SSPC: The Society for Protective Coatings

PAINTING SYSTEM GUIDE NO. 20.00

Guide for Selecting Painting Systems for Boottoppings*

1. Scope

1.1 This guide covers painting systems for the protection of the exterior boottop areas (the area from the light load line to the deep load line) of steel ships. It should be noted that boottops are rarely used with today's commercial ships and bottom systems may extend up to the deep load line. In general, the anti-corrosive and antifouling paints covered in SSPC-PS Guide 19.00 are applicable to boottop areas.

2. Description

2.1 This guide outlines the components of a complete painting system for the protection of the exterior boottop 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 20	Zinc-Rich Primers (Type I - Inorganic and Type II - Organic)
Paint 27*	Basic Zinc Chromate – Vinyl Butyral Wash Primer
Paint 29	Zinc Dust Sacrificial Primer, Performance-Based
PS Guide 19.00	Guide for Selecting Painting Systems for Ship Bottoms
PS Guide 22.00	Guide for Selecting One-Coat Preconstruction or Prefabrication Painting Systems
SP 5/NACE No. 1	White Metal Blast Cleaning
SP 7/NACE No. 4	Brush-Off 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

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-Guide 22.00, "Guide for Selecting One-Coat Preconstruction or Pre-Fabrication Painting Systems."

4.2 MAINTENANCE AND REPAIR OF EXISTING SHIPS: Immediately upon docking, the entire boottop area should be washed with fresh water at high pressure to remove marine fouling, loosely adhering paint, salt deposits, and calcareous deposits from cathodic protection. High pressure water cleaning equipment should operate at approximately 14 to 21 Mpa (2,000 to 3,000 psi) for proper removal.

COMMENT: Once the hull has been cleaned and has dried, the entire boottop area should be carefully inspected

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for coating system breakdown. For large areas of breakdown, abrasive blasting to the degree required by the coating system is recommended. For tenaciously adhering fouling, SSPC-SP 7, "Brush-Off Blast Cleaning," may be required. SSPC-SP 7 may also be required for proper adhesion of the new coating to certain aged coatings, e.g., epoxy, etc.

5. Paints

A boottop 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, appropriate antifouling paint, and maintenance and repair procedures. Special notations and comments follow for each boottop coating system. Table 1 summarizes these recommendations.

COMMENT: For boottop areas which see only partial immersion or no immersion service, the following systems are appropriate. Finishing can be done with either an appropriate antifouling paint or other finish, depending on service. Special consideration should be given to the use of organo-tin antifouling coatings, as they offer the greatest potential to eliminate weed growth. For boottop coatings that are in continuous immersion service, use the coating systems recommended in SSPC-PS Guide 19.00, "Guide for Selecting Painting Systems for Ship Bottoms."

An inorganic zinc silicate coating described in Section 5.1 is the preferred primer coat for boottop coating systems described in Sections 5.2 through 5.7. If an inorganic zinc silicate primer is not used, an additional coat should be added to the systems as the first coat. The coating should be an acceptable anti-corrosive primer, preferably of the same generic class as the intermediate or build coats.

5.1 SSPC-PAINT 20, "Zinc-Rich Primers (Type I, Inorganic and Type II, Organic)," and MIL-PRF-23236, "Paint Coating System, Steel Ship Tank, Fuel and Salt Water Ballast," Type I, "General Use," Class 3, "Silicate, Phosphate, or Silicone Zinc" (See Note 9.2):

COMMENT: Of all anti-corrosive coatings, inorganic zinc silicates alone provide cathodic protection. Inorganic silicate vehicles may contain some organic modifications, but these modifications should not exceed 30 percent of the total binder composition. The cured binder should contain at least 70 percent silicate, calculated as silicone dioxide. As there are many levels and types of pigmentation, including zinc metal and extenders, the coatings supplier should supply specific performance data.

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).

Inorganic zinc silicates should not be used below the flakeglass epoxy or polyester coating system described in Section 5.3 as the silicate coating may interfere with the effectiveness of these highly abrasion resistant coatings.

For the application of a complete new coating of inorganic zinc during the maintenance and repair of existing ships, the surface should be abrasive blast cleaned as specified in SSPC-SP 1O, "Near-White Blast Cleaning."

5.2 CATALYZED EPOXY: MIL-DTL-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-DTL-24441 has replaced MIL-P-24441.)

For maximum performance on fast ships that are expected to see long service, unmodified 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.

5.3 FLAKE GLASS EPOXY OR POLYESTER:

COMMENT: These pure or hydrocarbon modified epoxy or polyester resins are filled with hammer milled fiberglass flakes. Polyesters may contain a large percentage of styrene monomer and are cured with cobalt and peroxides. Epoxies are cured with polyamine or polyamide resins.

This system is designed for very specialized applications where the maximum abrasion resistance is required. It is generally used on keel plates, rudders, skegs, and areas of high abrasion and turbulence.

Generally, flake glass epoxy or polyester systems have poor curing characteristics at temperatures below 10°C (50°F). Because intercoat adhesion is only poor to fair with most flake glass epoxy or polyester anti-corrosives after long-term exposures, surface preparation in the maintenance and repair of these systems must be handled under close supervision.

5.4 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

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TABLE 1
RECOMMENDED BOOTOP COATING SYSTEMS

GENERIC CLASS OF ANTI-CORROSIVE	NO. OF COATS	DRY FILM THICKNESS	FINISH COATS	NO. OF COATS	DRY FILM THICKNESS	MAINTENANCE AND REPAIR PROCEDURES
5.1 Inorganic Zinc Silicate	1	2.5-3.5 Mils 63-88 Micrometers	Consult Manufacturer**			Fresh water wash, spot blast bad areas.
5.2 Catalyzed Epoxy (Amine or Polyamide Cured)	2	6.0-8.0 Mils 150-200 Micrometers	Catalyzed Epoxy	1	2.0-3.0 Mils 50-75 Micrometers	Fresh water wash, spot blast bad areas.
5.3 Flake Glass Epoxy or Polyester	1 or 2	30.0-50.0 Mils 750-1250 Micrometers	None Catalyzed Epoxy Optional			Fresh water wash, spot blast bad areas.
5.4 Vinyl***	2	3.0-4.0 Mils 75-100 Micrometers	Vinyl, Vinyl Acrylic or Vinyl Alkyd	1 or 2	2.0-3.0 Mils 50-75 Micrometers	Fresh water wash, spot blast bad areas.
5.5 Vinyl Acrylic***	2	3.0-4.0 Mils 75-100 Micrometers	Vinyl Acrylic	1 or 2	2.0-3.0 Mils 50-75 Micrometers	Fresh water wash, spot blast bad areas.
5.6 Chlorinated Rubber**	2	6.0 Mils 150 Micrometers	Chlorinated Rubber	1	2.0 Mils 50 Micrometers	Fresh water wash, spot blast bad areas.
5.7 Alkyd**	2	4.0 Mils 100 Micrometers	Alkyd	1 or 2	2.0-4.0 Mils 50-100 Micrometers	Fresh water wash, spot blast bad areas.

** If an inorganic zinc silicate base coat is used, it will be necessary to apply an appropriate tie coat primer. Check with the coatings supplier for more specific information and recommendations on overcoating procedures.
***If no inorganic zinc silicate is used, a wash primer pretreatment applied to a dry film thickness of approximately 13 micrometers (0.5 mil) may be required with some vinyl or vinyl acrylic systems. Apply wash primer as soon as practical after cleaning and first coat of vinyl or vinyl acrylic as soon as practical, (preferable within 24 hours of the applicaiton of wash primer).

multiple coats to achieve the proper dry film thicknesses. High-build produces 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.

5.4.1 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.

5.5 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 times 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 pure epoxy or flake glass epoxy or polyester systems.

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5.6 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 and rosin. 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 intercoat adhesion is excellent after long periods of service without major surface preparation.

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

5.7 ALKYD:

COMMENT: Alkyd resins are prepared from various oils or the fatty acids of those oils and an anhydride and polyhydric alcohol. Primers generally contain inhibitive pigments.

The greatest attribute of this system is its low cost as compared to any of the above. Surface preparation is generally not as demanding as that for epoxy, vinyl, and chlorinated rubber systems.

Conventional alkyd or oleoresinous coatings cure by solvent release and metal catalyzed crosslinking. 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.

5.8 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. Notes

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.

9.2 Coatings conforming to SSPC-Paint 29, "Zinc Dust Sacrificial Primer, Performance-Based" may also satisfy the requirements of this Guide.

9.3 The paints specified herein may not comply with some air pollution regulations because of their solvent content.

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

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