coatings inspector.
2. Prime all surfaces indicated to be coated.
    a. Apply prime coat in accordance with coating manufacturer's written instructions and as written in this Specification Section.
3. Prime ferrous metals embedded in concrete to minimum of 1 IN below exposed surfaces.
4. Apply zinc-rich primers while under continuous agitation.
5. Brush or spray bolts, welds, edges and difficult access areas with primer prior to primer application over entire surface.
6. Touch up damaged primer coats prior to applying finish coats.
    a. Restore primed surface equal to surface before damage.
7. All surfaces of steel lintels and steel components of concrete lintels used in wall construction shall be completely coated with both prime and finish coats prior to placing in wall.

D. Finish Coat Application:
1. Apply finish coats in accordance with coating manufacturer's written instructions and in accordance with this Specification Section; manufacturer instructions take precedent over these Specifications.
2. Touch up damaged finish coats using same application method and same material specified for finish coat.
    a. Prepare damaged area in accordance with the PREPARATION Article of this Specification Section.

3.5 COLOR CODING

A. Color code piping in accordance with the SCHEDULE Article of this Specification Section.

3.6 FIELD QUALITY CONTROL

A. Application Deficiencies:
1. Surfaces showing runs, laps, brush marks, telegraphing of surface imperfections or other defects will not be accepted.
2. Surfaces showing evidence of fading, chalking, blistering, delamination or other defects due to improper surface preparation, environmental controls or application will not be accepted.
    a. Epoxy surfaces showing evidence of chalking or amine blush shall be prepared and recoated as follows:
        1) Solvent clean surfaces in accordance with SSPC-SP1 and abrasive blast in accordance with SSPC-SP7/ NACE No. 4.

2) Recoat with intermediate and finish coats in accordance with coating system specified herein.

B. Provide protection for coated surfaces.
   1. Surfaces showing soiling, staining, streaking, chipping, scratches, or other defects will not be accepted.

C. Contractor Performed Testing:
   1. Provide ongoing testing and inspection, including but not limited to the following:
      a. Measurement and recording of environmental conditions as specified herein.
      b. Measurement and recording of substrate conditions as specified herein.
      c. Thickness Testing:
         1) Wet film thickness during application in accordance with ASTM D4414.
         2) Dry Film Thickness (DFT) in accordance with SSPC-PA 2.
         3) Engineer may measure coating thickness at any time during project to assure conformance with these Specifications.
      d. Bond Strength:
         1) Bond strength testing will be required by the Engineer where there is reason to suspect the integrity of the coating system.
         2) Measure bond strength of the coating in accordance with:
            a) Steel substrate: ASTM D4541.
            b) Concrete substrate ASTM D7234.
         3) The number of test sites and locations to be tested shall be determined by the Engineer after application of coating. The Contractor will apply the dollies, perform the tests and repair the coating in the presence of the Engineer or Owner.
            a) For each test that fails, two additional tests shall be performed in the adjacent area.
            b) Further bond tests may be performed to determine the extent of potentially deficient bonded areas at no additional cost to the Owner.
         4) Repairs shall be made by applicator in strict accordance with manufacturer's recommendations. Any coated areas that do not pass the bond strength tests shall be removed and replaced at the expense of the Contractor.

D. Instrumentation:
   1. Provide instrumentation as necessary to measure and record atmospheric and substrate conditions, including but not limited to:
      a. Dry Film Thickness Gauge:
         1) Ultrasonic: ASTM D6132.
         2) Magnetic: ASTM B499.
      b. Wet Film Thickness Gauge: ASTM D4414.
      c. Sling Psychrometer: ASTM E337.
      d. Surface Temperature Gauge.
      e. Anemometer.
      f. Moisture Meter.
      g. Adhesion test apparatus:
         1) Steel: ASTM D4541.
         2) Concrete: ASTM D7234.

E. Maintain Daily Records:
   1. Record the following information during application:
      a. Date, starting time, end time, and all breaks taken by applicators.
      b. Air temperature.
      c. Relative humidity.
      d. Dew point.
      e. Moisture content and pH level of concrete or masonry substrates prior to coating.
      f. Surface temperature of substrate.

g. Provisions utilized to maintain work area within manufacturer's recommended application parameters including temporary heating, ventilation, cooling, dehumidification and provisions utilized to mitigate wind-blown dust and debris from contaminating the wet coating.
h. For outdoor coating, also record:
    1) Sky condition.
    2) Wind speed and direction.
i. Record environmental conditions, substrate moisture content and surface temperature information not less than once every 4 HRS during application.
    1) Record hourly when temperatures are below 50 DEGF or above 100 DEGF.

2. Record the following information daily for the coating manufacturer's recommended curing period:
    a. Date and start time of cure period for each item or area.
    b. For outdoor coating, also record:
        1) Sky conditions.
        2) Wind speed and direction.
        3) Air temperature.
            a) Dry Bulb.
            b) Wet Bulb.
        4) Relative humidity.
        5) Dew point.
        6) Surface temperatures.
    c. Record environmental conditions not less than once every 4 HRS.
        1) Record hourly when temperatures are below 50 DEGF or above 100 DEGF.
    d. Provisions utilized to protect each item or area and to maintain areas within manufacturer's recommended curing parameters.
3. Format for daily record to be computer generated.

F. Provide wet paint signs.

3.7 CLEANING

A. Clean coating spattered surfaces.
    1. Use care not to damage finished surfaces.

B. Upon completion of coating, replace hardware, accessories, plates, fixtures, and similar items.

C. Remove surplus materials, scaffolding, and debris.

3.8 COLOR SCHEDULE

A. Piping:
    1. Refer to Specification Section 10 14 00 for the piping system and banding material and refer to this Specification Section and this Schedule for the banding colors.

END OF SECTION