

SSPC: The Society for Protective Coatings

PAINTING SYSTEM GUIDE 21.00

Guide for Selecting Painting Systems for Topsides*

1. Scope

1.1 This guide covers painting systems for the protection of the topside or exterior area of steel ships. This includes the area from the deep load line to the rail, more commonly called the freeboard, decks, and superstructure.

These systems can also be used for above-water parts of floating structures exposed to salt or fresh water and the normal marine environment. They also cover all above-water areas on ships such as deck equipment or machinery, booms, mast, and bulwarks.

2. Description

2.1 This guide outlines the components of a complete painting system for the protection of the exterior topside areas of steel ships operating primarily in salt or brackish waters. It consists of surface preparation for both new construction and for maintenance and repair of existing ships, prime coats, build or intermediate anti-corrosive coats, and finishes.

3. Reference Standards

3.1 The standards referenced in this guide are listed in Section 3.4 through 3.6 and form a part of the specification.

3.2 The latest issue, revision, or amendment of the reference standards in effect on the date of invitation to bid shall govern unless otherwise specified.

3.3 If there is a conflict between the requirements of any of the cited reference standards and the specification, the requirements of the specification shall prevail.

3.4 SSPC STANDARDS AND JOINT STANDARDS:

PA 1	Shop, Field, and Maintenance Painting of Steel
PA 2	Measurement of Dry Coating Thickness With Magnetic Gages
Paint 17	Chlorinated Rubber Primer
Paint 18	Chlorinated Rubber Intermediate Coat Paint
Paint 19	Chlorinated Rubber Topcoat Paint
Paint 21	White or Colored Silicone Alkyd Paint

Paint 27*	Basic Zinc Chromate – Vinyl Butyral Wash Primer
PS Guide 22.00	Guide for Selecting One-Coat Preconstruction or Prefabrication Painting Systems
SP 5/NACE No. 1	White Metal Blast Cleaning
SP 6/NACE No. 3	Commercial Blast Cleaning
SP 10/NACE No. 2	Near-White Blast Cleaning

3.5 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARD:

D 3925	Practice for Sampling Liquid Paints and Related Pigmented Coatings
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3.6 FEDERAL SPECIFICATIONS AND STANDARDS:

MIL-PRF-23236	Paint Coating Systems, Fuel and Salt Water Ballast Tanks (Formerly MIL-P-23236 or DoD-P-23236)
MIL-DTL-24441	Paint, Epoxy Polyamide, General Specification for (Formerly MIL-P-24441)

4. Surface Preparation

4.1 **NEW CONSTRUCTION:** The surface should be abrasive blast cleaned as specified in SSPC-SP 10, "Near-White Blast Cleaning." If specified in the procurement documents, a better degree of blast cleaning shall be substituted (SSPC-SP 5). If preconstruction primers are to be used, refer to SSPC-PS Guide 22.00, "Guide for Selecting One-Coat Preconstruction or Prefabrication Painting Systems."

4.2 **MAINTENANCE AND REPAIR OF EXISTING SHIPS:** All areas to be coated should be dry and free of all surface contaminants such as loose paint, oil, and grease. For large areas of coating breakdown, abrasive blast cleaning as specified in SSPC-SP 6, "Commercial Blast Cleaning" is recommended.

5. Paints

A topside coating system consists of anti-corrosive and/or barrier coatings overcoated with appropriate finish

coats. The following outlines accepted coating systems, recommended number of coats, and maintenance and repair procedures. Special notations and comments follow for each topside coating system. Table 1 summarizes these recommendations.

COMMENT: For topside areas which see only partial immersion or no immersion service, the following systems are appropriate. The choice of coating system depends upon service use and expected life of the system needed.

For partially immersed or non-immersed areas, the preferred base coat is a single coat of an inorganic zinc silicate applied at a dry film thickness of 63 to 88 micrometers (2.5 to 3.5 mils).

For the application of a complete new coating of inorganic zinc primer during the maintenance and repair of existing ships, the surface should be abrasive blast cleaned as specified in SSPC-SP 10, "Near-White Metal Blast Cleaning."

If an inorganic zinc silicate primer is used, one intermediate coat may be omitted from the system. The coating should be an acceptable anti-corrosive primer, preferably of the same generic class as the intermediate or build coats.

5.1 CATALYZED EPOXY: MIL-P-24441, "Paint, Epoxy Polyamide, General Specification for":

COMMENT: These are polyamide epoxies unmodified with hydrocarbon resins, tars, or other vehicle extenders. They can be chemically cured with amine or polyamide resins. (MIL-P-24441 has been replaced with MIL-DTL-24441.)

For maximum performance on fast ships that are expected to see long service, pure epoxy will also offer excellent abrasion resistance. Generally, these are high-build products which minimize the number of coats necessary to meet thickness requirements.

Generally, epoxy systems have poor curing characteristics at temperatures below 10°C (50°F). Below this temperature, intercoat adhesion is only poor to fair with most epoxy coatings; after long-term exposure, surface preparation in the maintenance and repair of these systems must be handled under close supervision.

For decorative purposes, a single coat of two part polyurethane (aliphatic type) or vinyl acrylic may be used to replace the finish coat of unmodified epoxy. Epoxies tend to chalk quite heavily.

5.2 VINYL SYSTEM: After cleaning, the steel shall be pretreated with a wash primer to improve adhesion. Apply the first coat of vinyl primer as soon as practical and preferably within 24 hours after the application of the wash primer.

COMMENT: The greatest attribute of a vinyl anti-corrosive system is the rate of cure achieved at low temperatures. They are also single-package for ease of application. As these are thermoplastic in nature, intercoat adhesion after long service times is excellent when

overcoating clean, dry, aged vinyls with new vinyl systems. This property makes these systems very good for maintenance and repair.

These systems have low volume solids and require multiple coats to achieve the proper dry film thicknesses. High-build products are possible, but care must be taken to ensure that all the solvents are released prior to putting into service. Abrasion resistance is inferior to pure epoxy or flake glass epoxy, or polyester systems.

5.2.1 Wash Primer Pretreatment: Use SSPC-Paint 27*, "Basic Zinc Chromate—Vinyl Butyral Wash Primer,":

COMMENT: This paint is an alcohol solution of polyvinyl butyral resin pigmented with basic zinc chromate reacted with an alcohol solution of phosphoric acid just prior to use.

5.3 VINYL-ACRYLIC (VINYL-ALKYD):

COMMENT: Vinyl-acrylic paints are a mixture of vinyl and acrylic resins plasticized with the same ester type plasticizers used in unmodified vinyls. Vinyl-alkyd paints are vinyl resins modified with long and medium long oil alkyd resins and plasticized in the same way as unmodified vinyls. The vinyl alkyds are used only as finish coats.

Unlike the vinyl anti-corrosive systems, vinyl-acrylic base coat primers generally do not need a wash primer.

The greatest attribute of a vinyl-acrylic anti-corrosive system is the rate of cure achieved at low temperatures. They are also single-package for ease of application. As these are thermoplastic in nature, intercoat adhesion after long service is maximized for maintenance and repair. In general, vinyl-acrylic finishes will offer substantially better gloss than vinyl systems.

These systems have low volume solids and require multiple coats to achieve the proper dry film thicknesses. High-build products are possible, but care must be taken to ensure that all the solvents are released prior to putting into service. Abrasion resistance is inferior to epoxy or flake glass epoxy or polyester systems.

5.4 CHLORINATED RUBBER: SSPC-Paint 17, "Chlorinated Rubber Inhibitive Primer," SSPC-Paint 18, "Chlorinated Rubber Intermediate Coat Paint," and SSPC-Paint 19, "Chlorinated Rubber Topcoat Paint":

COMMENT: These paints generally contain chlorinated rubber resin modified with chlorinated paraffin. They may also contain hydrocarbon resin modifications. They may also be filled with inert extenders.

These single-package, generally high-build paints are applicable at very low temperatures. Chlorinated rubber systems are thermoplastic, and inter-coat adhesion is excellent after long periods of service without major surface preparation.

Although volume solids are somewhat greater than those of vinyl systems, they are still considered low as compared to epoxy systems. Abrasion resistance is fair.

5.5 ALKYD:

COMMENT: Based on short, medium, and long oil alkyds depending upon properties desired. Base coat primers generally contain rust inhibitive pigments. Finishes may be gloss, semi-gloss, or flat depending upon areas of usage and appearance needed. May be pigmented with inorganic or organic pigments for color, provided light stability is afforded.

If an inorganic zinc silicate coating is used as the primer, then a tie-coat compatible with both coating types must be applied before any alkyd coatings.

The greatest attribute of this system is its low cost and ease of application as compared to any of the above. Surface preparation is generally not as demanding as that for epoxy, vinyl, and chlorinated rubber systems. These are single package and can be supplied as high build paints. Heavy films of primers should be avoided in maintenance work.

Conventional alkyd or oleoresinous coatings cure by solvent release and oxidation. Cure below 10°C (50°F) is poor. Volume solids are generally 10 to 20 percent higher than those for vinyl and chlorinated coatings, but high build alkyds are not recommended. Because of poor low temperature curing, application as related to film thickness can be critical. Abrasion resistance is only fair.

5.6 SILICONE ALKYD: SSPC Paint 21, "White or Colored Silicone Alkyd Paint" (Type I, "High Gloss" and Type II, "Medium Gloss"):

COMMENT: Silicone alkyd paints use the same primers as alkyd paints with similar surface preparation. Gloss is usually high or medium to maximize long-term weatherability.

Although initial cost is higher than alkyd paints, silicone alkyds retain initial gloss and are more chalk resistant.

Like alkyds, silicone alkyds cure by solvent evaporation and oxidation. Cure below 10°C (50°F) is poor. Volume solids are generally 10 to 20 percent higher than those for vinyl and chlorinated rubber coatings, but high build alkyds are not recommended. Abrasion resistance and chemical resistance properties are equal to alkyd paints.

5.7 PROPRIETARY COATING SYSTEMS:

COMMENT: A proprietary coating system of the above generic types with proven performance capability may be used if desired by the specifier. Specify the manufacturer, trade name, and product number of the desired proprietary paints. The paint manufacturer should furnish a typical label analysis.

6. Paint Application

6.1 PAINT APPLICATION: Follow requirements of SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel."

6.2 NUMBER OF COATS: See Table 1.

6.3 DRY FILM THICKNESS: Measure in accordance with SSPC-PA 2, "Measurement of Dry Coating Thickness with Magnetic Gages." See Table 1.

7. Inspection

7.1 All work and materials supplied under this specification is subject to timely inspection by the purchaser or his authorized representative. The contractor shall correct such work or replace such material as is found defective under this specification. (See Note 9.1.) In case of dispute, unless otherwise specified, the arbitration or settlement procedure established in the procurement documents shall be followed. If no arbitration procedure is established, the procedure specified by the American Arbitration Association shall be used.

7.2 Samples of paints under this painting system may be requested by the purchaser and shall be supplied upon request along with the manufacturer's name and identification for the materials. Samples may be requested at the time the purchase order is placed, or may be taken from unopened containers at the job site.

7.3 Unless otherwise specified, the sampling shall be in accordance with ASTM D 3925.

8. Disclaimer

8.1 While every precaution is taken to ensure that all information furnished in SSPC standards and specifications is as accurate, complete, and useful as possible, SSPC cannot assume responsibility nor incur any obligation resulting from the use of any materials, coatings, or methods specified herein, or of the specification or standard itself.

8.2 This specification does not attempt to address problems concerning safety associated with its use. The user of this specification, as well as the user of all products or practices described herein, is responsible for instituting appropriate health and safety practices and for insuring compliance with all governmental regulations.

9. Note

Notes are not a requirement of this specification.

9.1 The procurement documents should establish the responsibility for samples, testing, and any required affidavit certifying full compliance with the specification.

TABLE 1
RECOMMENDED TOPSIDE COATING SYSTEMS

GENERIC CLASS OF ANTICORROSIVE	NO. OF COATS	DRY FILM THICKNESS	APPROPRIATE THICKNESS	NO. OF COATS	DRY FILM THICKNESS	MAINTENANCE AND REPAIR PROCEDURES
5.1 Catalyzed Epoxy	1 or 2	2.0-4.0 Mils 50-100 Micrometers	Catalyzed Epoxy	1	4.0-6.0 Mils 100-150 Micrometers	Fresh water wash, spot blast bad areas.
5.2 Vinyl (A) Wash Primer	1	(A) 0.5 Mils 13 Micrometers	Vinyl Alkyd or Vinyl Acrylic	1 or 2	2.5 Mils 64-75 Micrometers	Fresh water wash, spot blast bad areas.
(B) Anti-Corrosive	3	(B) 4.5-6.0 Mils 114-150 Micrometers				
5.3 Vinyl Acrylic (A) Primer	1	(A) 2.0-2.5 Mils 50-64 Micrometers	Vinyl Acrylic	1 or 2	1.5-3.0 Mils 38-75 Micrometers	Fresh water wash, spot blast bad areas.
(B) Intermediate	2	(B) 4.0-6.0 Mils 100-150 Micrometers				
5.4 Chlorinated Rubber	3	9.0 Mils 225 Micrometers	Chlorinated Rubber	1	1.0-1.5 Mils 25-38 Micrometers	Fresh water wash, spot blast bad areas.
5.5 Alkyd	2	3.0-4.0 Mils 75-100 Micrometers	Alkyd or Silicone Alkyd	2	3.0-4.0 Mils 75-100 Micrometers	Fresh water wash, spot blast bad areas.
or						
5.6 Silicone Alkyd						

* This paint contains chromate pigments. Users are urged to follow all health, safety, and environmental requirements in applying, handling, or disposing of these materials.