

COATING SYSTEMS FOR STEEL TANKS AND PIPES

1. GENERAL

1.1 References

- .1 The following is a list of standards which may be referenced in this Section:
 - .1 NSF International: 61, Drinking Water System Components-Health Effects.
 - .2 SSPC:
 - .1 SP 1, Solvent Cleaning
 - .2 SP 2, Hand Tool Cleaning
 - .3 SP 3, Power Tool Cleaning
 - .4 SP 5, White Metal Blast Cleaning
 - .5 SP 6, Commercial Blast Cleaning
 - .6 SP 7, Brush-Off Blast Cleaning
 - .7 SP 8, Pickling
 - .8 SP 10, Near-White Blast Cleaning
 - .9 SP 11, Power Tool Cleaning to Bare Metal
 - .10 SP 12, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.
 - .3 AWWA:
 - .1 C210, Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
 - .4 NACE:
 - .1 RP0188-99 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

1.2 Definitions

- .1 Terms used in this Section:
 - .1 Coverage: Total minimum dry film thickness in mil, or m²/L.

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- .2 MDFT: Minimum Dry Film Thickness, mm.
- .3 MDFTPC: Minimum Dry Film Thickness per Coat, mm.
- .4 Mil: Thousandth of an inch.
- .5 PSDS: Paint System Data Sheet.
- .6 SP: Surface preparation.

1.3 Submittals

- .1 Action Submittals:
 - .1 Data Sheets:
 - .1 For each paint system used, furnish a painting system data sheet, and paint colours available (where applicable) for each product used in the paint system, except for products applied by equipment manufacturers.
 - .2 Submit required information on a system-by-system basis.
 - .3 Provide copies of paint system submittals to coating applicator.
 - .4 Indiscriminate submittal of Manufacturer's literature only is not acceptable.
 - .2 Detailed chemical and gradation analysis for each proposed abrasive material.
 - .3 Samples: Proposed Abrasive Materials: 2 kg minimum Sample for each proposed.
- .2 Informational Submittals:
 - .1 Anticipated tank coating sequence.
 - .2 Coating Manufacturer's letter or certificate stating that the proposed product, material, or service complies with that specified. Attach supporting reference data, affidavits, and certifications as appropriate.
 - .3 Copy of applicable NSF listings.
 - .4 Applicator's Qualification: List of references substantiating experience.
 - .5 Manufacturer's written instructions for applying each type of coating.
 - .6 Field Testing: Inspection and test reports.
 - .7 Form 102 – Certificate of Satisfactory Installation.

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1.4 Quality Assurance

- .1 Applicator Qualifications: Minimum five (5) years' experience in application of specified products.
- .2 Regulatory Requirements:
 - .1 Meet federal, provincial, and local requirements limiting the emission of volatile organic compounds.
 - .2 Perform surface preparation and painting in accordance with recommendations of the following:
 - .1 Paint Manufacturer's instructions.
 - .2 SSPC-PA Guide No. 3, A Guide to Safety in Paint Application.
 - .3 Federal, provincial, and local agencies having jurisdiction.
- .3 Mockup:
 - .1 Before proceeding with Work under this Section, finish one complete space or item of each colour scheme required showing selected colours, finish texture, materials, quality of Work, and special details.
 - .2 After approval, sample spaces or items shall serve as a standard for similar work throughout the Work.

1.5 Delivery, Storage, and Handling

- .1 Deliver materials to Site in unopened containers labeled with designated name, date of manufacture, colour, and Manufacturer.
- .2 Store paints in a protected area that is heated or cooled as required to maintain temperatures within the range recommended by paint Manufacturer.
- .3 Shipping:
 - .1 Protect pre-coated items from damage. Batten coated items to prevent abrasion.
 - .2 Use nonmetallic or padded slings and straps in handling.

1.6 Environmental Requirements

- .1 Do not apply paint in temperatures outside of Manufacturer's recommended maximum or minimum allowable, or in dust, smoke-laden atmosphere, damp or humid weather.

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- .2 Do not perform abrasive blast cleaning whenever relative humidity exceeds 85%, or whenever surface temperature is less than 3°C above dewpoint of ambient air.

2. PRODUCTS

2.1 Manufacturers

- .1 Ameron Protective Coatings, Brea, CA
- .2 Benjamin Moore Paints, New York, NY
- .3 Carboline Coatings Company, St. Louis, MO
- .4 ICI Devoe, Louisville, KY
- .5 DuPont Chemical Co., Wilmington, DE
- .6 Hempel/Reliance Paints, Houston, TX
- .7 Keeler and Long, Inc., Watertown, CT
- .8 Master Builders, Inc., Cleveland, OH
- .9 Plas-Chem Coatings, St. Louis, MO
- .10 International Protective Coatings, Houston, TX
- .11 Sherwin-Williams, Cleveland, OH
- .12 Tnemec Coatings, Kansas City, MO
- .13 Plasite Protective Coatings, Green Bay, WI
- .14 Cloverdale Paint, Surrey, BC
- .15 Enviroline, Pompano Beach, FL

2.2 Materials

- .1 Quality: Manufacturer's highest quality products and suitable for intended use.
- .2 Abrasives: As recommended by paint Manufacturer to produce surface profile recommended for specific paint system.
- .3 Materials Including Primer and Finish Coats: Produced by same paint Manufacturer.

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- .4 Thinners, Cleaners, Driers, and Other Additives: As recommended by paint Manufacturer of the particular coating.
- .5 Polyamide Epoxy: Polyamide epoxy coatings approved for potable water contact conforming to NSF 61.
- .6 Polyurethane Enamel: Two-component, aliphatic or acrylic based polyurethane; high gloss finish.
- .7 Wash Primer: Vinyl butyral acid.
- .8 Rust Inhibitive Primer: Single package steel primer with anticorrosive pigment loading.
- .9 Alkyd Enamel: Gloss finish, medium oil length.

2.3 Colours

- .1 Formulate with colorants free of lead and lead compounds.
- .2 Furnish as selected by Contract Administrator.
- .3 Proprietary identification of colours is for identification only; selected manufacturer may supply matches.

2.4 Mixing

- .1 Multiple-Component Coatings:
 - .1 Prepare using all the contents of the container for each component as packaged by paint Manufacturer.
 - .2 No partial batches will be permitted.
 - .3 Do not use multiple-component coatings that have been mixed beyond their pot life.
 - .4 Furnish small quantity kits for touchup painting and for painting other small areas.
 - .5 Mix only components specified and furnished by paint Manufacturer.
 - .6 Do not intermix additional components for reasons of colour or otherwise, even within the same generic type of coating.
- .2 Keep paint material containers sealed when not in use.

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3. EXECUTION

3.1 General

- .1 Coatings and linings on steel piping shall be applied in strict accordance with AWWA C210.

3.2 Preparation

- .1 Notify the Contract Administrator at least seven (7) days prior to start of shop blast cleaning to allow for inspection of the Work during surface preparation and shop application of paints. Work shall be subject to the Contract Administrator approval before shipment to Site.
- .2 Items such as structural steel, metal floor doors, manways, and frames, metal louvers, and similar fabricated items may be shop prepared and primed. Centrifugal wheel blast cleaning is an acceptable alternative to shop blast cleaning.
- .3 Remove, mask, or otherwise protect hardware, machined surfaces, nameplates on machinery, and other surfaces not intended to be painted.
- .4 Protect all surfaces adjacent to, or downwind of Work area from overspray. Contractor shall be responsible for any damage resulting from overspray.

3.3 Preparation of Surfaces

- .1 Metal Surfaces:
 - .1 Meet requirements of the following SSPC Specifications as referenced in specific coating systems:
 - .1 Solvent Cleaning: SP 1.
 - .2 Hand Tool Cleaning: SP 2.
 - .3 Power Tool Cleaning: SP 3.
 - .4 White Metal Blast Cleaning: SP 5.
 - .5 Commercial Blast Cleaning: SP6
 - .6 Brush-Off Blast Cleaning: SP 7.
 - .7 Near-White Blast Cleaning: SP 10.
 - .8 Power Tool Cleaning to Bare Metal: SP 11.
 - .9 Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.: SP 12.

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- .2 Wherever the words “solvent cleaning”, “hand tool cleaning”, “wire brushing”, or “blast cleaning”, or similar words of equal intent are used in these Specifications or in paint Manufacturer’s specifications, they shall be understood to refer to the applicable SSPC Specifications listed above.
- .3 Hand tool clean areas that cannot be cleaned by power tool cleaning.
- .4 Preblast Cleaning Requirements:
 - .1 Remove oil, grease, welding fluxes, and other surface contaminants prior to blast cleaning.
 - .2 Cleaning Methods: Steam, open flame, hot water, or cold water with appropriate detergent additives followed with clean water rinsing.
 - .3 Clean small isolated areas as above or solvent clean with suitable solvents and clean cloths.
 - .4 Round or chamfer sharp edges and grind smooth burrs, jagged edges, and surface defects.
 - .5 Welds and Adjacent Areas:
 - .1 Prepare such that there is:
 - .1 No undercutting or reverse ridges on weld bead.
 - .2 No weld spatter on or adjacent to weld or other area to be painted.
 - .3 No sharp peaks or ridges along weld bead.
 - .2 Grind embedded pieces of electrode or wire flush with adjacent surface of weld bead.
 - .6 Blast Cleaning Requirements:
 - .1 Type of Equipment and Speed of Travel: Design to obtain specified degree of cleanliness. Minimum surface preparation is as specified herein and takes precedence over coating Manufacturer’s recommendations.
 - .2 Select type and size of abrasive to produce a surface profile that meets coating Manufacturer’s recommendations for particular primer to be used.
 - .3 Use only dry blast cleaning methods.
 - .4 Do not reuse abrasive, except for designed recyclable systems.

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- .5 Meet applicable federal, provincial, and local air pollution and environmental control regulations for blast cleaning and disposition of spent aggregate and debris.
- .7 Post-Blast Cleaning and Other Cleaning Requirements:
 - .1 Clean surfaces of dust and residual particles from cleaning operations by dry (no oil or water vapor) air blast cleaning or other method prior to painting. Vacuum clean enclosed areas and other areas where dust settling is a problem and wipe with a tack cloth.
 - .2 Paint surfaces the same day they are blast cleaned. Reblast surfaces that have started to rust before they are coated.

3.4 Application

.1 General:

- .1 The intention of these Specifications is for new interior and exterior metal and submerged metal surfaces to be painted, whether specifically mentioned or not, except as modified herein. Prime coat structural steel surfaces.
- .2 Extent of Coating (Immersion): Coatings shall be applied to all internal vessel and pipe surfaces, nozzle bores, flange gasket sealing surfaces, carbon steel internals, and stainless steel internals, unless otherwise specified.
- .3 For coatings subject to immersion, obtain full cure for completed system. Consult coatings Manufacturer's written instructions for these requirements. Do not immerse coating until completion of curing cycle.
- .4 Apply coatings in accordance with paint Manufacturer's recommendations. Allow sufficient time between coats to assure thorough drying of previously applied paint.
- .5 Paint units to be bolted together and to structures prior to assembly or installation.
- .6 Where more than one (1) coat of a material is applied within a given system, alternate colour to provide a visual reference that the required number of coats have been applied.

.2 Shop Primed Surfaces:

- .1 Schedule inspection with the Contract Administrator before shop primed items are delivered to Site.
- .2 Hand or power sand areas of chipped, peeled, or abraded coating, feathering the edges. Follow with a spot primer using specified primer.

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- .3 For two-package or converted coatings, consult coatings Manufacturer for specific procedures as relates to Manufacturer's products.
 - .4 Prior to application of finish coats, clean shop primed surfaces free of dirt, oil, and grease and apply mist coat of specified primer, 1 mil dry film thickness.
 - .5 After welding, prepare and prime holdback areas as required for specified paint system. Apply primer in accordance with Manufacturer's instructions.
- .3 Stripe Coating:
- .1 Stripe coat all field welds, edges, angles, fasteners, and other irregular surfaces located inside tanks.
 - .2 Stripe coat shall consist of one coat, brush applied, to the coating thickness specified.
 - .3 Apply stripe coat between intermediate and final coats.
 - .4 Stripe coat colour shall contrast intermediate coat to allow visual verification of application.
- .4 Film Thickness:
- .1 Number of Coats: Minimum required without regard to coating thickness. Additional coats may be required to obtain minimum required paint thickness, depending on method of application, differences in Manufacturers' products, and atmospheric conditions.
 - .2 Maximum film build per coat shall not exceed coating Manufacturer's recommendations.
 - .3 Film Thickness Measurements and Electrical Inspection of Coated Surfaces:
 - .1 Perform with properly calibrated instruments.
 - .2 Recoat and repair as necessary for compliance with the Specifications.
 - .3 All coats are subject to inspection by the Contract Administrator and coating Manufacturer's representative.
 - .4 Give particular attention to edges, angles, flanges, and other similar areas, where insufficient film thicknesses are likely to be present, and ensure proper millage in these areas.
 - .5 Thickness Testing:
 - .1 After repaired and recoated areas have dried sufficiently, final tests will be conducted by the Contract Administrator.

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- .2 Measure coating thickness specified in mils with a magnetic type dry film thickness gauge.
 - .3 Test finish coat for holidays and discontinuities with an electrical holiday detector, low voltage, wet sponge type.
 - .4 Check each coat for correct millage. Do not make measurement before a minimum of eight (8) hours after application of coating.
- .5 Damaged Coatings, Pinholes, and Holidays:
- .1 Feather edges and repair in accordance with recommendations of paint Manufacturer.
 - .2 Hand or power sand visible areas of chipped, peeled, or abraded paint, and feather the edges. Follow with primer and finish coat in accordance with the Specifications. Depending on extent of repair and appearance, a finish sanding and topcoat may be required.
 - .3 Apply finish coats, including touch-up and damage-repair coats in a manner that will present a uniform texture and colour-matched appearance.
- .6 Unsatisfactory Application:
- .1 If item has an improper finish colour, or insufficient film thickness, clean surface and topcoat with specified paint material to obtain specified colour and coverage. Obtain specific surface preparation information from coating Manufacturer.
 - .2 Evidence of runs, bridges, shiners, laps, or other imperfections are causes for rejection.
 - .3 Repair defects in coating systems in accordance with written recommendations of coating Manufacturer.
 - .4 Leave all staging up until the Contract Administrator has inspected surface or coating. Replace staging removed prior to approval by the Contract Administrator.

3.5 Field Quality Control

- .1 Testing Gauges:
 - .1 Provide a magnetic type dry film thickness gauge to test coating thickness specified in millimetres, as Manufactured by Nordson Corp., Anaheim, CA, Mikrotest.
 - .2 Provide an electrical holiday detector, low voltage, wet sponge type to test finish coat, except zinc primer, high-build elastomeric coatings, and galvanizing, for holidays and discontinuities as manufactured by Tinker and Rasor, San Gabriel, CA, Model M-1.
- .2 Test all coated surfaces with a holiday detector in accordance with NACE RP0188. Coated surfaces shall be free of holidays.

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3.6 Manufacturer's Services

- .1 The coating Manufacturer's Representative shall be present at shop or Site as follows:
 - .1 On the first day of application of any coating.
 - .2 A minimum of two (2) additional inspection visits, each for a minimum of four (4) hours, in order to provide Form 102 – Certificate of Satisfactory Installation.
 - .3 As required to resolve field problems attributable to, or associated with the Manufacturers' product.

3.7 Cleanup

- .1 Place cloths and waste that might constitute a fire hazard in closed metal containers or destroy at the end of each day.
- .2 Upon completion of the Work, remove staging, scaffolding, and containers from the Site or destroy in a legal manner.
- .3 Completely remove paint spots, oil, or stains upon adjacent surfaces and floors and leave entire job clean.

3.8 Protective Coatings Systems

- .1 System No. 1 Submerged or Embedded Metal-Potable Water:

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast (SP10)	Potable Grade, Polyamide Epoxy Coating	3 coats, 0.08mm MDFTPC (3 mils MDFTPC)

- .1 Application Schedule:
 - .1 Use this system on all metal surfaces inside piping and tanks, including, but not limited to, steel plates and structural steel; interior and exterior surfaces of the inlet, outlet, and overflow piping; manhole covers; hatches; ladders; landings; couplings; and vents.
 - .2 Use this system on the exposed surfaces of direct buried and concrete encased steel pipe.
 - .3 Coating is not required for the bottom side of the floor plates.
 - .4 Provide full coating thickness to the top of all structural steel that will be covered by the roof plates, or otherwise shielded from full coating thickness, before the structural steel members are installed. Remove coating in areas to be welded.

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.2 System No. 5 Exposed Metal:

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast, or Centrifugal Wheel Blast (SP 10)	Polyamide, Anticorrosive Epoxy Primer (Beige Colour)	1 coat, 0.064mm MDFT (2.5 mils MDFT)
	Polyurethane Enamel	1 coat, 0.08mm MDFT (3 mils MDFT)

.1 Application Schedule: Use this system on exposed exterior metal surfaces of piping and tanks. For galvanized surfaces to be coated, reference System No. 10.

.2 Tank Coating Sequence Anticipated:

- .1 Shop prime all surfaces of shell plates and roof and floor plates and structural steel associated with the exterior of the tank; hold back shop primer where required for field welding.
- .2 Shop priming of galvanized steel surfaces is not required.
- .3 After tank erection, abrasive blast welds (SP 10) and damaged areas; apply primer.
- .4 Clean primed surfaces and brush blast.
- .5 Apply mist coat of primer.
- .6 Apply finish coats.
- .7 Touch up as required.

.3 System No. 6 Exposed Metal-Atmospheric:

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast, or Centrifugal Wheel Blast (SP 6)	Rust-Inhibitive Primer	1 coat, 0.05 mm MDFT (2 mils MDFT)
	Alkyd Enamel	2 coats, 0.1 mm MDFT (4 mils MDFT)

.1 Application Schedule: Use this system on exposed exterior metal surfaces of tanks. For galvanized surfaces to be coated, reference System No. 10.

.2 Tank Coating Sequence Anticipated:

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- .1 Shop prime all surfaces of shell plates and roof and floor plates and structural steel associated with the exterior of the tank; hold back shop primer where required for field welding.
 - .2 Shop priming of galvanized steel surfaces is not required.
 - .3 After tank erection, abrasive blast welds (SP 10) and damaged areas; apply primer.
 - .4 Clean primed surfaces and brush blast.
 - .5 Apply mist coat of primer.
 - .6 Apply finish coats.
 - .7 Touch up as required.
- .4 System No. 10 Galvanized Metal Conditioning:

Surface Prep.	Paint Material	Min. Coats, Cover
Solvent Clean (SP 1) Followed by Hand Tool (SP 2), Power Tool (SP 3), or Brushoff Blast (SP 7)	Wash primer or coating Manufacturers' recommended primer followed by System No. 5	1 coat, 0.01 mm MDFT (0.4 mils MDFT)

- .1 Application Schedule: Use on galvanized surfaces, including handrails and gratings, before application of System No. 5.
- .2 Coating Sequence Anticipated:
 - .1 Clean galvanized surfaces.
 - .2 Apply primer.
 - .3 Apply intermediate and finish coats (See System No. 5).

END OF SECTION

PAINTING – CONCRETE AND STEEL FABRICATIONS

1. GENERAL

1.1 Work Included

- .1 Paint modified and new concrete items (Division 3).
- .2 Paint steel fabrications (Division 5) indicated to be painted.

1.2 Standards

- .1 Do painting and finishing to CAN/CGSB-85.10 and CAN/CGSB-85.100 including Appendix A, and to material Manufacturer's instructions, except where specified otherwise.

1.3 Delivery, Storage, and Handling

- .1 Deliver materials in manufacturer's sealed and labeled containers.
- .2 Store containers of volatile materials in well ventilated location, not exposed to excessive heat or direct sunlight.
- .3 Keep containers tightly closed except when in use.

1.4 Protection

- .1 Remove used wiping cloths from building daily.
- .2 Protect against spontaneous combustion by drenching with water or place in airtight metal containers.
- .3 Protect other work from paint splattering. Provide adequate tarpaulins and drop cloths.
- .4 Remove finish hardware, electrical switch and receptacle plates, etc., prior to painting and replace after completion.
- .5 In finished areas, place "WET PAINT" signs and bar traffic as necessary.

1.5 Maintenance Materials

- .1 Deliver to the Contract Administrator, one litre of each colour and finish used, in unopened sealed containers, with contents clearly labeled.
- .2 Maintenance materials to be from same production run as applied materials.

1.6 Submissions

- .1 Submit to Contract Administrator Manufacturer's standard colour chips or samples of colours to be used. Final colours to be accepted by the Contract Administrator.

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2. PRODUCTS

2.1 Materials

- .1 Paint materials: to CGSB standards listed in Paint Finishes. Materials to be premium quality manufactured by Glidden, C.P.I., Sherwin-Williams, or Pratt & Lambert.
- .2 Paint materials for successive coatings on same surface to be products of a single manufacturer.

3. EXECUTION

3.1 Surface Preparation

- .1 Prepare concrete surfaces to SSPC-SP 13, Table 1, Light Service. Do not coat concrete till after concrete has cured for 28 Calendar Days.
- .2 Test surfaces for moisture content. Do not apply materials to substrate when moisture content, exceeds 12% as determined by accepted moisture testing device.
- .3 Concrete surfaces: remove form release oil with Xylo. If smooth, etch for better adhesion. Follow instructions on Product Data sheets.
- .4 On steel surfaces, touch up damaged shop primer with CISC/CPMA 2-75.

3.2 Application

- .1 Wet sand and dust between each coat to remove defects visible from distance up to 1.5 m.
- .2 Apply number of coats of specified materials to designated surfaces as specified to cover surfaces perfectly. If surfaces are not properly covered, apply additional coats as necessary to properly finish work, at no cost to City.

3.3 Paint Finishes

- .1 For concrete surfaces apply Formula 1:
 - .1 One (1) coat primer-sealer to CAN/CGSB-1.119
 - .2 Two (2) coats alkyd semi-gloss enamel CAN/CGSB-1.57
- .2 For primed steel surfaces apply Formula 15:
 - .1 One (1) coat spot priming to CISC/CPMA 2-75
 - .2 Two (2) coats alkyd semi-gloss enamel CAN/CGSB-1.57

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3.4 Colour

- .1 Colours are to match existing adjacent surfaces or existing equipment.

END OF SECTION